P

Paleostriatum

► Globus Pallidus

Palpebronasal Fold

► Epicanthic Fold

Para

► Para-educator
► Paraprofessional

Paraeducator

► Paraprofessional

Para-educator

Karen Meers
Center of Excellence on Autism Spectrum Disorders, Southern Connecticut State University, New Haven, CT, USA

Synonyms

Aide; Classroom aide; Educational assistant; Instructional assistant; One-to-one; Para; Paraprofessional; Teacher's aide; Teaching assistant; Tutor

Definition

Para-educators are school employees who work directly under the supervision of licensed professionals and who deliver instructional and direct services to students and their families. The licensed professionals, however, maintain responsibility for assessing learner and family needs and for planning, evaluating, and modifying programs. Pickett (1996) was the first to introduce the title para-educator to convey a level of training analogous to paramedic in the medical field and paralegal in the legal field. Historically, para-educators provided assistance with tasks ranging from clerical to individualized living tasks. In the present, they have become a key part of the specialized education team in delivering individualized instruction and services. Para-educators who work with children with autism spectrum disorders (ASD) and other developmental disabilities have responsibilities that may include assisting students with instruction; social, emotional, and behavioral skill development; and personal care. Additionally, they may also engage in behavioral data collection and collaboration with other educators (Rossetti & Goessling, 2010). National Research Council (2001) lists para-educators as one of the potential resources for providing special services for children with autism.

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See Also

► Paraprofessional

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Paralinguistic Communication Assessment

Sue Peppé
High Appin, Tynron, Thornhill, UK

Definition

"Paralinguistic communication" has been defined as "not WHAT you say, but THE WAY you say it." Paralanguage, sometimes known as nonverbal communication, is communication by means other than words, although (usually) operating alongside language. Paralanguage is often impaired in people with autism spectrum disorder, to a lesser or, more often, greater degree than their language. Here, prosody (also known as intonation) and voice, which operate in conjunction with speech, are considered. More peripheral aspects of paralanguage would include eye-gaze, body language, and gesture: all often impaired in ASD.

"Prosody" is an umbrella term for modulations of the speech stream in terms of its loudness, length, and pitch. These modulations manifest themselves as the relative duration of syllables (determining speech-rhythm and speech-rate), the placing and quantity of stress in words, and changes of pitch (which produce pitch-patterns or contours). These affect the linguistic impact of utterances, conversational interaction, and the verbal punctuation of speech; they also give indications of the speaker's identity (accent) and attitude to what is said. "Intonation" is another umbrella term for these modulations, which can also be described as "suprasegmental": "segmental" refers to the makeup of words in terms of consonants and vowels, and "suprasegmental" to levels which span individual sounds/letters, that is, generalizations that apply to syllables, whole words, phrases, and discourse.

"Voice" here denotes vocal quality, and the way this can affect the impact of the spoken word; for example, vocal huskiness suggests the imminence of tears and profound sadness in the speaker. Atypical vocal quality has often been noted in people with ASD.

"Assessment" refers to methods of gauging ability and the severity of disability. Assessment protocols range from procedures devised on an ad hoc basis for research projects to formal tests. Formal tests assess the degree, usually described in numerical terms, to which a speaker may be impaired on a particular aspect of speech. Such tests may be standardized, that is, provide data from large numbers of unimpaired speakers with which the performance of individual speakers can be compared.

Historical Background

Although the importance of prosody in speech has long been recognized, it was not until the

1980s that ways of assessing prosodic ability began to develop. Some protocols were devised as parts of investigations into speech impairment in conditions such as dysarthria or aphasia. These procedures were not comprehensive as tests of prosodic ability: They often assessed only a few aspects of prosody, for example, whether stress was placed correctly. Moreover, they focused on prosody in speech-production without assessing how well prosody was understood. They usually required transcription: A disadvantage, in that systems for transcribing prosody were (and are still) unsettled, and few people are familiar with them.

David Crystal designed a series of procedures for measuring disability in different aspects of speech and language, one of which concerned prosody: This was known as "*Pro*sody *P*rofile" or "PROP" (Crystal, 1982). The PROP sampled spontaneous speech which was prosodically transcribed and scored according to how correctly the prosody was deemed to reflect the speaker's intentions as to phrasing and conversational interaction. Since then, the PVSP (q.v.) has been devised, on lines similar to PROP in that it involves the sampling and transcription of spontaneous speech.

For the assessment of vocal quality, Laver devised the Vocal Profile Analysis (VPA) in the 1980s. This is a technique for assessing laryngeal, phonatory, and articulatory settings. Similarly, the GRBAS (Grade, Roughness, Breathiness, Asthenia, Strain) scale is used for evaluating hoarse voice quality.

There has been an awareness of prosodic and vocal impairment in autism since the earliest descriptions of the condition; in 1943, Leo Kanner, writing about children with autism mentions "a monotonous singsong manner" (Case 7) and a voice "peculiarly unmodulated, hoarse; utters her words in an abrupt manner" (Case 11). He also notes that in the repetitions (echolalia) of what was said to the children he examined "even the intonation is retained." Hans Asperger, writing in 1944, similarly observed odd prosody in the children with ASD that he examined.

The work of Christiane Baltaxe in the 1980s was pioneering in that it focused particularly on the assessment of expressive prosody in autism. See "References and Readings," McCann & Peppé, 2003, for a review of articles addressing the issue and a description of assessment methods used. No publication has been made of the findings of the VPA and the GRBAS with speakers with ASD.

Current Knowledge

There are essentially four tests for assessing prosody and voice: one that assesses both, one devoted to prosody, and two to voice. There are also several other ad hoc procedures that have been used in research papers. Automated assessment is likely to increase: This will involve the collection of large amounts of speech-data which can be scored in increasingly sophisticated ways by computer programs and will thus focus on prosody in speech-production as opposed to understanding of prosody.

Prosody and Voice

The *Prosody-Voice Screening Profile* (*PVSP*) assesses five suprasegmental speech factors (phrasing, rate, stress, pitch, and loudness) as well as two aspects of voice quality (laryngeality and resonance) in spontaneous speech for their appropriateness.

A major study used this test to compare the utterances of young people with ASD and typical development, and found inappropriate resonance and stress placement in the speakers with ASD (see "References and Readings").

Prosody

The *Profiling Elements of Prosody in Speech-Communication* (*PEPS-C*) test assesses receptive and expressive ability in four functional aspects of prosody as well as auditory discrimination and imitation of prosody.

Several studies (see "References and Readings") have used this test to research prosody in speakers with ASD, and have found impairment in some aspects, for example, the ability to place stress correctly, the use of prosody for conveying affect, and imitation of prosody.

Voice

Voice quality is assessed by making judgments about vocal sound, using adjectives such as "hoarse" and "husky" to describe it. Little has been done in the way of assessment of vocal quality in autism, and the standard diagnostic reference for ASD does not include vocal characteristics as a marker of ASD. As mentioned above, hoarse vocal quality was noted by Kanner in his first evaluation of autism. Vocal quality is generally taken as a good indicator of a speaker's emotional and physical state, and hoarseness normally suggests tiredness or ill-health; this could be misleading if the hoarseness is part of the autistic condition. It is, however, true that listeners rapidly learn to discount the information value of habitual voice quality.

The Vocal Profile Analysis assesses laryngeal, phonatory, and articulatory settings, but no publication has been made of its use with speakers with ASD.

The GRBAS (Grade, Roughness, Breathiness, Asthenia, Strain) scale is used for evaluating hoarse voice quality, but has apparently not been used for this in people with ASD. This scale was developed in Japan in the 1980s, but has no published standardized English protocol.

The Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V) has recently been developed under the auspices of the American Speech-Language-Hearing Association (ASHA) and compares well with the GRBAS for reliability.

Automated Assessment

Programs have been developed to analyze speech automatically in terms of syllable-length, loudness, and pitch-variation. The advantage of automated assessment is that it can process very large samples, for example, of continuous day-long recordings. A disadvantage is that the programs have some way to go before they can accurately assess appropriateness for language use: Whether the variations of length, loudness, and pitch are typical of the language or accent being spoken, or adequately convey stress, phrasing, questions, etc.

Oller and associates (see "References and Readings") have used such automated procedures with no human intervention; comparisons show that human judgment and automated assessment agreed well. They found that vocalizations of typically developing children and those of children with ASD were distinguished by spectral differences related especially to syllabification and by features of voice quality.

Van Santen and colleagues are also working on automated assessment. They have found that children with ASD show a difference in the balance between the various prosodic cues, such as pitch, amplitude, and duration, and not necessarily a difference in the strength or clarity with which prosodic contrasts are expressed.

Future Directions

Recent research suggests that certain prosodic functions are generally impaired in autism spectrum conditions, for example, stress placement and the expression of emotion, and the understanding of prosody. It also seems that the degree varies more or less according to the severity of the autism condition. There is, however, scope for further research, for example in people with ASD who speak *languages other than English*.

A generalization in objective terms about the *acoustic characteristics of autistic prosody* has however proved elusive, although many people who work with autism would find it highly recognizable.

The period of time-consuming manual data collection and transcription for research purposes appears to be reaching its end, although this is still important for clinical investigation of individuals. In research, the manual process is being overtaken by *automation*.

The ability to understand prosody is central to language development and it seems that *prosodic processing* in the brains of those with autism may be different from non-autistic processing. Magnetic resonance imaging is being used to investigate this.

Assessment of Prosody in Other Languages

The PEPS-C test has been translated into French, Spanish, Dutch, and Norwegian, as described in

Peppé et al. (2010). It is also available in various accents of English: UK General, UK Scottish, Irish, North American General, and Australian General. Requests for translated versions have been received from researchers working in Finnish, Portuguese, Farsi, Chinese, and Egyptian Arabic, and translation into more languages is a possibility.

Acoustic Characteristics of Prosody in ASD

The ability to generalize about the acoustic characteristics of prosody in ASD is still at an early stage. Diehl, Paul and colleagues found that their group of children with ASD had overall longer utterance durations than children with learning difficulties and typical development, and that children with high-functioning autism show greater pitch variation in their speech (see "References and Readings" for details of this work). With increasing scope for acoustic analysis such generalization may be extended.

Automation

Having written nearly 20 years ago, Shriberg and colleagues regret that "completely objective measurement of all relevant parameters for prosody-voice assessment is currently not a technical option . . . use of inappropriate lexical, emphatic, and sentential stress, inappropriate intonation in pragmatic contexts, breathiness, nasality, denasality, and other parameters cannot be accomplished by current voice or speech recognition programs." Assessment of prosody by automated acoustic analysis is increasingly available as technology develops, as indicated by the work of Oller and colleagues (see "References and Readings"). This focuses on the acoustic characteristics rather than the functions of voice and prosody: Their findings that atypical vocal quality and syllabification in children with ASD can be determined with automated analysis can be expected to contribute to early diagnosis and screening for ASD.

Prosodic Processing

There is increasing interest in using magnetic resonance imaging to establish whether there are differences in prosodic processing in the brains of people with and without ASD. Some differences have been found: for example, that in people without ASD the processing of speech sounds occurs in a different part of the brain than the processing of non-speech sounds, but that this is not the case in people with ASD; and that patterns of brain activation suggested a decrease of activation for emotional stimuli in people with ASD. For more recent research in this area, see the work of the Yale Center for Research in Autism and of Isabelle Hesling in Bordeaux, France.

See Also

- ▶ PEPS-C
- ▶ Prosody
- ▶ PVSP

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Parallel Play

► Play

Paraphasia

Margaret Millea
Department of Psychology, University of Notre Dame, Indiana, USA

Synonyms

Speech impairment

Definition

Paraphasia is a speech disorder with neurological origins. Although the hearing and comprehension of speech may not be inhibited, the production of speech is not correct. The individual may be able to speak fluently, but with errors. The errors range from the mispronunciations of single words to the combination of words in inappropriate or meaningless ways. Because the sounds or words are mixed up, it may be difficult to understand the intended meaning.

There are three types of paraphasia:

1. Literal or phonemic paraphasia – incorrect phonemes are substituted. For example, one may say "spot" instead of "pot." Literal paraphasia could also be switching syllables or creating reverse compound words such as "markbook" instead of "bookmark."
2. Verbal paraphasia – saying a completely different word than the one intended. It could

be a semantic replacement and be related to the intended word, or it could be remote with no clear connection to the intended word. An example of semantic verbal paraphasia would be saying "drive" instead of "car." Remote verbal paraphasia would be saying "dog" instead of "car."

3. Neologistic paraphasia – more than half of a word is incorrect. Out of context, it is difficult to guess what the intended word was. An example would be substituting "camalee" for "camera."

See Also

- ▶ Apraxia
- ▶ Speech Impairment

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Paraprofessional

Danielle Geno
The College of Arts and Sciences,
The University of Vermont, Burlington,
VT, USA

Synonyms

Aide; Assistant; Associate; Classroom aide; Instructional assistant; One-on-One; Para; Paraeducator

Definition

Paraprofessionals are employees who, following appropriate academic education/instruction and/or on-the-job training, work with children with disabilities, including those with autism, during the day to support their educational needs. The intention of a paraprofessional is to supplement the work of a teacher/service provider (American Speech-Language-Hearing Association 1999). The paraprofessional is becoming better known as a resource for providing services to the individual with ASD (National Research Council, 2001).

See Also

- ▶ Paraeducator
- ▶ Para-educator

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Parent Involvement

- ▶ Parent-Professional Partnership

Parent Protections

▶ Procedural Safeguards

Parent Training

Cynthia R. Johnson[1] and Johanna Patricia Taylor[2]
[1]Pediatrics, Psychiatry, & Education, University of Pittsburgh, Pittsburgh, PA, USA
[2]Pediatrics & Education, University of Pittsburgh, Pittsburgh, PA, USA

Definition

Over the past 40 years, parent training (PT) has been defined to have slightly differing meaning depending on the intended population, the professional delivering the training, and the targets of the PT. The term "PT" has also been used interchangeably with parent management training, parent effectiveness training, parent-mediated training, and parent-assisted training depending on the target group and foci of treatment goals. PT as a model of service delivery has been described extensively in numerous fields to include the mental health and psychological sciences, education, and health sciences. Broadly defined, PT involves teaching parents and caregivers knowledge and skills to more distally impact a child. The specific content and format of PT may vary, as does the delivery and duration of the program. PT programs may include sessions on child development, behavior management, communication, and interaction styles but more specific skills such as increasing a child's compliance to a medical regimen. PT may be delivered individually, in group setting, and via distant learning mediums (Internet, DVD). For purposes of PT related to autism spectrum disorders (ASD), PT assumes parents are taught to intervene with their child with ASD to decrease challenging, interfering behaviors (e.g., aggression, disruptive behaviors) and/or to teach new behaviors. These new behaviors may be directly related to core and early emerging deficits (e.g., social communication behaviors) but also developmentally appropriate skills (e.g., preacademic skills) and self-help, adaptive skills.

Historical Background

As already suggested, teaching parents in the concepts and skills to in turn impact their children's behavior has a long history for a range of childhood issues. PT is a well-established intervention for children with noncompliance and disruptive behaviors. PT, often referred to as parent management training for these populations, has been study for children with attention deficit/hyperactivity disorder (Barkley, Edward, Laneri, Fletcher, & Metevia, 2001) and conduct problems (Kazdin, 2003). PT has more recently been demonstrated to be a promising treatment mode for childhood anxiety disorders (Barrett & Shortt, 2003) and for tics and Tourette's (Scahill et al., 2006). PT training during the preschool years to offset the sequelae of childhood behavioral issues has been an active area of inquiry as well (Eyberg, Boggs, & Algina, 1995; Webster-Stratton & Taylor, 2001). Further, PT as treatment or prevention of child abuse is a well-recognized approach (Lundahl, Nimer, & Parsons, 2006).

PT also has a long tradition for children with developmental delay and intellectual disability (ID) broadly defined. Parent involvement is generally accepted to be particularly critical for improved outcome in this population. Baker and colleagues have been instrumental in establishing parent training as an efficacious approach for children with a range of ID (Baker, 1996; Baker et al., 1997). Parent training in this line of work focused on teaching parents basic behavioral principles to improve behaviors as well as teaching procedures to promote skill development. Other lines of research have focused more specifically on intervening at a younger age for children to promote early development (Kaiser & Hancock, 2003).

A parallel literature has been devoted to interventions for children ASD where the parent is

trained to deliver the intervention in lieu of a trained therapist. A plethora of single-subject publications demonstrate that parents of children with ASD can learn techniques for decreasing challenging behaviors as well as improving functional skills, features of autism, and overall compliance (Ducharme & Drain 2004; Lerman, Addison, & Kodak, 2006; Moes & Freas, 2002; Smith, Buch, & Gamby, 2000; Symon, 2005). Across the United States, comprehensive educational and intervention programs for children with ASD very often have a PT component as part of the package of services. However, only more recent years have PT in ASD have withstood the rigors of randomized controlled trials.

Rationale or Underlying Theory

Parent training programs have varied in the theoretical underpinning. The bulk of parent training programs have been behavioral in nature, either based primarily on operant conditioning or social learning theory. Much has been written about coercion theory and more recently on dynamic systems principles as explanatory of the development of antisocial childhood behaviors (Granic & Patterson, 2006). For parents of children with disruptive behaviors, but not ASD (non-ASD), there is a core assumption that deficit or dysfunctional parenting and parent-child interactions are at least contributory to the child's maladaptive behaviors. This hypothesis is not made for parents of children with ASD. Rather, the assumption is that parenting a child with ASD is particularly challenging given the child's core deficits, and parenting a child requires a higher level of skill and knowledge and higher level of input than that of developing a child without ASD.

PT programs specifically for ID and ASD have been primarily based on operant learning procedures but have also included developmental theory as well. The empirical support for operant learning procedures borne out of the field of applied behavior analysis (ABA) over the past 30 years is unequivocal for those with ID and ASD. These procedures have been in turn taught to parents. The rationale for including parents is based on several assumptions such as the child is most influenced by the parent, the parent spends considerable time with the child, and, of course, the parent is motivated, willing to learn and implement the behavioral procedures, and has the necessary resources to do so.

Goals and Objectives

While some PT programs for children with ASD have targeted disruptive, challenging behaviors (self-injury), other programs have specifically target core deficits to include communication skills, social skills, and adaptive skills. In keeping with a more stringent ABA model, PT for ASD has also focused more on determining the function of behaviors in children with communication deficits. In our own work, an emphasis has been placed on teaching parents to identify the function of their child's behavior. An emphasis has also been on teaching parents a range of antecedent management approaches such as the use of visual strategies and functional communication approaches as well as more traditional consequence approaches (reinforcement, extinction, and mild punishments). Other PT programs have emphasized skill development related to core deficits and developmentally appropriate skills to include early prerequisite skills such as joint attention, imitation skills, nonverbal and verbal communication skills, and social engagement. More descriptive information of representative programs is offered in section G. PT has often been an adjunct to other interventions but has also been the sole treatment for children with ASD.

Treatment Participants

Within a PT model, both the parent/caregiver and child are considered participants. While the intervention is delivered to the parent, the primary outcomes of interest are those distal effects on the child. However, changes in parent behaviors are of interest as well. Parent variables associated

with better versus poorer outcomes have been closely evaluated in the non-ASD literature, but are only now being evaluated more systematically in the PT literature specific to ASD. For PT for children with disruptive and noncompliance behaviors but typically developing, parent's adherence to the treatment has been shown to predict outcome, and specific attention to enhancing adherence has been studied (Nock & Ferriter, 2005). Adherence has been defined in various ways but has included such variables as whether the parent regularly attended to sessions, parent completed requested homework, and parent implemented taught strategies.

While child variables associated with more or less response to PT have not specifically been determined in the ASD field, child variables more responsive to psychosocial treatments more broadly defined have been suggested. Higher developmental, cognitive, and language levels are believed to be associated with better outcomes in general and larger gains with psychosocial treatments. Not surprisingly, better outcome has been shown to be associated with fewer symptoms of ASD at outset. Much more research is necessary to determine which parent and which child with ASD will most likely benefit from a PT model of service delivery and then to what PT program more specifically. Considerably more research efforts are needed before such questions can be answered.

Treatment Procedures

PT programs and procedures have widely differed across several variables. These include the intended target of PT program, the ages of the children with ASD included, duration or "dose" of training parents received, and how the program was delivered (individual, group, distant/online program). The PT may have been highly specific to the child or a manualized approach. Moreover, as already mentioned, the goals of the PT have been broad. For purposes of discussing the current literature, an overview of a few representative programs addressing challenging problems, those addressing core skill deficits and teaching of new skills, and finally those emerging programs via distant, Internet format are provided. It should be noted, however, that many programs overlap, particularly the more comprehensive, manualized PT programs. Table 1 provides more detailed information about these PT programs.

Programs Addressing Challenging Problem Behaviors

As already mentioned, research utilizing primarily single-subject designs has demonstrated parents of children with ASD can be taught ABA procedures and techniques to alter their children's targeted problem behaviors such as aggression, self-injury, noncompliance, and other disruptive behaviors. Much of this single-subject literature reported on teaching parents very specific, individualized ABA procedures to target one or two challenging behaviors. More comprehensive PT programs have taught parents and caregivers a range of ABA-based procedures (e.g., antecedent management, reinforcement contingencies, extinction, planned ignoring) to decrease their children's maladaptive behavior and teach new functional and adaptive skills. Two large-scale randomized control trials (RCTs) have provided evidence toward the efficacy of teaching a range of behavioral management strategies to parents through a structured, manual-based approach. Sessions were individual and delivered through didactic teaching, use of videos, regular homework assignments, role-playing, and rehearsal with immediate feedback (Aman et al., 2009; Johnson et al., 2007).

A few other programs utilized a combination of individual and group sessions. Whittingham and colleagues (Whittingham, Sofronoff, Sheffield, & Sanders, 2009) conducted a large study evaluating a PT model that incorporated ABA principles, social learning theory, coercion theory, and ASD-specific interventions (i.e., Social Stories™, Comic Strip Conversations™). This program extended an already established program (i.e., Stepping Stones Triple P) for parents of children with various developmental disabilities for use with parents of children with ASD. Training techniques (i.e., observation,

Parent Training, Table 1 Parent training programs

Reference	Participants N and age in months	Target behaviors	Dose of PT	Experimental design	Description
Smith et al. (2000)	N = 6 35–45 months	Children's receptive actions, nonverbal imitation, verbal imitation, and expressive object labels	Six (6 h) 1-day training workshops over 3 months	Multiple baseline across subjects	Taught parents to design and oversee a Lovaas-based discrete trial home-based program
Tonge et al. (2006)	N = 105 30–60 months	Parent mental health and adjustment	Twenty weeks of ten small group (90 min) sessions	RCT	Treatment groups Both manual-based PEBM: Parent education and behavioral management PEC: behavioral management and counseling
Solomon et al. (2008)	N = 19 60–144 months	Child problem and adaptive behaviors, parent stress, and shared positive affect	Two phases: six sessions each	RCT	Parent-Child Interaction Therapy includes two phases: (1) child-directed interaction and (2) parent-directed interaction
Anan et al. (2008)	N = 72 25–68 months	Child cognitive and adaptive functioning	Twelve weeks (180 h total/3 h each session)	Within single subject	Group Intensive Family Training: individual and group sessions with parent-child dyads Parents applied behavior analytic techniques in vivo with child. Staff modeling, coaching, and feedback provided
Whittingham et al. (2009)	N = 59 24–108 months	Parenting measures (i.e., laxness, overreactivity, verbosity, efficacy, satisfaction)	Nine sessions	RCT	Use of Stepping Stones Triple P in combination with ASD-specific interventions (comic strip conversations and social stories)
Nefdt et al. (2010)	N = 27 < 60 months	Parent elicited speech from child, parent confidence, treatment fidelity Child functional utterances		RCT	Self-directed learning model DVDs of PRT techniques
Kasari et al. (2010)	N = 38 21–36 months	Child joint attention, diversity of functional play	Twenty-four sessions, follow-up 1 year prior	RCT	Parent-mediated Joint engagement intervention, individual therapist-led sessions
Dawson et al. (2010)	N = 48 18–30 months	Child developmental levels and adaptive behaviors	Two years	RCT	Delivered by therapists and parents Combination of ABA, PRT, the Denver Model
Green et al. (2010)	N = 152 24–59 months	ASD severity rating Parent-child interaction, child language, adaptive functioning in school	Twice a week (2-h clinic sessions) and 6 months of booster sessions (total 18 sessions)	RCT	Preschool Autism Communication Trial: individualized therapist sessions to address social communication deficits

practice, feedback) were employed throughout individual and group sessions to provide instruction in behavioral techniques (e.g., development of positive relationships, management of maladaptive behaviors, planning for high-risk situations, maintenance of behavioral changes). This method of instruction was shown to decrease problem behaviors and improve parenting skills (e.g., less overreactivity, verbosity).

Anan, Warner, McGillivary, Chong, and Hines, (2008) reported on a program they called Group Intensive Family Training (GIFT). While the PT sessions were administered individually, these were followed by in vivo instruction of parent-child dyads in a group setting. In this case, staff taught parents to work with the other children also enrolled and to extend their use of behavioral principles by training an additional individual (i.e., spouse) to acquire the same skill set. GIFT not only decreased problem behaviors in young children with ASD but also significantly improved their cognitive and adaptive functioning.

Another group of investigators piloted the Parent-Child Interaction Therapy (PCIT) to children with ASD but who were higher functioning (Solomon, Ono, Timmer, & Goodlin, 2008). PCIT is a well-established, manualized parent training approach for children with early emerging conduct problems (Eyberg et al., 1995) and may hold promised for some parents of children with ASD. In this small pilot study, results reported improvements of parent rating of child behaviors and improved "shared positive affect."

Programs Focusing on Core Symptoms and Skill Acquisition

Parent training approaches to target improvements in the three core deficit areas (i.e., communication, social, atypical behaviors) of ASD diagnosis have received considerable research attention. These often include principles of ABA in combination of other theoretical approaches (e.g., developmental, transactional). Generally assumed in these programs is that in order to move children toward a typical developmental trajectory, parents should be taught specific skills to address core deficiencies in social, communication, and/or adaptive functioning. Representative programs are described below.

Smith et al. (2000) earlier investigated the use of group workshops as an effective mechanism to teach parents to design and oversee a Lovaas-based discrete trial home-based program, a commonly implemented treatment approach for this population. Children acquired new skills (i.e., receptive language, expressive language, nonverbal imitation, and verbal imitation) when parents served as therapists. However, the gains were not as substantial as made when the discrete trial therapy was delivered by a therapist.

Koegel and colleagues have developed and tested PT programs targeting what they describe as pivotal areas (i.e., motivation to engage in social communication, self-initiation, self-management, and response to multiple cues) (Schriberman & Koegel, 2005). These key areas have been addressed through pivotal response training (PRT), an approach originally designed with a strong emphasis on parent-practitioner collaboration, and have been shown to be an effective intervention for all professionals (e.g., speech language pathologists, behavioral therapists, special educators) working with this population. PRT differs from more behaviorally based approaches due to its unstructured nature that capitalizes on the child's motivation while embedding natural learning opportunities into daily activities. PRT parent programs have been shown to significantly improve communication and play skills but also a decrease in problem behaviors (Stahmer & Gist, 2001).

Green and colleagues (2010) reported on a large multisite RCT investigation of a PT program called Preschool Autism Communication Trial (PACT). Therapist-guided individualized sessions taught parents to use communication responses and language appropriate for their children's developmental levels. Video feedback and a written summary of key session aims achieved were used to elicit discussion of parental acquisition of skills. Similar to PRT, PACT targeted core deficits in shared attention, form (e.g., nonverbal language, vocalizations) and

function (e.g., request, gain attention) of language, and communicative intent. Although significant improvements in the parent-child interaction dynamic (i.e., child initiations, shared attention) were reported, a significant reduction in ASD symptoms was not found.

Other PT programs have focused on instructing and coaching parents how to teach imitation and joint attention given children with ASD do not learn these through typical parent-child interactions. The Early Start Denver Model (ESDM), a combination of PRT, ABA, and the original Denver Model, was reported on as a PT program to teach parents how to elicit critical behaviors (e.g., joint attention, imitation, attention) necessary for the development of functional, purposeful speech in their children. This manualized program includes a PT component along with a therapist-delivered intervention component. In a large RCT, program was shown to improve the child's skills toward a more typical developmental trajectory (Dawson et al., 2010). Similarly, Kasari and colleagues reported on what was described as a parent-mediated intervention to improve joint engagement in a sample of toddlers (Kasari, Gulsrud, Wong, Kwon, & Locke, 2010).

Parent Training Programs That Promote Training for Distance Learners

As the prevalence of ASD escalates, so does the need for feasible, accessible training for caregivers living in areas where services for children with ASD are not readily available. The delivery of PT though distance-based telepractice (e.g., video training, phone consultation) has been shown to be a possible alternative to clinic-based practice. A recent RCT examined self-directed learning through a structured PRT curriculum delivered sequentially through DVD instruction in the home environment. Functional speech and parental confidence in treatment implementation were noted as positive outcome measures in this case (Nefdt, Koegel, Singer, & Gerber, 2010). Other programs have been developed but have yet to report on effectiveness. A couple examples can be viewed at www.autismacademy.com and www.simplestepsautism.com.

Efficacy Information

PT as an efficacious intervention depends on the criteria used to define efficacy. While the ABA single-subject literature offers strong support for the use of PT as an intervention for children with ASD, only a few studies have used randomized controlled or controlled trials. Hence, in a systematic review, McConachie and Diggle (2007) concluded that further research is needed and suggested future studies should include adequate sample sizes, use standardized outcome measures, as well as attention to the components of the training. There is an urgent need for more large-scale RCTs using assembled manuals to more fully evaluated PT as well as other behavioral and psychosocial interventions (Smith et al., 2007). However, the need for effective intervention for children with ASD is now. At the time of writing, several other large-scale PT studies are under way and hopefully will begin to fill the gaps in our knowledge.

Outcome Measurement

Measure of outcome in the field of ASD has been fraught with many challenges. For psychosocial interventions, the choice of outcomes is complicated by the frequent multiple or less than exact goals of the intervention, the heterogeneity of children with ASD, the feasibility of completing direct measures with often uncooperative children with ASD, and the desire to have measures blind to the participants and/or investigators (single- or double-blind studies). In the single-subject literature, the outcome measures have often been highly specific, operationally defined directly observed behaviors (e.g., frequency of use of joint attention, frequency of aggressive behavior, percent compliance). Direct observation methodology has often been used in some larger RCT PT programs. Parent and child are videotaped for later coding of both child and parent behaviors (e.g., Johnson et al., 2009; Kasari et al., 2010).

Broader outcomes incorporated have been behavior rating scale of behaviors completed by

an informant (i.e., parent/caregiver, teacher) when the PT is primarily targeting behavior problems. In one large RCT, the Aberrant Behavior Checklist (Aman, Singh, Steward, & Field, 1985) was used, given it had previously been shown to be sensitive to treatment change. Global ratings completed by an independent evaluator who is naïve to intervention arm have been suggested as a measure. The Clinical Global Impression Scale (Guy, 1976) was used successfully in the RUPP-PI Autism Study (Aman et al., 2009). Measures to assess the presence of core features over time have also been included in a number of PT studies. These have included the Autism Diagnostic Observation Schedule (Lord, Rutter, DiLavore, & Risi, 2002) and the Autism Diagnostic Interview-Revised (Lord, Rutter, & LeCouteur, 1994). A wide range of developmental, cognitive, language, and adaptive behavior measures have also been included as outcome instruments. A few examples include the Mullen Scales of Early Learning (Mullen, 1995), the MacArthur CDI (Fenson et al., 1993), and the Vineland Adaptive Behavior Scales (Sparrow, Cicchetti, & Balla, 2005).

Measures of parent well-being and satisfaction have often been included as outcomes in PT programs. The Parenting Stress Index (Abidin, 1995) is a frequently reported parent outcome. Program-specific parent satisfaction measures are often employed as well.

Qualifications of Treatment Providers

The background and training of those providing the parent training have varied in what has been reported in the literature. For those providing parent training steeped in ABA, a working understanding of these concepts and how they apply to procedures and strategies for children with ASD is essential. While it is imperative to have this conceptual and technical knowledge base, it is also essential that PT providers have the additional therapeutic skills to establish working alliances with parents/caregivers and are able to motivate parents toward change. Hence, PT providers require the therapeutic skills essential for other more traditional therapies. Others have more explicitly described important skills in those providing parent training such as a collaborative style with the parent, ability to provide immediate feedback, and ability to individualize interventions even if the treatment delivered is within a manualized program (Kaiser & Hancock, 2003). All in all, an effective PT provider is also an effective clinician in general.

See Also

- ▶ Applied Behavior Analysis
- ▶ Behavior Modification
- ▶ Operant Conditioning

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Parent-Professional Collaboration

► Parent-Professional Partnership

Parent-Professional Partnership

Debra Dunn
The Center for Autism Research, The Children's Hospital of Philadelphia, Philadelphia, PA, USA

Synonyms

Family-centered programming; Parent involvement; Parent-professional collaboration

Definition

A Parent-Professional Partnership is a collaborative relationship between the parent of a child with a disability and a professional who is involved with helping that child. Educators are the professionals most frequently thought of when referencing a Parent-Professional Partnership. However, any professional who provides a direct or indirect service to the child with the disability or to the child's family, or who is involved in the policies affecting the child, can be a part of this collaborative partnership. In addition to educators, other professionals with whom a parent may form a partnership include policy makers, trainers, and therapists.

The Individuals with Disabilities Education Improvement Act of 2004 (IDEIA) specifically endorses partnerships between parents and educators. The IDEIA encourages parents to be actively involved in their children's education and empowers them with rights and responsibilities with respect to the assessment process and the development of the individualized education program. In particular, the early intervention system requires a family-centered approach that takes family values and priorities into account, which necessitates the development of a Parent-Professional Partnership.

Parent-Professional Partnerships exist in many venues outside the education setting as well. For example, partnerships are frequently formed between parents and professionals delivering therapies and services outside of the education setting (e.g., through a state's mental health or behavioral health system or through private practice). Parent-Professional Partnerships may also be created to train teachers, staff, or college students pursuing a career in special education. On a larger scale, federal, state, and local agencies or advisory groups also rely on Parent-Professional Partnerships by having representation from both professionals and parents who work collaboratively to set policies for children with disabilities. For example, every state has a special education advisory committee (SEAC), and many of these committees exist at the local level as well.

Effective Parent-Professional Partnerships are based on open communication, commitment, trust, sensitivity, and mutual respect. Both sides must recognize the importance of what the other

can contribute. While professionals bring expertise on interventions, resources, specialized instruction, and available programming, parents are the experts of their children. While professionals often see the child in only one environment, parents are frequently accustomed to dealing with multiple service systems and have the benefit of knowing what has been successful or unsuccessful in the past. Parents can also facilitate communication among service providers, thus assisting with continuity and convergence of services.

Obstacles to the Parent-Professional Partnership include attitudinal barriers, socioeconomic and cultural barriers, communication barriers, and fear. Yet the benefits of an effective Parent-Professional Partnership outweigh the difficulties in overcoming these hurdles: Research has shown that family involvement is one of the most important factors in ensuring a child's success. Parent training organizations, support groups, and resource centers are available to help prepare parents for this collaborative role, and increasingly professional organizations are devoting time to train their constituents to work as partners with parents.

See Also

- ▶ Advocacy
- ▶ Early Intervention
- ▶ Individuals with Disabilities Educational Improvement Act
- ▶ Parent Training

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Parietal Cortex

▶ Parietal Lobe

Parietal Lobe

Marco Iacoboni
Semel Institute for Neuroscience and Human Behavior, David Geffen School of Medicine at UCLA, Los Angeles, CA, USA

Synonyms

Inferior parietal lobule; Parietal cortex; Superior parietal lobule

Structure

On the lateral wall of the cerebral hemispheres, the parietal lobe is divided into three major sectors. These sectors are the postcentral gyrus – located anteriorly, between the central sulcus and the postcentral sulcus – and the superior and inferior parietal lobules, which together form the posterior parietal cortex. The posterior parietal cortex is divided into these two major lobules by the intraparietal sulcus, which stems

from the postcentral sulcus and runs posteriorly. The superior parietal lobule is located medially to the intraparietal sulcus whereas the inferior parietal lobule is located laterally to it. In humans, the inferior parietal lobule is composed of two major giry: the supramarginal gyrus anteriorly and the angular gyrus posteriorly.

The popular cytoarchitectonic maps of Brodmann are unfortunately not very accurate in the parietal lobe. According to Brodmann, the superior parietal lobule is composed of two large cytoarchitectonic fields, area 5 anteriorly and area 7 posteriorly, whereas the inferior parietal lobule is composed of area 40 anteriorly and area 39 posteriorly. Brodmann area 40 and 39 correspond fairly well with the supramarginal gyrus and the angular gyrus. However, practically every other anatomist that studied the parietal lobe has proposed much more fractionated cytoarchitectonic maps. Different anatomical models propose different levels of cytoarchitectural differentiation, with some models proposing up to approximately 80 different cytoarchitectonic fields. Recent studies have revisited this issue using a probabilistic approach that combines postmortem data from 10 or more brains (classical anatomical studies typically relied on only one brain, as in the case of Brodmann, or just a few). These recent studies have identified three separate cytoarchitectonic fields in Brodmann area 5, four in Brodmann area 7, and an additional field on the medial wall of the superior parietal lobule (Scheperjans et al., 2008). Furthermore, these studies have also identified five different cytoarchitectonic fields in the supramarginal gyrus and two in the angular gyrus (Caspers et al., 2006). This higher anatomical segregation fits better the variety of neurophysiological properties that have been reported by single cell recordings in primates.

Function

Parietal functions are mainly revealed by neurological and neuropsychological investigations that study deficits occurring after brain damage to the parietal lobe, by neurophysiological studies with depth electrodes, by brain imaging studies, and by neuromodulation studies as for instance the investigations with Transcranial Magnetic Stimulation (TMS).

A number of deficits and syndromes have been associated with parietal damage. Most typically, anterior lesions produce contralateral somatosensory deficits. Lesions in the posterior parietal cortex, on the other hand, are associated with widely different deficits according to the lateralization of the lesion. This clearly demonstrates that the posterior parietal cortex is a highly lateralized brain structure in humans. Lesions in the left posterior parietal cortex are typically associated with language deficits and ideomotor apraxia. Patients with ideomotor apraxia have typically problems using tools that require coordination of a sequence of actions, for instance when combing or brushing, in the absence of disorders in basic motor or sensory functions. These praxis deficits have considerable impact on the daily functioning of these patients.

Lesions in the right posterior parietal cortex are associated with a variety of deficits of visuospatial behavior. The most common deficit is hemi-spatial neglect, which is typically associated with lesions in the inferior parietal lobule. Patients with hemi-spatial neglect have deficits of visuo-spatial attention typically localized to the left sector of space, or to the left side of objects, in the absence of primary sensory deficits. This is also a deficit that can substantially impair everyday functioning, since these patients may bump into objects located to their left. A typical test of hemi-spatial neglect is to ask the patient to make a copy of a drawing, for instance the drawing of a house. These patients tend to copy well the right side of the house, but completely neglect the left one.

Another deficit relatively commonly associated with posterior parietal lesions is optic ataxia. This is a deficit of coordination of motor behavior in space, mainly affecting reaching movements. Optic ataxia is associated with lesions in the superior parietal lobule, both in the left and in

the right hemisphere. However, the reaching disorders associated with optic ataxia somewhat differ for left or right hemisphere lesion (Perenin & Vighetto, 1988).

Neurophysiological studies with depth electrodes in primates have revealed a variety of neuronal properties in posterior parietal neurons. These properties can be observed in physiologically defined areas, clearly suggesting that neurons with similar functional properties tend to cluster together. For instance, area LIP (lateral intraparietal area) is located in the lateral bank of the intraparietal sulcus and contains neurons that fire in association with eye movements directed at objects that appear suddenly in the environment. LIP neurons do not fire for eye movements directed at objects already present in the environment, even when the object, following the eye movement, enters the receptive field of the neuron. Only novel, attention-grabbing objects will trigger the response of LIP neurons. This demonstrates that while LIP neurons are important for oculomotor behavior, their functional properties have more to do with implementing attentional mechanisms than ocular movements. Recently, a study has shown that some LIP neurons also fire when the monkey is observing another monkey making an eye movement in the preferred direction of the neuron (Shepherd, Klein, Deaner, & Platt, 2009). Thus, in LIP, some neurons have mirroring properties that may be critical for joint attention. Deficits in joint attention are among the earliest signs of autism and joint attention skills have often been associated with outcome in subjects with autism, both in the natural history of the condition and when used in intervention programs (Volkmar, 2011).

Area VIP (ventral intraparietal area) is located in the ventral aspect of the intraparietal sulcus. VIP neurons respond to arm, face, and neck movements and tend to have bimodal receptive fields, responding to tactile stimulation and to the sight of three-dimensional objects near the body. The tactile and visual receptive fields are also spatially congruent. For instance, if a bimodal VIP neuron has a tactile receptive field on the forearm, it also responds to the sight of three-dimensional objects near the forearm, generally within 20–30 cm of space surrounding the tactile receptive field. The strongest responses in these VIP neurons are elicited with objects moving toward the body, which suggests that VIP implements a map of the space surrounding the body that can be used to defend the body. Indeed, prolonged stimulations over cortical parietal sites around the intraparietal sulcus can elicit highly coordinated defensive movements (Cooke, Taylor, Moore, & Graziano, 2003). A recent study has demonstrated mirroring mechanisms in VIP neurons too. Some VIP neurons fire not only at the sight of a three-dimensional object near the tactile receptive field of the neuron, but also when the monkey observes a three-dimensional object nearing the corresponding body part (say, the forearm) of another monkey (Ishida, Nakajima, Inase, & Murata, 2010).

Area AIP (anterior intraparietal area) is also located in the intraparietal sulcus, in its most anterior sector, as the name suggests. AIP neurons are divided into three classes: motor, visual, and visuo-motor neurons (Jeannerod, Arbib, Rizzolatti, & Sakata, 1995). Motor AIP neurons fire for object-oriented actions, for instance grasping. These cells fire even when the monkey performs the grasping action in the dark. Visual AIP neurons fire at the sight of graspable objects, whereas visuo-motor AIP neurons fire during grasping actions but only when the action is visible. Grasping in the dark does not activate the visuo-motor AIP neurons.

Brain imaging activation studies and TMS studies have generally confirmed the main findings from neurological and neuropsychological investigations in brain-damaged patients and neurophysiological single unit recordings in nonhuman primates. An important novel contribution of the brain imaging literature, especially as applied to the study of autism, has been provided by connectivity studies and by morphometric studies. While most of the findings from these studies are quite recent (there has been an explosion of such studies in the last 3 years) and need replication, some patterns already emerge quite clearly, as discussed in the next section.

Pathophysiology

A general pattern that seems to emerge from the literature on functional connectivity in the brain with autism is that there is reduced connectivity between distant regions (Just, Cherkassky, Keller, Kana, & Minshew, 2007) and increased local connectivity between neighboring brain regions (Rudie et al., 2011). Given the dense set of connections between the parietal lobe and both the occipital lobe and the frontal lobe, it is logical to conclude that these connections may be reduced in the brain with autism.

Indeed, a number of studies have supported this conclusion. For instance, a recent study demonstrated reduced connectivity in subjects with autism between the parietal cortex and the pars opercularis of the inferior frontal gyrus, which was taken as seed region for functional connectivity maps in that study (Rudie et al., 2011). The pars opercularis of the inferior frontal gyrus has shown reduced activation in functional studies of social cognition in subjects with autism (Dapretto et al., 2006). A key issue is to understand whether the reduced activation observed in pars opercularis of the inferior frontal gyrus in autism during social cognition tasks is related or not with the reduced connectivity with the parietal cortex. At the moment, it is not even clear how to investigate this issue. However, future studies will obviously have to address it.

Another focus of research on functional connectivity in autism is related to the neural systems that belong to the default state network. This is a set of areas that shows high metabolic activity at rest and that typically reduce their activity during cognitive tasks (Raichle & Snyder, 2007). One of these areas is the medial posterior parietal cortex. Connectivity studies have shown reduced connectivity in autism between the medial posterior parietal cortex and other cortical areas, including the medial prefrontal cortex (Monk et al., 2009), which is another area that belongs to the default state network. This reduced connectivity in autism between areas that belong to the default state network may possibly explain also the abnormal pattern of activation observed in these areas in subjects with autism.

Imaging data suggest that patients with autism do not reduce activity in medial posterior parietal cortex (and other default state areas) during cognitive tasks (Kennedy, Redcay, & Courchesne, 2006). This is strikingly different from the pattern of activity observed in neurotypical subjects. One possible explanation for the reduced activity in the default state network during cognitive tasks compared to rest (and for the high metabolic activity at rest in these areas) is that the default state network implements self-referential thinking, that may be high when subjects are not engaged in any task and get reduced when subjects' attention is directed at the task at hand. Even if this model is correct, it is not clear why subjects with autism fail to reduce activity in medial posterior parietal cortex and other areas of the network. It may be because they cannot disengage self-referential thoughts or because their self-referential thinking at rest is already low. Unfortunately, the metabolic rate at rest of the medial posterior parietal cortex (and other default state network areas) is not clear in autism, because the few studies that assessed cerebral metabolism in subjects with autism did not compare metabolic rates at rest in these subjects with those observed in neurotypical subjects.

The self-referential thinking account of the high metabolic rate at rest in medial posterior parietal cortex, however, can hardly explain – at least in its simpler form – the findings of increased activity in this area and in medial prefrontal cortex observed during some social cognition tasks in neurotypical subjects (Iacoboni et al., 2004). It is possible, however, that some social cognition tasks – the ones that most resemble ecologically valid scenarios, as for instance watching other people interacting – increase activity in medial posterior parietal cortex and medial prefrontal cortex because the self is indeed a social construct, and the observation of social interactions of other people triggers the mental representations of the self as the spouse, the parent of the offsprings, the child of his or her parents, and so on.

Future studies, especially if employing the combination of multiple modalities of brain investigations, may be able to disentangle these alternative explanations.

See Also

▶ Mirror Neuron System

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Paroxetine

Marcel Moran[1], Kate S. Perri[2], Kimberly Stigler[3] and Christopher J. McDougle[4]

[1]Indiana University School of Medicine, Indianapolis, IN, USA

[2]Christian Sarkine Autism Treatment Center, Riley Hospital for Children, Indianapolis, IN, USA

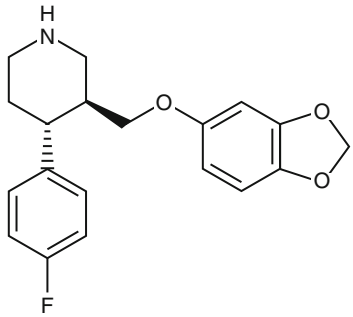
[3]Christian Sarkine Autism Treatment Center, James Whitcomb Riley Hospital for Children, Indianapolis, IN, USA

[4]Lurie Center for Autism/Harvard Medical School, Lexington, MA, USA

Synonyms

Paroxetine hydrochloride; Paxil

Definition



Paroxetine is a selective serotonin reuptake inhibitor (SSRI) used to treat depression, social anxiety disorder, obsessive-compulsive disorder, and posttraumatic stress disorder. Paroxetine is available in immediate- and controlled-release formulations and is the most potent inhibitor of serotonin reuptake compared to currently available SSRIs. Originally developed in the 1970s, its side effects include constipation, sedation, sexual dysfunction, discontinuation syndrome, and weight gain. Given the growing body of research that suggests that abnormalities in serotonin function are linked to autism, the use of SSRIs in patients with autism has grown. Case studies of patients with autism using paroxetine indicate mixed results, with reports of improved and worsened aggressive behavior.

See Also

- ▶ Antidepressants
- ▶ Selective Serotonin Reuptake Inhibitors (SSRIs)

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Paroxetine Hydrochloride

- ▶ Paroxetine

Parroting

- ▶ Movie Talk

Partial Agenesis

- ▶ Agenesis of Corpus Callosum

Passive Group

Lorna Wing
Centre for Social and Communication Disorders, Bromley, Kent, UK

Synonyms

Inactive; Unengaged

Definition

The various different sets of criteria for autistic disorders usually include repetitive routines,

language abnormalities or mutism, clumsiness, and odd responses to sensory input, but all emphasize marked impairment of social interaction as a fundamental problem. Kanner (1943) and Kanner and Eisenberg (1956), in their definitions of early infantile autism, emphasized social aloofness and indifference as an essential criterion for diagnosis. Asperger (1944) described children with what he called "autistic psychopathy," whose pattern of social interaction was active, initiating contact with other people, but inappropriate in form.

Wing and Gould (1979) and Wing (1981) suggested that these authors were describing different aspects of an "autism spectrum." This spectrum included those who were "aloof and indifferent" to others, those who were "passive" in their social interaction, and those who were "active but odd" in their approach to others. It must be emphasized that these groups merge into each other – there are no sharp dividing lines. It is also possible for someone to change from one type to another in their pattern of social behavior with increasing age or even in different environments.

The typical passive child does not make social approaches but accepts approaches from others. He or she may make eye contact, especially if the person approaching them makes positive effort to obtain eye contact. Many passive children are amenable and willing to do as they are told, so they can be accepted into a group of children playing together. The passive child will often accept the role assigned to him or her, such as that of a baby in a game of mothers and fathers. But, when the game is over, the passive child may continue in the role while the others turn to other pursuits. Passive children are much less likely than others in the autism spectrum to be difficult in behavior, to refuse to cooperate, or to have temper tantrums so do not draw attention to themselves (but see description of PDA below). However, Wing and Shah (2006) found in a study of individuals with autism spectrum disorders and a history of catatonic features, who developed catatonic deterioration, that this pattern occurred significantly more often in those with a history of social passivity. The clinical picture included movement problems (slowness and difficulty in initiating movements unless prompted, odd gait, odd stiff posture, freezing during actions, difficulty crossing lines, and inability to cease actions) and behavior problems (impulsive acts, bizarre behavior, awake at night but sleeping in the day, incontinence, and excited phases). In addition, there was marked reduction in the amount of speech or complete mutism.

In recent years, attention has been given to the prevalence of autism spectrum conditions in females. Attwood (2007) found that girls are more likely than boys to be passive, and, for this reason, their autism often remains undiagnosed. Kopp and Gillberg (1992) and Kopp et al. (2010) have reported that girls are much more likely than boys to refuse demands passively, thus fitting into the group called pathological demand avoidance (PDA) (Newson et al., 2003).

In the past, it has been assumed that the passive group is markedly less common than the aloof or the active but odd groups. However, the recent rise of interest in this group, especially its prevalence in females, may change this view of passivity in autism. It is to be hoped that, in future, research will be carried out into the neurology underlying this mode of presentation.

See Also

- ▶ Active-But-Odd Group
- ▶ Aloof Group
- ▶ Catatonia
- ▶ Gender Differences
- ▶ Spectrum/Continuum of Autism
- ▶ Subtyping Autism

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Patterning (Doman-Delacato Method)

Robert LaRue
Douglass Developmental Disabilities Center, Rutgers, The State University of New Jersey, New Brunswick, NJ, USA

Definition

The Doman-Delacato method, commonly known as patterning, is designed to improve a child's "neurological organization" through a series of specific prescribed sensory and motor experiences conducted on a rigorous daily schedule. These methods were presumed to improve functioning of the central nervous system in children with severe brain injuries (Doman, Spitz, Zucman, Delacato, & Doman, 1960).

Historical Background

The Doman-Delacato method is an approach to address neurological functioning by a series of motor activities thought to alter the structure and function of specific areas of the brain. The method was developed by Glen Doman, a physical therapist, and Carl Delacato, a doctor of education. Doman and Delacato focused on maximizing the development of typical children. Spurring what Doman coined as the "Gentle Revolution," he began to publish books aimed at teaching parents how to make their babies mentally and physically superior. Titles of their published books include "How to Teach Your Baby to Read" (Dorman, 1964b), "How to Teach Your Baby Math" (Dorman, 1979), and "How Smart Is Your Baby?: Develop And Nurture Your Newborn's Full Potential" (Doman and Doman 2006). Many of the titles from the Gentle Revolution series were coauthored with Doman's son and daughter, Douglas and Janet Doman. Doman also published a book focused primarily on children with brain injury. In 1974, he published "What to Do About Your Brain Injured Child: Or Your Brain Damaged, Mentally Retarded, Mentally Deficient, Cerebral-Palsied, Spastic, Flaccid, Rigid, Epileptic, Autistic, Athetoid, Hyperactive Child" (Doman, 1974).

In 1955, Doman founded the headquarters for the Institutes for the Achievement of Human Potential in the Philadelphia area. The IAHP (commonly referred to as "the Institutes") is a nonprofit organization offering inpatient and outpatient treatment for brain-damaged children. The IAHP was created as a means for distributing the Doman-Delacato method, as described in a paper on neurological organization published in the Journal of the American Medical Association in 1960 (Doman et al. 1960). The IAHP has gained a global following, with offices in Japan, Italy, Mexico, Guatemala, Singapore, Brazil, Spain, and France.

Rationale or Underlying Theory

Temple Fay first applied the recapitulationist view of ontogenesis to children with nervous system disorders (Fay, 1955), and the Doman-Delacato method is an extension of this work

(MacKay, Gollogly, & McDonald, 1986). According to the recapitulationist theory, ontogeny (the development of an individual from fertilized egg to its adult form) mimics phylogeny (the evolutionary history of a species). Stated another way, the development of an individual being imitates the evolutionary steps of the species. The recapitulationist school of thought was popular in the 1920s and 1930s. However, the theory has been refuted in modern biology and has not found support in the greater scientific community (Novella, 1996).

Doman and Delacato advocate that children are expected to move through a series of locomotor patterns which reflect earlier forms of movements that human evolutionary ancestors performed, such as creeping and crawling. As such, skipping one of these evolutionary steps in one's own development is believed to result in perceptual and motor difficulty as well as disturbances in language and communication skills (Doman, 1974). The method presumes that basic motor sequences are essential to the neurological organization of an individual. According to the authors, the different stages of crawling, creeping, and walking are each associated with a unique neurological function and a gap in the appropriate sequence does not allow for an individual to fully develop (Doman, 1964b). For example, a child who failed to crawl before walking is hypothesized to have skipped a critical step unique to human development, and this gap leaves the child subjected to both higher and lower order neurological deficits. Based on this rationale, it follows that the child must be "patterned" by a team of adults trained to position the child's body in such a way that mimics this critical prerequisite step. As a result, the child's neurons would be "repatterned" and reorganized in a way that allows them to continue with their typical development and encourage learning readiness in academic skills. According to this theory, the majority of cases of mental retardation, learning, and behavior disorders are caused by brain damage. Most importantly, these deficiencies are believed to exist on a single continuum for which the only solution is to regress to earlier forms of primitive movement (Cohen, Birch, & Taft, 1970).

On the phylogenetic continuum, human movement may be divided into five main classes:

1. Truncal movement: Comparable to the swimming movement of a fish and believed to impact the medullary level of the brain.
2. Homolateral crawling: Defined as a crawling motion in which the arm and leg on the side to which the head is turned and flexed, while the opposite extremities are extended. This is hypothesized to reflect amphibian motility and believed to affect a pontine level of brain organization.
3. Cross-pattern creeping: Defined as creeping with a flexed arm and extended leg on the side toward which the head is turned. This creeping is believed to be related to reptilian movement and is hypothesized to be related to midbrain functioning.
4. Crude walking: Defined as walking without a cross pattern. This reflects a primitive upright form of locomotion consistent with cortical functioning.
5. Cross-pattern walking: Defined as the only uniquely human gait and associated with advanced cerebral function and hemispheric dominance.

In addition, the importance of establishing cerebral dominance is believed to be unique to humans, and this lateral neurological function is said to account for the human ability to read, write, and talk. As such, the lateralization of movement is central in the theory and practice of this method (Holm, 1983). The authors also emphasize the importance of adding ongoing sensory stimulation to the patterning movements, as learning begins with the stimulation of the senses.

Goals and Objectives

Treatment goals of the Doman-Delacato method aim to improve physical, intellectual, and social capability in children with brain injuries by reorganizing "neurological organization."

Treatment Participants

Proponents of the method believe that treatment is suitable for all children classified as "brain-injured." As defined by the IAHP, the term "brain-injured" encompasses nearly 300 potential childhood disorders. The IAHP does not differentiate across severity, and even the most severely handicapped children may be admitted. Doman and Delacato have repeatedly emphasized that only those parents who are most dedicated to their children's recovery can expect to see a result from the prescribed demanding regimen.

Treatment Procedures

Predetermined patterns of movement are imposed on the child by manipulation of the child's extremities. Such manipulations are performed by teams of up to five people, often consisting of therapists, parents, and volunteers. In the sessions, each adult is responsible for manipulating one of the child's limbs or the head. It is required that it should be preformed smoothly and rhythmically and in complete accordance with the movement of the other limbs in order to mimic the natural movement of the body (Doman et al., 1960). The IAHP recommends that these exercises be conducted a minimum of at least 5 min, four times a day every day of the week. While the treatment team is initially composed of therapists, it gradually becomes the responsibility of parents and volunteers to conduct the sessions. Typically, the treatment therapists conduct follow-up visits in 60- to 90-day intervals. It is hypothesized that such patterning sessions will ingrain the movements into the central nervous system.

Parents are also required to provide their children with a program of sensory stimulation. In addition, masking, or rebreathing expired air into a face mask for 30 to 60 s once every waking hour, is promoted to increase cerebral blood flow, increase carbon dioxide intake, and aid in the establishment of hemispheric dominance (Freeman, 1967). According to the IAHP, this rebreathing treatment is also recommended in the treatment of seizure disorders, and the IAHP requires that all patients be gradually weaned off of anticonvulsant medications to maximize the effectiveness of their own treatment regimen. Restricting salt, sugar, and fluids and limiting exposure to music are additional recommendations.

Efficacy Information

The Doman-Delacato method has not been scientifically investigated with individuals on the autism spectrum. To date, the concept of neurological organization that serves as the foundation for the method has not been subjected to scientific research, and those programs which offer patterning have not been shown to improved learning or functioning. Many have contested that the theoretical rationale for the treatment is without merit and is inconsistent with accepted views of neurologic development (Novella, 1996). Although any intervention that calls for one-to-one daily interaction for hours at a time on a daily basis might have the potential to have some positive effect, evidence for any permanent and lasting change from patterning is lacking (Howlin, 1997). As a result, this method has been met with controversy and criticism.

The American Academy of Pediatrics Committee on Children With Disabilities has issued several cautionary statements regarding the Doman-Delacato method. Due to the lack of empirical support for the strategies, warnings were published as early as 1968, with the most recent statement reaffirmed in 2005 (American Academy of Pediatrics, 1982, 1999). This was a joint statement approved by several organizations, including but not limited to the American Academy for Cerebral Palsy, American Academy of Neurology, American Academy for Physical Medicine and Rehabilitation, American Academy of Orthopedics, Canadian Association for Retarded Children, and the National Association for Retarded Citizens (Hyatt, 2007).

Outcome Measurement

The primary outcome measurement tool for this therapy was developed by the inventors of this method. The Doman-Delacato developmental profile, which is used for both planning treatment and monitoring progress, enables the therapist to ascertain at which level of neurological organization a brain-injured child is functioning. The profile is based on chronological age development when the following domains are hypothesized to develop mobility, language, manual competence (writing), vision (reading), auditory competence, and tactile competence. Each of these domains is divided into seven chronological stages of functional development which corresponds with ascending brain levels.

The validity of this tool for planning treatment or measuring outcome has yet to be demonstrated (Sparrow & Zigler, 1978). Because the administration of this instrument at intake informs the course of treatment, changes with treatment may reflect teaching to the test and do not necessarily correlate with a generalizable improvement in functioning. To date, this measurement has not been standardized against any accepted measures of development, although inter-rater reliability is reported to be valid. The dimensions measured by the assessment make the comparison to any standard measure difficult.

Qualifications of Treatment Providers

Staff at the IAHP are trained as "child brain developmentalists." These developmentalists specialize in one of the following: intellectual excellence, physical excellence, or physiological excellence. According to IAHP literature, this certification requires rigorous training and yearly recertification. No certification or licensure process exists outside of the Institutes for the Achievement of Human Potential, and the required qualifications of these child brain developmentalists are not publically disclosed. The IAHP continually holds courses in seminars throughout the world to educate parents on how to conduct patterning with their children.

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Pavlovian Conditioning

▶ Classical Conditioning

Paxil

▶ Paroxetine

Pay

▶ Employment

PDD

▶ Asperger Syndrome

PDDRS

▶ Pervasive Developmental Disorders Rating Scale (PDDRS)

PDMS

▶ Peabody Developmental Motor Scales (PDMS)

PDMS-2

▶ Peabody Developmental Motor Scales (PDMS)

PDMS-II

▶ Peabody Developmental Motor Scales (PDMS)

Peabody Developmental Motor Scales (PDMS)

Renee Watling
Division of Occupational Therapy, Department of Rehabilitation Medicine, University of Washington, Seattle, WA, USA

Synonyms

PDMS; PDMS-II; PDMS-2

Description

The Peabody Developmental Motor Scales-2 (PDMS-2; Folio & Fewell, 2000) is a criterion-referenced and norm-referenced developmental assessment comprised of two scales: the Gross Motor Scale and the Fine Motor Scale. The Gross Motor Scale includes four categories: reflexes, stationary gross motor skills, locomotion, and object manipulation. The reflex subtest is administered to children from birth through 11 months. It contains eight items that measure reactions to environmental events. The stationary subtest includes 30 items that measure equilibrium and sustained control of the body within the center of gravity. The locomotion subtest measures the child's skills in moving from one place to another through 89 items that cover the developmental progression of various modes of movement. The object manipulation subtest includes 24 items that measure the ability to manipulate balls. Test items specifically measure skills such as:

Reflex integration and postural adjustments
Balancing on one foot and on tiptoes
Crawling, walking, running, jumping, and skipping
Throwing, catching, and kicking a ball

The Fine Motor Scale is comprised of two categories: grasping and visual-motor integration. The grasping subtest includes 26 items that measure the ability of the child to use hands

independently or together. The visual-motor integration subtest contains 72 items that measure visual perceptual skills and eye-hand coordination. Test items specifically measure skills such as:

Demonstrating various grasp patterns as appropriate for different objects

Stacking or configuring blocks to replicate a demonstrated design

Manipulating buttons, using scissors, folding paper, and drawing to copy designs

A child's performance on each test item is scored a 0, 1, or 2. A score of 0 indicates no success on the item, 1 indicates emerging abilities to complete the item, and 2 indicates mastery or success in meeting all criteria for the test item. Test scores can be calculated as percentiles, standard scores, and age equivalents for the Gross Motor Quotient, Fine Motor Quotient, and Total Motor Quotient.

As a performance-based measure, the PDMS-2 can be administered in approximately 20–30 min per scale and 45–60 min for the total test (Folio & Fewell, 2000).

Historical Background

The Peabody Developmental Motor Scales (PDMS; Folio & Fewell, 1983), originally published in 1983, consisted of a Gross Motor Scale and Fine Motor Scale which were normed for children ages 1–83 months. The scales could be used separately to measure the respective motor domain or used together to obtain an overall motor performance composite score. The test was widely used throughout North America and frequently referenced in the published literature. The PDMS was revised in the late 1990s in order to update test items and establish contemporary norms. Normative data were collected between 1997 and 1998 using a sample of 2,003 North American children representing four major geographic regions from 46 states and one Canadian province. The test continues to be widely used by occupational and physical therapists and can also be administered by diagnosticians, early intervention specialists, psychologists, and others with training in motor skill assessment.

Psychometric Data

Characteristics of the normative sample for the PDMS-2 were consistent with the 1997 US Census demographic data with respect to geographical area, gender, race, residence location (rural, suburban, urban), ethnicity, and socioeconomic status. Overall, the sample is considered representative of the US population at the time the test was developed. Scoring norms are available for typically developing children from birth through age 5 (1–84 months). No normative data are available for children with disability conditions.

Reliability. Internal consistency was evaluated using Cronbach's coefficient alphas. Values ranged from 0.84 to 0.98 indicating strong associations among test items within the same construct (e.g., fine motor, gross motor). Measures of test-retest reliability were limited to two groups of young children ages 2 through 11 months ($n = 20$) and 12 through 17 months ($n = 30$). Resulting correlation coefficients ranged from 0.73 to 0.96, suggesting acceptable test-retest reliability within the items applicable to these age groups. Inter-rater reliability for test scores yielded coefficient values of 0.96 to 0.98. Inter-rater reliability for individual test items has not been examined.

Validity. Content validity of the PDMS-2 is supported through developmental theory and various item analysis techniques including item response theory and logistic regression. Age-related trends, such as increases in mean test scores occurring with increasing age, have been observed. The various subtests within each composite are supported through confirmatory factor analysis. Concurrent validity was examined between the PDMS-2 and the initial version of the test, the PDMS. The resulting correlations were strong with 0.84 for the fine motor composite and 0.91 for the gross motor composite.

Moderate to strong correlations were also noted with scores from the gross and fine motor scales of the Mullen Scales of Early Learning: AGS Edition.

Clinical Uses

The PDMS-2 is often used in clinical and educational settings to assess gross and fine motor skills along the developmental trajectory (Richardson, 2010). The tool can be used to identify children with delays in motor skills and to plan intervention.

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Peabody Individual Achievement Test, Revised

Melissa Maye
Clinical Psychology, University of Massachusetts, Boston, Boston, MA, USA

Synonyms

PIAT-R; PIAT-R/NU

Description

The PIAT-R/NU assesses achievement across six different content areas: general information, reading recognition, reading comprehension, mathematics, spelling, and written expression. The PIAT-R/NU does not consolidate each content area under a specific domain, and only the subtests that contain content related to the individual's educational concern should be administered. However, in order to calculate composite scores, multiple tests must be administered. The administration of multiple tests allows for a more in-depth understanding of an individual's strengths and weaknesses. The PIAT-R/NU allows for composite scores to be derived from the reading (Total Reading) and writing (Written Language) subtests. A total composite score (Total Test) can also be calculated utilizing five of the six subtests (excludes Written Expression). The PIAT-R/NU is published by Pearson Assessments and the author is Frederick C. Markwardt, Jr.

The General Information subtest contains 100 items that assess general knowledge. The topics included within this subtest are: science, social studies, fine arts, and factual knowledge. These items are administered verbally. The Reading Recognition subtest contains 100 items that measure recognition of printed letters and assess an individual's ability to read words out loud. These items also require a verbal response. The Reading Comprehension subtest consists of 82 items that measure reading comprehension. This task necessitates an individual to be able to select a picture (by pointing or verbal response) that best

illustrates a sentence that she/he has just read. The Mathematics subtest contains 100 questions. In this subtest, an individual is read a math question and then is required to respond via multiple choice either orally, or by pointing. The Spelling subtest consists of 100 items that assess both letter recognition (both by name and by sound) and spelling words correctly. The spelling portion of this subtest requires the examinee to choose the correctly spelled word from a choice of several words, either verbally or by pointing. The Written Expression subtest assesses both prewriting skills (i.e., the ability to copy and write letters, words, and sentences from dictation) and the ability to write a story about a presented picture (Sattler, 2001).

Criticisms of the PIAT-R/NU include that the Reading Comprehension subtest may be more of an assessment of memory, as opposed to reading comprehension. The Mathematics subtest does not include any paper and pencil computations and covers a large range of mathematical skills and therefore does not narrow in on any one topic. The format of the spelling test (choosing from a group of variations of the target word) may not adequately assess for spelling ability. Lastly, the Written Expression subtest has low test-retest reliabilities, inter-scorer reliabilities, and internal consistency reliabilities (Sattler, 2001).

A score of "1" indicates a correct score and a score of "0" indicates an incorrect score, with the exception of Written Expression. Raw scores are converted to standardized scores, grade equivalents, age-equivalent scores, percentile ranks, normal curve equivalents, and stanine scores. The Written Expression subtest requires a general achievement score to be calculated, and then grade-based stanines and a developmental scaled score are provided (Sattler, 2001).

Scoring software is available to decrease the amount of time spent scoring and increase accuracy. The software is available for both Windows and Macintosh operating systems. The scoring software also allows reports to be generated in both English and Spanish.

In addition to being used with typically developing children, the PIAT-R/NU is an adequate assessment tool for individuals with developmental difficulties such as intellectual disability. Furthermore, the PIAT-R/NU can be a useful tool for children with Autism Spectrum Disorders (ASDs) given the flexibility of the instrument. Individuals with an ASD often have varied needs across the spectrum resulting in atypical testing approaches being a necessary component of a quality assessment (Koegel, Koegel, & Smith, 1997). The PIAT-R/NU allows for this flexibility with six subtests that can be used interchangeably in response to an individual's needs and/or a spoiled administration of a subtest. Additionally, many of the subtests allow for responses in a multiple choice approach. For example, the mathematics subtest requires the examiner to read a question out loud and then the individual chooses the best answer from a limited selection. Other subtests allow for responses to be counted if they are gestured, written, or spoken. This format is especially useful for testing individuals with adequate receptive and low expressive language abilities, which often describe individuals with an ASD (Sattler, 2001).

Historical Background

The Peabody Individual Achievement Test (PIAT) was first published in 1970 by Llyod Dunn and Frederick C. Markwardt, Jr. The original version of the achievement test only contained five subtests. When the PIAT was renormed in 1989 the subtest Written Expression was added, thus resulting in the Peabody Individual Achievement Test, Revised (PIAT-R). In addition to the creation of a new subtest, most of the items of the original five subtests were replaced with new items to address changes in school curriculum (Allinder & Fuchs, 1992). The PIAT-R was then re-normed between 1995 and 1996 as a part of a coordinated norming initiative, thus resulting in the Peabody Individual Achievement Test, Revised/Norms Update (PIAT-R/NU). The re-norming process allowed for an extension of the age range from 22-years-0-months to 22-years-11-months. The PIAT-R/NU is the most up-to-date version of the test.

Psychometric Data

The PIAT-R/NU was standardized between 1995 and 1996 as part of a re-norming project that included the KeyMath-Revised, Kaufman Test of Educational Achievement-Brief Edition, Kaufman Test of Educational Achievement-Comprehensive Edition, and Woodcock Reading Mastery Tests-Revised. The sample that the PIAT-R/NU was standardized with included 3,184 children between the grades of kindergarten and the 12th grade and 245 young adults between the ages of 18 and 22. Between 204 and 295 children were administered each subtest per grade level. Special needs populations were included in the standardization process consistent with the nationwide representation. The sample is representative of 40 of the 52 states of the United States of America (USA). The sample was representative of the 1994 US census data with respect to gender, race/ethnicity, parental education, educational placement and geographic region. Most children did not receive the complete PIAT-R during the norming process (Sattler, 2001).

For five of the six subtests, internal consistency reliabilities were quite good ranging from .87 to .98. For the Written Expression subtest, internal consistency reliability ranged from .60 to .91, relatively weaker in comparison to the other subtests (Sattler, 2001).

Test-retest reliability was acceptable with correlations ranging in the high .80s to the mid-.90s for grade norms and with correlations ranging in the low to mid-.90s for age norms. Inter-rater reliability was low for Written Expression with Level II reliability being .58 for Prompt A and .69 for Prompt B.

The validity of the PIAT-R/NU is considered acceptable. The clinical validity studies completed have suggested that the PIAT-R/NU is a sensitive tool used to distinguish strengths and weaknesses across five of the six subtests.

Clinical Uses

Achievement testing is a necessary component of any special needs assessment protocol. Utilizing a measure, like the PIAT-R/NU, that allows for broad screening and is adaptive and flexible allows for easing the challenges of testing individuals who are restricted verbally. Achievement testing allows for better Individual Education Plans (IEPs) to be developed that are specific to the needs of the student. Without the use of achievement testing IEPs risk being broad and nonspecific to the individual student, thus running the risk of not receiving adequate services and school placement.

The PIAT-R/NU is advantageous in that there are norms for both grade level and age. This allows for nontraditional students to be assessed and compared on multiple levels. For example, if a student with mild intellectual disability was held back a year and was being assessed to determine grade placement for the following year, it would be useful to consult the grade norms as opposed to the age norms to determine advancement.

Not only can the PIAT-R/NU be helpful in the school setting to aid in assessing strengths and weaknesses and creating goals for IEPs, but they also can assist in procuring services such as need-based tutoring, special education placement, and Title I services.

Appropriate intervention following a screen demonstrating academic weaknesses could result in significant gains for many individuals. The PIAT-R/NU is unique in that it allows for even individuals with low expressive language to be evaluated which offers many opportunities for helping these individuals work on building both their strengths and weaknesses.

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Peabody Picture Vocabulary Test

Inge-Marie Eigsti
Department of Psychology, University of Connecticut, Storrs, CT, USA
Haskins Laboratories, New Haven, CT, USA

Synonyms

Peabody Picture Vocabulary Test, Fourth Edition (PPVT)

Description

The PPVT is a test of receptive vocabulary – that is, it assesses the lexicon of words that a person can understand when he or she hears them. It is also designed to serve as a screening test for verbal ability. The test has a straightforward structure. Examinees see a page on an easel with four-color pictures. For each item, the examiner says a word, and the examinee responds by selecting one picture out of four that best illustrates that word's meaning. Because the examinee points to the appropriate item, the test requires no reading, writing, or expressive verbal language. Thus, it can be used with nonreaders and those without fluent verbal abilities. The test is untimed and individually administered. In total, the PPVT contains 228 items, divided into 19 "sets" of 12 items each; an examinee completes all items within a set. The *basal* level is set when an examinee correctly responds to 11 or more items in a set; the *ceiling* is established as the set where an examinee makes eight or more errors. Basal and ceiling levels are thought to represent the levels of difficulty below which an examinee is expected to know all items and above which the examinee is predicted to fail most items, respectively.

The PPVT was co-normed with the Expressive Vocabulary Test – Second Edition, which serves as a measure of what words a person can speak aloud after seeing a pictorial representation of the item; PPVT and EVT scores were correlated at r (3,540) =.82 in the normative sample. PPVT scores are provided as standard scores with a mean of 100 and a standard deviation of 15. Grade- and age-equivalent scores can also be computed and can help with interpreting an examinee's relative knowledge. However, such scores are not recommended for research use given discontinuities between months or grades; that is, there are meaningful differences in the rate of development over different age periods, or between grade levels, which makes the steps between levels noncontinuous. Furthermore, consumers of such scores may not always remember that, as an average score, there must by necessity be 50% of examinees that score below the mean for a given age or grade level. Finally, users can also calculate a growth scale value, which tracks vocabulary over time.

Historical Background

The first edition of the PPVT was published by Lloyd M. Dunn in 1959. Subsequent revisions were published by Lloyd and Leota Dunn in 1981 (PPVT-R), in 1997 (PPVT-III), and by Douglas Dunn (son of Lloyd and Leota, Ph.D. in statistics and business) in (2007) The PPVT-IV, is the current version. Lloyd Dunn, an expert in the fields of special education and child development, founded the Kennedy Center in 1965 and was central in efforts to train researchers in the field of mental retardation. His early work was instrumental in promoting *educational mainstreaming* and, more generally, addressing educational needs of all children whose abilities differ from the average. He served as the first director of the Institute on Mental Retardation and Intellectual Development, an institute of the Kennedy Center, developed the first doctoral

program in special education at the Vanderbilt Peabody College of Education and Human Development, and developed a number of tools designed to assess language and cognitive skills in the service of educational intervention.

Psychometric Data

Words for the PPVT were originally selected from the dictionary on the basis of their imageability both the target word and the three distractors had to be amenable to representation via line drawings (originally in black and white; in the current version, in color). Items were selected from the categories of body parts, emotions, foods, clothing, toys and recreation, and so on. In earlier versions of the test, there was a high proportion of items depicting verbs, but the PPVT-IV contains a smaller proportion of these items; they were found to be disproportionately difficult for young children. All items in a given trial are balanced for detail, visual complexity. There are no items that cannot be distinguished by individuals with color blindness. The training items for the PPVT consist of four items, for which the examiner is permitted to give feedback. An examinee must correctly complete two of these items in order for testing to be valid. This training process permits the examiner to establish whether the examinee is capable of responding in a standard fashion.

The PPVT-IV was standardized on a sample of 3,540 individuals between the ages of 2 years, 6 months and 90 years. Participants did not differ from the general US population (as recorded by census data) in gender (male, female), ethnicity (Hispanic, African-American, White, and "other," a group comprising American Indians, Alaska Natives, Asian Americans, Pacific Islanders, and all other groups not otherwise classified), geographic region, socioeconomic status, and special education placement. Twelve percent of the sample had parents whose educational achievement was grade 11 or lower; 28% had achieved 12th grade or a GED; 31% had 1–3 years of college; and 28% had 4 or more years of college. To establish age norms, the sample consisted of 28 age groups, with approximately 100–200 cases in each group; for ages 2–6, intervals were 6 months to account for the rapidly changing vocabulary levels in young children. Fifty-seven percent ($n = 2003$) of the sample contributed to a grade-stratified sample, stratified into 26 groups (fall and spring, kindergarten through twelfth grade).

In addition, some participants who make up the normative sample had developmental concerns, including speech or language impairment (5–15 years, $n = 178$ for ages 5–15; $n = 60$ ages 50–96), language delay (3–7 years, $n = 63$), mental retardation/intellectual disability (6–17 years, $n = 70$), reading disability (ages 8–14 years, $n = 71$), ADHD (6–17 years, $n = 91$), hearing impairment (4–12 years, $n = 99$), and several low-incidence disabilities. ASD was not specifically targeted for the normative sample. Proportions of special populations were intended to match population percentages. Data for difference in average scores for these subgroups relative to the larger reference group are provided in the technical manual and range from a relatively small difference of −5.6 points for individuals with speech impairment to a relatively large difference of −29.7 points for hearing-impaired individuals with cochlear implants.

Two alternate forms are available, providing the option to repeat assessments more frequently. The reliability of these forms, which are identical in format and organization, with parallel but nonidentical words tested, was assessed at .94. This licenses the potential use of the PPVT as an assessment of *"response to intervention*." Test-retest correlations range from .92 to .96.

Construct validity of the PPVT-IV was assessed by comparison of scores from the Comprehensive Assessment of Spoken Language (CASL; Carrow-Woolfolk, 1999); for ages 3–5 years ($n = 68$), CASL subtest scores correlated with the PPVT as follows: basic concepts, $r = .50$; antonyms, $r = .41$; and sentence completion, $r = .54$. For ages 8–12 years ($n = 62$), CASL subtest scores correlated with the PPVT as follows: synonyms, $r = .65$; antonyms, $r = .78$; sentence completion, $r = .63$; and lexical/semantic composite, $r = .79$. Correlations with core

language scores from Clinical Evaluation of Language Fundamentals – Fourth Edition ranged from .73 (ages 5–8) to .72 (ages 9–12), with slightly lower correlations for the receptive (r = .67 and .75 for the two age groups) and expressive (r = .75 and .86 for the two age groups) subscales. These moderate to high correlations indicate that the other oral language assessments measure a constellation of similar but nonidentical skills. The PPVT-IV test provides reliable scores, with all reliability and validity coefficients in the .90s range.

Clinical Uses

Research partially supports the utility of the PPVT as an assessment of general language abilities in the autism spectrum disorders. A study of 44 children with autism, ages 4–14, found that standardized measures of language ability (PPVT, EVT, and Clinical Evaluation of Language Fundamentals, a measure of morphosyntax) correlated well with spontaneous assessments (mean length of utterance, index of productive syntax, and number of different word roots; Condouris, Meyer & Tager-Flusberg, 2003). Furthermore, assessments of vocabulary and semantic knowledge more generally were significantly correlated with assessments of grammatical knowledge. A meta-analysis of 133 publications in the field of ASD between 1999 and 2002 (Mottron, 2004) found that a vocabulary measure (British Picture Vocabulary Scale, or BPVS; nearly identical in structure to the PPVT) had been used as a matching variable for 22% of publications, second only to overall IQ estimations using the Wechsler scales (47%). Thus, research in the field has acted in accord with the assumption that vocabulary skills, estimated with the PPVT, may be a useful proxy for general verbal language skills. Certainly, data from typical development indicates that vocabulary correlates highly with other language abilities and is the single best predictor of academic success for children starting school.

However, there is significant evidence that vocabulary assessed by the PPVT may be a strength for individuals with ASD relative to morphosyntax (Eigsti, Bennetto, & Dadlani, 2007) or discourse-level comprehension (Asberg, 2011). That is, PPVT scores may overestimate general verbal abilities. Supporting this proposal, Mottron (2004) reported that receptive vocabulary may be a particular area of strength in ASD, even compared to tests considered to tap into ASD-specific expertise, such as block design tasks. Thus, vocabulary skills, estimated with the PPVT, may overestimate the functional abilities of participants with ASD.

The PPVT-IV has several specific limitations. First, it assesses only vocabulary items that are imageable – primarily, concrete nouns and verbs. As noted above, verbs, function words (*and, if*), and grammatical markers (*–ing*, plural "*s*") are absent from the test. Thus, if an individual has a specific deficit in morphosyntactic abilities, the PPVT will fail to identify this difficulty. Second, the PPVT is inadequate for assessing individuals who are not fluent in English. There is also a Spanish version (Test de Vocabulario en Imagenes, TVIP; 1986) whose format is similar to the English version but with distinct items; because word frequencies differ dramatically across languages, it is not possible to simply translate items into another language.

A third important limitation of the PPVT, specific to the case of ASD, is the presence of atypical vocabulary skills, such as the production of jargon words or echolalia (Eigsti, Bennetto, & Dadlani, 2007). Children with ASD have been found to show some similar word-learning biases to typically developing children, in that they are able to map novel words onto novel objects, suggesting that their word learning is constrained by a "mutual exclusivity" bias that category labels apply to mutually exclusive objects (de Marchena, Eigsti, Worek, Ono, & Snedeker, 2011). Furthermore, they are able to sort objects according to typical semantic categories. In contrast, research suggests that individuals with ASD produce less prototypical words, have difficulty in learning words that refer to mental states, and show differential priming effects (as reviewed in Eigsti, de Marchena, Schuh, & Kelley, 2011). Because the PPVT is organized according to how

vocabularies are structured in typically developing individuals, it may fail in detecting differences in ASD. This lack of sensitivity is especially likely because the PPVT does not have any overt semantic organization in the scoring procedure; it is not possible to report a particular deficit in acquisition of words in any particular semantic (or structural) language category.

One final topic bears explicit mention. Clinicians have occasionally reported better responses by individuals with ASD in the PPVT when they use facilitated communication strategies. However, studies explicitly comparing responses by examinees with the assistance of facilitators who could or could not see the task materials have conclusively demonstrated that any improvement in scores using assistance is primarily due to the facilitator's knowledge, rather than any motor assistance or other examinee-specific change (Beck & Pirovano, 1996).

See Also

- ▶ Echolalia
- ▶ Idiosyncratic Language
- ▶ Verbal Comprehension
- ▶ Vocabulary

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Peabody Picture Vocabulary Test, Fourth Edition (PPVT)

▶ Peabody Picture Vocabulary Test

Pedantic Speech

Lisa Edelson
Department of Psychology, Boston University, Boston, MA, USA

Definition

Pedantic speech refers to an overly formal speaking style that is inappropriate to the conversational setting. It can be characterized by didactic patterns of prosody and very precise articulation, as well as unnecessarily complex vocabulary. Some individuals diagnosed with Asperger syndrome speak in this manner, which can be an impediment to social interactions as a conversational partner may interpret this type of speech as condescending. Pedantic speech is particularly marked in children as it is developmentally inappropriate; such children are often described as "little professors" for their very precise style of speaking.

See Also

- ▶ Intonation
- ▶ Monotone
- ▶ Prosody

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PEDI

- ▶ Pediatric Evaluation of Disability Inventory (PEDI)

PediaCare® Children's Allergy [OTC]

- ▶ Diphenhydramine

PediaCare® Children's NightTime Cough [OTC]

- ▶ Diphenhydramine

Pediatric Evaluation of Disability Inventory (PEDI)

Daniel Mruzek and Christen Szymanski
Department of Pediatrics (SMD), University of Rochester, School of Medicine and Dentistry, Rochester, NY, USA

Synonyms

PEDI

Description

The Pediatric Evaluation of Disability Inventory (PEDI; Haley, Coster, Ludlow, Haltiwanger, & Andrellos, 1992) is a clinical assessment instrument designed for use with children aged 6 months to 7.5 years who have disabilities resulting in delays or impairments in functional independence. Specific applications of the PEDI include ascertaining the extent of functional delay in children, monitoring progress in rehabilitation and intervention programs, and measuring outcomes in therapeutic and educational programs. Though the instrument also may be given as part of an initial developmental or diagnostic assessment, caution is warranted because extensive validation studies of using the PEDI for this purpose have not been completed.

Administration of the PEDI is typically completed through a 45–60-min structured interview with the parent or primary caregiver, direct assessment by therapists or educators who are familiar with the child, or a combination of these two approaches. If there are severe time constraints, the PEDI may be completed directly by the parents as a "paper-and-pencil" checklist; however, the authors strongly recommend that a clinician review responses carefully with the parent and interpret the resultant data with caution.

PEDI content is based on a conceptual model that centers upon identifying the child's functional limitations in the context of developmental expectations, task conditions, and caregiver assistance.

Pediatric Evaluation of Disability Inventory (PEDI), Table 1 Organization of the PEDI

Scales	Number of content items			Rating scale	Scoring system
	Self-care	Mobility	Social function		
Functional skills	63	59	65	Dichotomous Unable/capable	Standard scores[a] and scaled scores[b]
Caregiver assistance	8	7	5	6-point scale "Total Assistance" to "Independent"	Standard scores[a] and scaled scores [b]
Modifications	8	7	5	4-point scale "None" to "Extensive"	Frequency counts

[a]Mean of 50, standard deviation of 10
[b]Range from 0 to 100 and used to compare child's relative strengths and weaknesses

Consistent with this model, the PEDI has three sets of scales (i.e., functional skills, caregiver assistance, and modifications), each of which is organized by three "content areas" (i.e., self-care, mobility, and social function; see Table 1). The functional skills scales include items on daily living activities, such as use of utensils, toilet transfers, and interactive play. The caregiver assistance scales assess the amount of help a child requires to complete functional skills, with responses rated on a 6-point rating system that is "weighted" so that the greatest degree of specification is provided at the "higher" end of the scale (i.e., toward the independent end). The modifications scale presents the same items as the caregiver assistance scale but asks caregivers to assess the degree to which environmental modifications and equipment are necessary for use by the child to complete functional or routine daily living activities. The ratings from the modifications scale cannot be converted into normative data; therefore, they can only be analyzed as frequency counts.

Historical Background

The Pediatric Evaluation of Disability Inventory (PEDI; Haley et al., 1992) was developed at the New England Medical Center and first published in 1992. The development and testing of the test in the prior decade noted favorable comparison to the Battelle. The PEDI was designed to assess the functional independence of children with developmental disabilities. Scaled scores in multiple domains estimate the child's capabilities. It has been used internationally, and in 2008, a computer-assisted version was developed. The literature indicates greater accuracy for children with motor disabilities than language impairment.

Psychometric Data

For each of the functional skills scales and the caregiver assistance scale, two different domain scores can be determined: "normative standard scores" and "scaled scores." The normative standard scores have a mean of 50 and a standard deviation of 10 and compare the individual child's functioning to a group of children within the same age range in the normative sample. The normative group is composed of a small sample of 412 typically developing children residing in the northeastern United States. This sample was composed of a nearly equal number of males and females (49.3% and 50.7%, respectively). Distribution by race is commensurate with 1980 US census data, with the exception of an overrepresentation of African-American children (18.7% in the normative sample versus 11.7% in the US population).

The "scaled scores" are used to provide an estimate of functional independence across the items that compose each of the scales by comparing the child's performance relative to the maximum number of points possible (Haley et al., 1992). The scaled score range is 0–100, with "0" reflecting low functioning and "100" reflecting high functioning. These scores can be graphed on the score form for analysis of an individual child's relative

strengths and weaknesses. As the authors point out, these scaled scores do not take into account the age of the child but, rather, provide an estimate of the child's capability in each content domain. To this end, scores can be plotted on a "score profile" located on the score summary page of the score form for visual analysis of a child's relative strengths and weaknesses. Confidence intervals are provided for both normative standard scores and scaled scores, and a 95% confidence interval is recommended by the authors.

The PEDI manual contains evidence of high internal consistency (i.e., the degree to which the items in each of the domains measure a similar concept). Internal consistency has since been replicated and found to be adequate in a population of children with cerebral palsy (McCarthy et al., 2002). Additional evidence of instrument reliability is provided when comparing the results of separate PEDI administrations by two different examiners with two respondents who know the child well (e.g., a child's parent and member of his or her rehabilitation team). Interrater/intrarater reliability was shown to be fairly consistent when two caregivers of a child were interviewed by the same clinician (Berg, Jahnsen, & Hussain, 2004). However, when multiple clinicians interviewed providers, reliability of results was lower (Berg et al., 2004). Test-retest reliability data are not available.

The PEDI authors provide evidence of satisfactory validity on several dimensions. The results of reviews of the instrument by developmental experts suggest that the PEDI does measure the presence of a pediatric functional disability (i.e., content validity). A strong positive correlation between the age of the children in the normative sample and their PEDI scores suggests that the skills measured by the instrument are closely tied to overall child development (i.e., construct validity). Scores on the PEDI were found to be strongly correlated with scores on the Battelle Developmental Inventory Screening Test (BDIST; Newborg, Stock, Wnek, & Svinicki, 1984) for both a group of typically developing children and a group of children with disabilities (Feldman, Haley, & Coryell, 1990). Evidence of strong discriminant validity is provided in the PEDI manual as well, suggesting that the instrument effectively distinguishes between children with and without disabilities. A comparison of PEDI scores of a group of children at hospital intake for traumatic injuries with their follow-up scores at 1 and 6 months postrehabilitation showed that the PEDI detected change in the functional status of children over time, suggesting evaluative validity (i.e., the ability of the instrument to detect change in functional status of the individual).

Since its publication in 1992, the PEDI has been translated and used in several other countries with solid psychometric results (e.g., Ganotti & Cruz, 2001; Wassenberg-Severijnen, Custers, Hoz, Vermeer, & Helders, 2003), suggesting that the instrument is a good measure of overall functional skill development. A recent attempt to abbreviate the measure and make a computer version shows promise (Coster, Haley, Pengsheng, Dumas, & Fragala-Pinkham, 2008). The PEDI has been utilized with a variety of populations (e.g., premature infants, brain injuries, autism, cerebral palsy) but may be best suited for populations with severe motor deficits. For example, while the PEDI has been consistently shown to be effective in identifying motor progress of children with cerebral palsy (e.g., Vos-Vromans, Ketelaars, & Gorter, 2005), it is less sensitive in detecting subtle deficits of children with primary language impairments (Mayrand, Mazier, Menard, & Chiningaryan, 2009).

Clinical Uses

For children with autism, the PEDI is most likely to be administered as part of an intake evaluation (e.g., such as during referral for early intervention services) or when there is a concern about additional physical disabilities or delays that impact the independent functioning of the child. Given the "prompt dependency" that many children with autism demonstrate (i.e., the necessity of caregivers to direct a child to initiate and/or complete a task that is otherwise within his or her skill repertoire), the PEDI may be a useful tool for monitoring independence and timely use of functional skills. Repeated administrations of the PEDI as part of ongoing treatment for a child

with autism may allow caregivers and clinicians the ability to monitor progress with functional skills over time. Given that the data used to establish the norms was collected over 30 years ago, it is recommended that normative standard scores be interpreted with great caution.

The PEDI is most useful in the assessment of children with motor disabilities such as children who were premature infants or who have cerebral palsy.

See Also

- ▶ Functional Life Skills
- ▶ Vineland Adaptive Behavior Scales

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Pediatric Onset Schizophrenia

- ▶ Childhood Schizophrenia

Pediatric Speech Intelligibility Test

Jennifer McCullagh
Department of Communication Disorders, Southern Connecticut State University, New Haven, CT, USA

Synonyms

PSI test

Description

The Pediatric Speech Intelligibility (PSI) test is a closed-set test composed of 20 monosyllabic words and a 10-sentence procedure. The monosyllabic word lists consist of simple nouns like "bear" and "fork." The sentences consist of two formats. In the first format, the sentences are composed of a noun phrase, verb-ing, and a noun phrase and are preceded by the carrier phrase "show me." An example of a sentence in the first format is "Show me a rabbit painting an egg." In the second format, the sentences are composed of a noun phrase, auxiliary verb-ing, and a noun phrase. An example of a sentence in the second format is "A rabbit is painting an egg"

(Jerger, Lewis, Hawkins, & Jerger, 1980; Northern & Downs, 2002). The child is instructed to point to one of the five pictures corresponding to the sentence or word that is heard (Jerger, Jerger, & Lewis, 1981). The PSI test can be administered in quiet, as well as in the presence of a competing message.

Historical Background

The Pediatric Speech Intelligibility (PSI) test was developed to evaluate both peripheral and central components of auditory disorders in children between the ages of 3 and 6 years. The test takes into consideration children's receptive language function since the test stimuli were generated by typically developing children between 3 and 7 years of age. The word and sentence stimuli were elicited by picture stimulus cards which were chosen from lists of words and actions comprising the vocabularies of young children (Jerger et al., 1980).

Psychometric Data

Validity studies using the PSI test indicate that test performance on the Format I and Format II sentences was significantly different in children between the ages of 3 and 6 depending on their chronological age as well as receptive language ability. Performance on the monosyllabic word materials did not change with receptive language abilities. Trends in chronological age were evident for both the word and sentence materials (Jerger et al., 1981). Performance intensity functions were reported in quiet and in noise and performance reached 100% in children with normal hearing on words and sentences in both quiet and noise at a presentation level of 50 dB SPL (Jerger & Jerger, 1982). Test-retest measures indicated high test-retest reliability for both normal hearing and hearing-impaired children (Jerger, Jerger, & Abrams, 1983). Furthermore, the PSI test has been shown to have high sensitivity and specificity to central auditory nervous system lesions in children (Jerger, 1987).

Clinical Uses

The PSI test has been used to evaluate speech intelligibility in quiet and in noise in a variety of populations, both children and adult as follows: speech intelligibility in children with recurrent otitis media (Jerger, Jerger, Alford, & Abrams, 1983), central nervous system lesions (Jerger et al., 1983; Jerger, 1987), and hearing impairment (Jerger et al., 1983). In addition, the PSI test has been used to evaluate speech intelligibility in children with cochlear implants and hearing aids (Somers, 1991). Clinically, the person administering the PSI should take into consideration the cognitive, hearing, speech, and language abilities of the individual being tested as these factors may affect outcomes. Thus, the PSI is not typically administered to children with autism, and performance on this test should be interpreted with caution in this population.

See Also

► Central Auditory Processing Disorder

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Peer Victimization

► Bullying

Peer-Mediated Intervention

Kathy Thiemann-Bourque
Schiefelbusch Institute for Life Span Studies
Juniper Gardens Children's Project, University of Kansas, Lawrence, KS, USA

Definition

Peer-mediated interventions (PMIs) involve training peers without disabilities to be responsive and interactive social partners to children with autism spectrum disorders (ASD). Both peers and students with ASD are taught to initiate and respond to each other within engineered (i.e., instruction in small groups) and typical school social contexts (e.g., centers, game play, recess, and lunch) across the school day. For adolescents with ASD, programs involving peers without disabilities are generally referred to as peer networks. A group of 5–6 peers is recruited and meets regularly to plan social activities, seek solutions to social problems, and create daily opportunities for students with ASD to have positive social experiences both in and outside of the classroom. The primary focus of PMIs, regardless of age, is to increase social reciprocity, positive interactions, and possibly the development of friendships.

Historical Background

The concept of training peers without disabilities to be responsive social partners to young children with autism began in the 1970s. This landmark research was particularly important given the core deficits in social communication characteristic of autism and failure to develop peer relationships (American Speech-Language-Hearing Association [ASHA], 2006). In the 1980s, these initial positive findings were replicated, and different PMI approaches were explored with preschoolers with much success. Some of these approaches included teaching peers to (1) use responsive language facilitation strategies (e.g., repeat and expand on language used by focus child with autism), (2) use social initiation strategies (e.g., establish joint attention, initiate play routines, comment on one's own play), and (3) learn language scripts that matched dramatic play themes (e.g., hamburger stand, birthday party) (Goldstein, Schneider, & Thiemann, 2007). In the 1990s, PMI approaches were extended to include elementary school-age students with ASD and, to a lesser degree, middle school and high school students. The focus over the last decade has been to create comprehensive school-based PMIs that integrate peer training with evidence-based direct instruction to achieve more widespread and robust social outcomes in inclusive settings.

Two instructional approaches more recently incorporated within PMIs are video modeling and the use of written-text or graphic-cueing systems (Thiemann & Goldstein, 2001, 2004). For example, social group interactions can be videotaped then played back for self-evaluation and feedback. Words or short phrases (written-text cues) are used to prompt what to say in a specific social context, along with picture symbols or photographs of children interacting. These strategies capitalize on visual learning styles and strengths of children with autism.

Rationale or Underlying Theory

Friendships build on social interactions. There must be opportunities for interactions and the outcomes of those interactions must be positive for friendships to begin to develop. Social interdependence theory considers how the rewards or benefits of a social interaction outweigh the costs. It is more likely that children will engage in social interactions when their social exchanges are rewarding and fun than if interactions require effort to maintain.

This applies to both children with autism and those without developmental disabilities. Adults in the children's environment are the key to planning effective social programming to assure maximum benefits for all involved.

In inclusive settings, exposure to peers alone is not enough to impact the social and communication deficits characteristic of children with ASD. When an adult sets up the social environment to meet individual child needs, then models, prompts, and reinforces social communication and social responsiveness – many benefits can occur. For students with ASD, involvement in PMIs usually leads to increased reciprocal communication with peers, greater friendship ratings among classmates, and a decrease in behaviors that can lead to awkward or uncomfortable interactions. Group contexts provide naturally occurring social opportunities with socially sophisticated peers who can model important communication skills. Consequently, children with ASD will have a greater chance of generalizing communication skills across social settings and partners. Benefits to peers include learning social and communication skills to engage in positive interactions with children with disabilities and other classmates and enjoyment in helping others. Further, involving available peers as social change agents can decrease time demands on teachers or other staff and lead to spillover effects to untrained peers. Without training, peers may reinforce children's inappropriate social behaviors and ignore desirable behaviors.

Several possible reasons may explain the benefits of using written-text, graphic, or other picture cues to teach social communication within peer groups. First, it is a widely held belief that children with ASD have a superior ability to recall visually presented information (Grandin, 1995). Second, written-text cues are basically "scripts" that provide children with constant access to a relevant and appropriate "social outline" to follow and language to use within a social context. Peers are taught to remind focus children to use this cue to initiate, respond, and stay engaged in the interaction. Third, having picture and text cues available throughout an activity provides opportunities for repeated practice of the same target skill(s), and when peers express the same utterances, they provide many models of the skill in a short time period. For children who are verbal yet not intelligible, communication attempts will be better understood given that everyone in the group knows the target communication skill and script. Finally, peers provide feedback on the timing and social appropriateness of the child's behavior in different social contexts. This feedback and reinforcement may lead to greater independent use of targeted communication skills.

Goals and Objectives

The primary goals and objectives of PMIs are:

1. To include peers as intervention agents and train them to use strategies that lead to successful social exchanges with children with ASD
2. To provide regular and frequent opportunities for children with ASD and peers without disabilities to practice age-appropriate social communication skills in typical school social settings
3. To provide direct instruction that increases children's repertoire of verbal and nonverbal social communication behaviors to (for example):
   - Engage in joint play routines
   - Respond to peer's bids for joint play
   - Take turns and share
   - Gain attention/greet others
   - Comment or describe actions and objects
   - Request actions, objects, or information
   - Keep talking to maintain topics
   - Be flexible about topics
   - Use social niceties (e.g., compliments, cheers, and sharing affection)
4. To improve reciprocal child-peer social interactions and enjoyment across varied social activities and environments
5. To reduce the divergent social path and social competency gap that occurs between children with and without ASD as they advance through higher grades
6. To foster friendships and relationships between individuals with and without ASD

Peer-Mediated Intervention, Table 1 Potential social communication goals and example written-text cues

Preschool	School age
Descriptive comments (e.g., "I have two"; "Mine is blue")	Descriptive comments (e.g., "You have a match"; "I got one!")
Provide assistance/offer help (e.g., "You want help?")	Requests for actions or objects (e.g., "Roll it" or "Can I have the dice?")
Share/give/accept toys (e.g., "Here you go" + giving toy)	Requests to gain information (e.g., "What do I do?")
Establish joint attention (e.g., tap on shoulder, move closer)	Secures for attention (before initiations) (e.g., "(name), ____" or tap on shoulder)
Provide affection and praise (e.g., high five, pat on back)	Social niceties (e.g., "Way to go!" or "Maybe next time")
Play organizers (e.g., "Let's play_____"; "You be the cook")	Make suggestions (e.g., "I have an idea, let's do rock-paper-scissors")

Children with better social skills are more likely to make friends, and having friends further supports the acquisition of social skills. If appropriate social skills provide a foundation for relationship and friendship development, what social goals are most important? Table 1 lists possible social communication targets that can lead to improved initiations and reciprocal interactions for young children with ASD. The difficulty in deciding which skills to teach is complicated by two factors. Children need to learn not simply a repertoire of skills but when to use which social skills, when to vary them based on the situation, with what frequency of use, and such. This is further complicated by the need to adjust to the ever-changing expectations of one's peer group, family members, teachers, and community members as the child grows older. Thus, the interventionist needs to be cognizant of shifting social demands and plan ahead to equip children with social skills that will be needed in future social encounters.

Treatment Participants

PMI approaches have been successfully implemented for individuals with autism spectrum disorders (ASD), including autism, Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS), and Asperger's syndrome. Participants with ASD are most often between the ages of 3 and 13 years and attend preschool or elementary school with typically developing peers. However, with modifications, peer network programs can be successfully implemented for middle and high school students as well (Thiemann-Bourque, 2010). Participants with ASD demonstrate a wide range of cognitive, social, and communication impairments. Peer implementers are generally the same age as their classmate with ASD and are recruited based on select criteria (see section "Peer Participation" below):

1. Age-appropriate social skills
2. Has similar interests to student with ASD
3. Well-liked by the majority of classmates (i.e., high-status peers)
4. Consistent school attendance
5. Similar academic groupings or classes with student with ASD
6. Not overtly shy or quiet
7. Willingness to participate

Treatment Procedures

Selecting Instructional Strategies

Successful implementation of PMIs can be accomplished by attending to the intervention components listed in Table 2. These are established guidelines for planning, implementing, and monitoring PMIs, with the understanding that there is an ongoing need to examine specific social

Peer-Mediated Intervention, Table 2 Components of comprehensive peer-mediated school social programs

Component	Description and examples
Supportive social environment	Visual schedule of group events, choice of two preferred and motivating activities, outline expectations and social roles, games with simple rules, 1–2 peers involved at one time
Regular social opportunities	Structured: 3–4 times/week for minimum of 15–20 min
	Less structured: 5–10 min across daily school routines
Naturalistic settings	Free play, centers, thematic play (e.g., grocery store, restaurants, hairdresser), phonics or math games, snack, recess, lunch, social activities before or after school
Age-appropriate activities	Board games, art projects, science experiments; incorporate interests and familiar themes so motivating and fun for all
Visuals and picture cues	Peer "buddy" manual of targeted social skills; conversation topic starter cards; real photographs of the children; placemats at snack or lunch with topic starters Velcroed on silly pictures, favorite foods, cartoon characters, etc.
Written-text cues	Write out 2–3-word simple phrases on skill sheets or in topic bubbles that match the game/social context; represent social skills with pictures or line drawings; peers use same cues as focus children; place in 5 × 7 or 8 × 10 clear photo frames
Peer training	Recruit 4–6 peers; well-liked and same age; teach 3–5 facilitative or responsive social skills; peers cue focus child to talk/interact using written-text and picture cues; peers can be taught to monitor skill use by self-evaluation – mark boxes on monitoring sheets; use cooperative progress charts for all
Adult mediation	Adult introduces and defines social communication skill; models examples using selected activity; role-plays with peers then focus child; prompts through peer first once per minute, then if unsuccessful, assists focus child; reinforces use of skill often at first, then fades, prompts, and reinforces
Videotape self- or peer modeling	Interactions are videotaped, then played back to discuss models of social skills, use of target skills, etc.
Plan for generalization	Train multiple peers; embed practice in natural inclusive settings; all staff aware of target skills; prompt and reinforce across the day; provide choices for activities; class-wide minisocial lessons, text cues, and visuals available across settings; coordinate home and community social activities

behaviors to teach and in what contexts to optimize the social outcomes. The following guiding principles can be used to select instructional strategies (Goldstein & Kaczmarek, 1992):

1. Strategies that teach behaviors observed in high-quality interactions between children in general (e.g., engagement, responsiveness, and smiling or other expressions of positive affect)
2. Strategies that have a higher chance of eliciting responsive social behaviors (e.g., mutual attention to an activity, descriptive comments about current activity, and acknowledging a speaker's communication)
3. Strategies that generate reciprocal interactions as reflected in more balanced turn-taking (e.g., sharing objects in play, taking turns in games, and being verbal in conversations)
4. Strategies that optimize the social environment to enhance social interactions between children with and without ASD (e.g., attention to group size, use of preferred activities and activity choices, and adult guidance)

Peer Participation

Teachers recommend a group of 4–6 peers to participate in PMIs. To give ample time for social interactions and friendships to develop, the same groups of peers are involved in a PMI for the entire school year. After students begin to show increased interactions and engagement outside of PMI sessions, additional peers can be recruited. Parent consent may or may not be necessary based on classroom and school social curriculums.

Once a group of 4–6 peers have been recruited, an adult meets with them to explain the purpose of the groups, to review what it means to be a "buddy," to find out preferred activities and popular games, and to talk about the social

group schedule. This can be accomplished within one to two 30-min group sessions. Two peers are paired up with the focus student with ASD in small groups, and these pairings rotate across the week so each peer participates once per week. For younger children or children with more severe social needs, one peer can be paired up in a dyad with the focus child to decrease social demands and to increase opportunities for social skill practice.

Scheduling Social Groups

For direct teaching of social communication skills, groups meet 3–4 times per week for 20–30 min. A combination of structured practice and more naturalistic social opportunities is recommended. An adult sets up the social environment for success by including visual schedules, behavioral and reinforcement systems for increasing engagement, and preferred activities and games with simple rules. Opportunities to practice target social communication skills are embedded within less structured social times, when the context matches the skill (e.g., greeting and saying goodbye to peers, asking for items from peer at snack, asking peer for help in small group work). Multiple social opportunities exist within preschool centers, circle time, meal times, and dramatic play. As children advance through the grades and as the emphasis on academics increases, there is a need to become creative in providing social opportunities. Groups could meet before or after school as part of school enrichment programs (e.g., breakfast club, games galore, drama club), at lunch (e.g., "lunch bunch"), at recess, or during the day when talking is allowed (small group work, art projects, etc.). The main idea is to provide numerous opportunities across the day to practice social skills taught in the small group format. This will greatly impact rate of learning and generalization of skill use.

Training Peers

Methods vary for training peers to be responsive conversational partners and to initiate and maintain interactions with children with ASD. In general, these methods are focused on teaching peers to model and prompt different social and language skills and provide corrective feedback and reinforcement to children with ASD. Peer training may take the form of meeting with peer buddies separately for group orientation, buddy training, and teaching specific facilitative social skills before joining a group with a child with autism. Alternatively, both peers and the child with autism can begin the groups together and be taught the same skills from the start of intervention. With this latter option, it is important for the adult to attend to the amount and level of language used when explaining the group goals, defining skills, etc. The child with autism may need a preferred reinforcer or behavior system to sit at the table with the group during the "teaching" time. Currently, the recommended method for training peers is to teach all children together and modify sessions accordingly to meet the needs of all children.

Two published curriculums for teaching preschoolers buddy skills include "Stay-Play-Talk" (English, Shafer, Goldstein, & Kaczmarek, 2005) and "Play Time/Social Time: Organizing your classroom to build interaction skills" (Odom & McConnell, 1997). Examples of adult verbal prompts and social skills from Play Time/Social Time curriculum are listed in Table 3.

Table 4 lists examples of facilitative social communication skills and behavior substeps successfully taught to peers to be responsive conversational partners (Thiemann-Bourque, Goldstein, & Vuong, 2012). Peers can also be taught to model and role-play target skills, use time delay prompts, and respond quickly and appropriately to their classmate with ASD.

Selecting Social Communication Goals

Young students with autism have a significantly restricted range or repertoire of social communication skills (e.g., language used to request objects or social routines, protest, greet, request information, and comment on personal or peer interests), and most demonstrate limited initiation skills. Evidence documenting characteristic social-communicative profiles of young students with PDD has distinguished them from children

Peer-Mediated Intervention, Table 3 Example prompts used in peer training from "play time/social time"

1. Sharing:
"___ wants to trade pictures with you. Please trade"
"___, give ___ a letter to put with the picture"
"___, ask ___ if she wants the picture"
2. Requesting to share:
"___, ask ___ to give you a letter. Point to the one you want"
"___, ask ___ if your puppet can share the word cards"
3. Play organizing:
"___, tell ___ to put his cat in the barn"
"___, tell ___ to put the word cat by the animal cat"
4. Agreeing:
"___, say, 'Yes, my rat is thirsty'"
"___, make your cat follow ___'s cat"
"___, say, 'Yes, I'll help you say the words'"
5. Assisting and requesting assistance:
"___, help ___ sort the picture cards"
"___, ask ___ to help you match the letters to the pictures"
6. Persistence:
"___, show me 'keep on trying' with the word cards"
"___, show me 'try another way' with the picture matching"
"___, show ___ matching the cat to the word card, then ask again"

Peer-Mediated Intervention, Table 4 Examples of social communication skills to teach peers

Skill #1: keep talking
1. Listen to what a friend is saying
2. Show you are listening by saying, "sure" or nodding your head "yes"
3. Ask a question to find out more
Skill #2: look, wait, and listen
1. Look at friend who is talking
2. Show interest by sitting quietly
3. Hold up hands to show friend you are waiting
Skill #3: answer questions
1. Listen to friend's question
2. Answer friend's question
3. Tell friend if you do not understand
Skill #4: start talking
1. Choose a friend to talk to, say their name
2. Talk about what you see a friend doing
3. Tell a friend what you are doing
Skill #5: say something nice
1. Decide what to say something nice about
What your friend is making or doing
If a friend is winning or needs encouragement
What a friend is wearing
2. Give compliments in an honest, friendly way
3. Choose a good time to say something nice

with other developmental disabilities and peers without disabilities (Wetherby & Prutting, 1984). Typically developing preschool children exhibit 3–5 social initiations per minute during free play with peers, and this may vary up to 12 initiations. In comparison, students with autism primarily will initiate to adults and rarely to peers. Given the considerable limitations in social communication skills, and language spontaneity directed to peers, selecting and prioritizing communication goals is a challenging yet important first step.

Table 1 describes specific social communication skills and example text cues/scripts that have been successfully taught to preschool and school-age children within PMIs. One important consideration in selecting appropriate communication objectives is to choose behaviors that are effective in obtaining a positive response from peers or that enhance children's responsiveness to their peers. For example, peers are more likely to respond to initiations of children with autism when their initiation attempt is combined with an attention-getting device (e.g., child looks at peer or says their name to get attention). Other strong predictors of successful communicative interactions are responding to what a peer just said and talking about topics related to peer interests. Furthermore, children with autism may be more responsive to peer's verbal and nonverbal *requests* compared to other types of communication acts (English, Goldstein, Shafer, & Kaczmarek, 1997). Additional considerations in selecting appropriate target communication skills include (1) the child's language abilities in different social situations (e.g., performance vs. specific skill deficits), (2) behaviors that may impede positive peer interactions (e.g., physical aggression, being "bossy," talking too close or too quiet, or difficulty losing), (3) current IEP goals, and (4) family and teacher perceptions of social priorities.

Adult-Mediated Instruction

Each 30-min treatment session typically consists of 10 min of direct instruction, 15-min engagement in a social activity, and 5 min of adult feedback and reinforcement. Steps for direct teaching of social communication goals generally include:

1. Adult writes out group tasks on a visual agenda and reviews session goals.
2. Adult defines target social skill and substeps of skill (e.g., "Today we are going to learn how to say nice things to our friends. This means we can cheer for them or give compliments.").
3. Adult reads written-text cues that match target skill (inserted in standing clear 5 × 7 photo frame) and explains symbols or pictures that represent the communication skill (e.g., "Look, these children are cheering for their friend who won the game.").
4. Adult models target skill by reading the text cues, using parts/pieces of the upcoming activity or game.
5. Peers read cues and model/role-play target skill with each other.
6. Peers model/role-play the target skill with the child with ASD.
7. Adult teaches peer to prompt child to read/say the text cues of target skill.
8. Adult explains rules and expectations of social activity and shows children the reinforcement card that will be marked when they use the target skill. Visual cues of target skill are left on the table in child's direct line of view.
9. Adult sits back from the group and monitors child-peer communicative interactions during a 15-min activity. If no interactions occur, adult prompts peer once every 30 s to 1 min to prompt child with ASD to use the text cue card of the target skill. If peer is unsuccessful in gaining an appropriate response from the focus child, the adult intervenes and prompts accordingly.
10. Adult provides specific feedback on rate of skill use, shows performance of skill based on reinforcement card, and gives reinforcer as appropriate.

Efficacy Information

PMIs have long been recommended best practice for preschool children with autism based on

intervention studies that span the last 40 years (McConnell, 2002). Over the past 10–15 years, a growing number of studies have demonstrated positive outcomes for school-age children with ASD (Chan et al., 2009; National Standards Project, 2009). Across these age groups, peer participation in social interventions should be considered recommended best practice for all individuals with autism. More evidence supporting implementation of peer training in natural school environments for older students is needed (Reichow & Volkmar, 2010). Studies that are available for older students show that children with ASD and their peers can learn to communicate using functional or contextually appropriate language during age-appropriate games and activities, recess, lunch, and centers, for example. Communication improvements relate to greetings and gaining attention (e.g., saying hello, inviting others to play, saying child's name), commenting (e.g., "I have a match."; "You won."), requesting objects or actions (e.g., "Can I have the dice?"; "Roll the dice"), requesting information (e.g., "Who's winning?"; "Is it my turn?"), maintaining topics, and giving compliments (e.g., "Way to go!"; "Maybe next time") (Goldstein et al., 2007; Thiemann-Bourque, 2010; Thiemann & Goldstein, 2001, 2004; Thiemann & Kamps, 2008). Effective strategies used to teach communication skills within PMIs include video modeling, written-text cues, graphics, and other visual cues. Video modeling and other symbolic representations of social skills may be more effective when combined with other teaching techniques, as part of more comprehensive social programs.

Literature on social interventions for this population has emphasized the need for comprehensive programming that integrates or "layers" effective techniques in planning programs powerful enough to affect generalized and durable social outcomes (National Research Council, 2001; Schwartz, 2000). These model intervention "packages" often combine social-pragmatic and developmental approaches (e.g., targeting functional social-communicative skills in natural contexts) (Prizant & Wetherby, 1998) with principles of contemporary behavioral interventions (e.g., multiple treatment components, systematic instruction of functional behaviors, access to preferred activities, and manipulation of ecological variables) (Horner et al., 1990). Schwartz discussed a promising intervention model that focuses on adult mediation, child's skill repertoire, the social environment, and peer skills, supports, and expectations to guide children's social relationships in natural settings. Recent PMI studies incorporating similar components of this model have reported the following benefits to students with ASD: (a) increased social initiations, (b) improved functional expressive language, (c) decreased unintelligible utterances, (d) use of new skills across novel and varied settings and social partners, (e) fewer inappropriate social utterances and behaviors, (f) improved friendship ratings, and (g) enhanced overall quality of interactions.

Evidence supporting PMIs is based primarily on multiple-baseline and alternating treatment experimental designs. There are over 50 single-subject experimental design studies, most of which contribute to evidence of robust effects of social skill interventions for young children with autism. Much has been learned from this literature. The focus is now shifting toward larger randomized control studies that compare PMIs with "business as usual" or traditional interventions. Furthermore, there are currently a number of therapy resources that promote the use of pictures, symbols with text cues, and other illustrations of social interactions (e.g., Baker, 2003; Kelly, 1996); additional studies are necessary to document the effectiveness of these approaches on social interactions. These studies will be important to increase understanding of what components of comprehensive PMIs are critical to impact more lasting social changes and how to ensure feasibility of implementation for school staff.

Outcome Measurement

Reports of social outcomes have historically focused on measuring changes in the duration of an interaction, proximity to peers, and changes in rates of social initiations. There has been

a growing emphasis on the need to measure multiple social outcomes that include social communication competence, social acceptance, and friendship development. Outcome measures have advanced to include verbal social communication (e.g., requests, comments, offers to share), nonverbal communication (e.g., facial expressions, body language), prelinguistic communication (e.g., gestures, eye gaze, joint attention), and conversational skills (e.g., topic maintenance). Measuring skill used within contexts that involve new (untrained) peers, novel activities, and games and that took place in nontreatment settings would indicate generalization of treatment gains. If generalization of skills is not observed, students need continued adult prompts and peer supports embedded within these novel, naturalistic settings.

A true measure of social success is the ability of individuals with and without ASD to engage in positive and successful interactions leading toward development of friendships. Haring and Breen (1992) adeptly provided the groundwork to measure this outcome by asking questions about friendship supports and relationships for junior high students (with autism and DD) following participation in peer networks. Measures included peer reports of interactions with the focus students based on invitations to extracurricular activities and interactions in the hallway, locker areas, cafeteria, and school field. Children perceived as being more socially competent are more likely to be accepted by peers and to be chosen as friends. These outcomes can be measured by asking peers to complete friendship or acceptance questionnaires at the beginning and end of the school year. For younger children, one way to assess acceptance is to ask them to place a photo of a "buddy" in their class that they would like to take on a train ride at the zoo (with connected paper train cars). For older students, rating scales with smiley faces can be used to assess acceptance with questions such as "Would you like to sit beside _____ at lunch time?" or "Do you play with _____ on the playground?" or "Would you like to be partners with ____ to do an art project?" etc. Knowledge of how student's social engagement and acceptance are developing outside of the treatment setting is critical to guide intervention efforts to enhance long-term friendships.

Qualifications of Treatment Providers

The ASHA (2006) published guidelines for speech-language pathologists (SLPs) working with individuals with ASD. These guidelines stress the critical role of SLPs in supporting the child with ASD *and* the communication partner (e.g., peers). Effective PMIs require strong collaborative relationships between SLPs and members of school support teams. In-service training and workshops should be provided to SLPs and other service providers such as school psychologists, counselors, paraprofessionals, and special education teachers. Regular education teachers are not typically involved in direct peer instruction, given that they have a classroom of students to manage; however, they can be instrumental in capitalizing on classroom or playground social opportunities to reinforce target social communication goals in inclusive settings. Training and involvement of multiple treatment providers can lead to improved generalized social outcomes if everyone is aware of and working on the same peer-related social communication goals.

See Also

- ▶ Circle of Friends
- ▶ Peers, Exposure to
- ▶ Service Delivery Model
- ▶ Social Behaviors and Social Impairment

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Peer-Mediated Supports

▶ Interpersonal Supports

Peers, Exposure to

Erin Rotheram-Fuller[1] and Mina Kim[2]
[1]School Psychology, Department of Psychological Studies in Education, College of Education Temple University, Philadelphia, PA, USA
[2]College of Education Temple University, Philadelphia, PA, USA

Definition

Exposure to typically developing peers is often used as an intervention to improve the socialization of children with autism spectrum disorders (ASD). Exposure to typical peer models provides examples of age-appropriate social behavior as well as opportunities to engage in those age-appropriate activities. Exposure to peers is also used to try to improve peer acceptance of children with ASD and appreciation of differences. Interventions utilizing exposure to typically developing peers often occur in the school setting, in inclusive classrooms or environments. Peers may be trained or untrained, and adults may or may not facilitate interactions between the peers and child with ASD. However, there is an overall emphasis to reduce adult intrusion and instead arrange the physical space to increase the likelihood of interactive play (Bellini, Peters, & Hopf, 2007b).

Historical Background

Peer relationships are considered to be a crucial factor for healthy academic and social development (Birch & Ladd, 1998). There has been an increasing push to include children with ASD into regular education classrooms (Falvey, 1995; Guralnick, 1990; Kasari, Freeman, Bauminger, & Alkin, 1999; Villa & Thousand, 1995). One goal of inclusion is to increase the exposure of children with ASD to typically developing peers, and ultimately develop social relationships (Gallagher et al., 2000). In autism-specific classrooms, children are often surrounded by children with similar social challenges to themselves and do not have the same opportunities to observe or practice peer-peer positive social interactions. Children with ASD have difficulties in social interaction as a hallmark of the disorder (American Psychiatric Association [APA], 2000). These social deficits can affect children with ASD's theory of mind (the ability to take another person's perspective; Peterson, Slaughter, & Paynter, 2007), communication skills (both verbal and nonverbal), interpretation skills of other's behavior, as well as their ability to stay on socially relevant topics (Jackson et al., 2003; Palmen, Didden, & Arts, 2008). Children with ASD seem to lack two of the most important qualities for successful peer relationships: the ability to relate positively and reciprocally to peers and the ability to easily adapt to changes in social situations (Schopler & Mesibov, 1986). Complex communication skills require a high level of sensitivity in order to recognize social cues, and children with ASD often lack the social skills required to interpret those cues and connect with others (Chawarska, Klin, & Volkmar, 2003). An inability to effectively communicate can severely impede the development and maintenance of peer relationships, when children cannot accurately understand one another, and having two children with social difficulties trying to interact only increases this challenge. By exposing the child with ASD to typically developing peers, there is an increased opportunity for the peer to adapt to the child with ASD's unique communication style and interact successfully. Children with ASD also do not attend to social cues, such as eye gaze, similar to their typical peers, and appear to process these visual cues differently (Chawarska et al., 2003). Other social challenges of children with ASD include inappropriate behaviors, such as failing to initiate conversations and/or respond to others, difficulties in turn-taking, and perseveration (APA, 2000). In addition, children with ASD may respond to failures in communication by getting frustrated and reverting to earlier forms of communication, such as crying and throwing tantrums, instead of working to

repair the miscommunication (Koegel, Valdez-Menchaca, Koegel, & Harrower, 2001). Children with ASD may also have disruptive, aggressive, age-inappropriate, or repetitive behaviors, such as hand-flapping, echolalia, and prosody of speech (Downs & Smith, 2004; McEvoy, Rogers, & Pennington, 1993). As a result of these challenges, many children with ASD have difficulty developing and maintaining peer relationships. Exposure to typically developing peers has the goal of improving social engagement and addressing some of these core deficits.

Rationale or Underlying Theory

Children with disabilities are often stigmatized, and the negative effects of stigmatization can be carried into adulthood (Koegel et al., 2001). Similarly, children who demonstrate difficulties forming peer relationships in their earlier years have a higher incidence of emotional maladjustment in later years (Schopler & Mesibov, 1986). Children with ASD do not engage in spontaneous play with other children and often fail to develop meaningful friendships (Koegel et al., 2001). However, positive peer relationships are related to improved academic performance, physical and behavioral outcomes, and increased feelings of companionship, self-worth, and self-esteem and may serve as a protective factor (Brendgen, Wanner, Morin, & Vitaro, 2005; Farmer et al., 2008; Gest, Graham-Bermann, & Hartup, 2001). Thus, promoting the development of peer relationships is crucial for the social and emotional development of children with ASD.

Exposure to typically developing peers offers a unique method of social training for the child with ASD. Peers are of similar age to the child with ASD and thus can become highly salient for the child with ASD to observe and try to emulate (as opposed to exposure to adults). Peers can also provide a desired acceptance and social praise for the child with ASD. Some children with ASD have been shown to be aware of their social status within the classroom and have shown increased ratings of loneliness as a result of that understanding (Bauminger & Kasari, 2000). Using peers to teach children with ASD how to appropriately interact socially may provide some inherent social rewards and reinforcement for the child with ASD to not only increase the desired social behavior but also increase their motivation to continue to emulate and seek out social interactions with their peers. Often when trying to shape the behavior of a child with ASD, artificial reinforcers are used (e.g., stickers, tokens, time on the computer) to reward the child for desired behavior. However, when peers respond positively to the child with ASD for exhibiting appropriate social behavior, that natural reward may be a more powerful reinforcer and motivator to increase the desired behavior than artificial tokens. Even using artificial rewards for appropriate behavior in real-life social experiences (e.g., rewarded for play on the playground) is more likely to achieve real and longer-lasting results than rewards for appropriate role-play in artificial clinical settings.

Goals and Objectives

Children with ASD are exposed to typical peers with the goal of increasing interaction and appropriate social skills as well as exposing the child to more age-appropriate behavior. There is a hope that exposure to typical peer models will result in a corresponding increase in the social skills and generalizability of those skills in the natural setting by children with ASD. Since play is important in forming a basis for peer relationships, many interventions focus on teaching and promoting specific play skills (Schopler & Mesibov, 1986). Targeting specific behaviors, such as decreasing stereotypic behaviors and tantrums and increasing play and cooperation, may also play an important role in long-term development and contribute to subjective observers' improved global impressions of the child with ASD (Koegel et al., 2001).

Exposure to typically developing peers also provides naturalistic rewards for age-appropriate

social behavior as well as increased opportunities for social communication, play, and social engagement. Some of the goals of exposure for peers to children with ASD are to increase their acceptance of children with special needs as well as increasing their understanding, empathy, and adaptive skills.

Treatment Participants

Treatment involving exposure to peers has focused mainly on children with ASD under the age of 15 years and their typically developing, preferably same-aged peers. Only a few studies have examined older students (Harris, 1998). Typically developing peers can be selected based on classroom proximity or on specific qualities of the peer (e.g., empathetic, having good social skills, or of average social acceptance themselves; Kasari, Rotheram-Fuller, Locke, & Gulsrud, 2010). Adults, such as parents and teachers, are also used to teach typical peers how to appropriately model social skills to children with ASD. However, the involvement of adults is often for peer training and observation purposes only and is otherwise minimal (Bellini et al., 2007b).

Treatment Procedures

Studies looking at exposure to peers can take many forms. Inclusion models often use classroom proximity alone to expose children with ASD to typically developing peer models. Classroom proximity may also be used with school- or class-wide training in appropriate positive social behavior (e.g., school-wide rules such as "everyone is allowed to play"). Targeted training of peers has also been used to facilitate interaction with children with ASD, where peers are specifically trained in social engagement techniques. Children with ASD can also be trained in specific social skills prior to social exposure to peers to increase the likelihood of appropriate social interaction. Finally, adults can serve as facilitators to increase the opportunities for interaction between the peers and the child with ASD (Luiselli, Russo, Christian, & Wilczynski, 2008). Procedures used in training of the child with ASD or typically developing peers can range from modeling, role-play, discrete trial training, social stories, and pivotal response training to self-management training or assigning peer buddies (Ferraioli & Harris, 2010; Luiselli et al., 2008). Peers play a variety of roles, acting as tutors, models, partners, and trainers (Luiselli et al.).

Most of the interventions promoting exposure to peers have utilized single-subject designs, with a variation of multiple-baseline or probe design being the most common (Bellini, Peters, Benner, & Hopf, 2007a). There is an overall lack of consistency in interventions, with the number of sessions ranging from 8 to 73 sessions and treatment ranging from 2.5 to 28 h and 10–210 days (Bellini et al., 2007a). The interventions have been conducted in schools, in classrooms, and in common areas, such as playgrounds and cafeterias, the child's home, and the community.

Peer exposure training is also used to teach a variety of social skills and behaviors. Much of the research literature has focused on verbal communication, such as initiation and responses, and social behaviors, such as sharing, helping, and showing affection (Bellini et al., 2007b; Rotheram-Fuller & Kasari, 2010). There are two main categories of behaviors targeted by peer-mediated interventions: specific, well-defined skills or behaviors or more diffuse socialization ability without a focus on particular skills (Rotheram-Fuller & Kasari, 2010). Some of the specific behaviors that have been studied are smiling and laughing with peers, entering ongoing peer activities, and giving compliments and praise (Schopler & Mesibov, 1986). The more general approach has focused on promoting overall social interaction skills in a less specified manner and may utilize social skills or friendship groups to increase participation in peer activities or cooperative play or measure complex concepts, such as friendship quality

(Rotheram-Fuller & Kasari, 2010; Schopler & Mesibov, 1986). According to Koegel and colleagues (2001), intervention focus should shift away from studying specific targeted behaviors to a more global approach that focuses on results, and emphasis should be placed on identifying the behaviors that will impact other behaviors, rather than treating each individual behavior independently.

Efficacy Information

There is mixed evidence for the efficacy of exposure to peers as an intervention technique. Exposure to peers has been shown to help children with ASD form successful relationships with typically developing peers and to improve social skills (Carr & Darcy, 1990; Garfinkle & Schwartz, 2002; Ryndak, Downing, Jacqueline, & Morrison, 1995). Exposure to multiple peers has also been shown to increase the generalizability and maintenance effects of the social skills treatments (Bellini et al., 2007b).

Exposure to peers may also indirectly improve the social skills of the typical peer in addition to the social skills of the child with ASD. Typical peers may become more sympathetic and empathetic, show increased tolerance and social awareness, and learn how to reduce the stress of interacting with the child with ASD (Koegel et al., 2001).

However, other peer-mediated interventions have had limited success due to the difficulty of teaching children with ASD how to spontaneously initiate social interactions (Harris, 1998). Much of the training has been focused on initiating social interactions; however, children with ASD do not easily transform initiations into extended conversations (Rotheram-Fuller & Kasari, 2010). Another challenge in evaluating the efficacy of peer-mediated interventions is the lack of consistency of interventions and their outcome measures. Many studies collect outcomes measuring the specific skills that were targeted in the interventions, which make it difficult to determine if improvements have been made in other areas, such as the child's global social functioning.

Traditional programs of simple exposure through proximity have been minimally effective in teaching social skills to children with ASD; however, programs that target specific social skills have been found to be more effective than programs focusing on global social functioning (Bellini et al., 2007b).

Peer interactions with children with ASD occur more frequently in inclusive settings; although, research on inclusion suggests that inclusion and peer exposure are not sufficient for teaching children with ASD the more subtle social skills, such as keeping up with topic changes in conversation (Wagner, 1999). Children in inclusive classrooms are simply placed in proximity to the other children in the class, without scaffolding on how to appropriately interact. While typically developing peers naturally tend to interact with others similar to themselves (Kemple, 2004), this leaves children with ASD within that classroom at a disadvantage. It is often necessary for adults to facilitate social interaction in order for inclusion to be truly successful (Kemple, 2004).

In a recent study comparing the efficacy of training the child with ASD compared to training typical peers to engage with the child with ASD, it was found that training peers can be more successful at improving the social involvement of the child with ASD into the regular classroom (Kasari et al., 2010). Peer interventions have been shown to be particularly effective in generalizing the skills across settings and people (Bellini et al., 2007b; Luiselli et al., 2008) and also have been found to be maintained over time (Mastergeorge, Rogers, Corbett, & Solomon, 2003). Parents and teachers have also reported increases in language and appropriate play skills and decreases in solitary play (Wagner, 1999). However, it is recommended that interventions should be implemented more frequently and intensely than is typical (Bellini et al., 2007b). More information is needed, however, to identify which interventions work best with which children and who might benefit most from inclusion practices.

Outcome Measurement

The outcome measures used across studies of exposure to peers vary considerably. There is no standard measurement to determine success of the intervention, and studies utilize both specific and global measures. The majority of outcomes could be categorized into two main areas: observations of specific skills to gauge improvement and standardized measures (including teacher, parent, child, or peer reports; Bellini et al., 2007a; White, Koenig, & Scahill, 2007). Given the spectrum nature of ASD, there are a broad set of target behaviors that are examined to determine social success. While an intervention targeting initiations must record initiations as an outcome, it is difficult to compare such an intervention to one that focuses on a different specific skill, such as increasing the number of friendships for the child. The specific skills that have been measured include social initiations, greetings, and responses, while the more global social skills include play skills, problem-solving skills, and exercising self-control (Bellini et al., 2007a; Rao, Beidel, & Murray, 2008).

Qualifications of Treatment Providers

No specialized training has been identified as necessary for providing treatment in peer exposure interventions. Parents, teachers, care providers, and siblings, as well as peers are typically used to provide training to the child with ASD (or typically developing peers). In the most basic form of exposure (proximity), children with ASD are exposed to typical peers in a naturalistic setting with no adult intervention or prior training. However, across studies, those that used more facilitation from adults or training of peers prior to exposure appear more effective at improving the social engagement of the child with ASD. Thus, training on social skills curriculums or specific intervention methods (pivotal response training, discrete trial training, etc.) is recommended to increase the efficacy of this approach. Training for treatment providers typically involves ensuring that data is collected correctly; additional training should be efficient (quick, minimal resources), effective (produce the desired outcomes), and acceptable (address needs and promote generalization of skills; Luiselli et al., 2008). Similarly for teachers, no intervention is expected as part of an inclusion classroom; however, providing guidance or activities with the class can increase or facilitate social engagement among all students, including the child with ASD.

See Also

► Inclusion

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PEG

▶ Pneumoencephalography

Pemoline

Lawrence David Scahill
Nursing & Child Psychiatry, Yale University School of Nursing, Yale Child Study Center, New Haven, CT, USA

Synonyms

Cylert

Definition

Pemoline is an older psychostimulant that is now off the market. Pemoline shares features in common with amphetamine and methylphenidate. It was removed from the market due to concern about rare problems with liver failure. Pemoline has not been well studied in children with pervasive developmental disorders.

See Also

► Stimulant Medications

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People-First Language

► Person-First Language

PEP-3

► Psychoeducational Profile – Revised (PEP-3)

PEPS-C

► Profiling Elements of Prosody in Speech-Communication (PEPS-C)

Perception

Laurent Mottron[1,2], Isabelle Soulières[3,4] and Michelle Dawson[3]
[1]Center of Excellence in Pervasive Developmental Disorders of University of Montreal, QC, Canada
[2]Department of Psychiatry, Riviere-des-Prairies Hospital, University of Montreal, Montreal, QC, Canada
[3]Centre d'excellence en troubles envahissants du développement de l'université de Montréal, Hôpital Rivière-des-Prairies, Montréal, QC, Canada
[4]Department of Psychology, Université du Québec à Montréal, Montréal, QC, Canada

Definition

Perception includes the selection, organization, and interpretation of external information coming from the senses up to a complete representation of a stimulus. The extraction of elementary features within primary cortical receiving areas in each sensory modality is called low-level perception. It is domain general such that the same mechanisms are involved in processing social and non-social information. At a higher level of integration, there is pattern construction in which elementary features (e.g., of visual or auditory stimuli) are grouped into basic configurations. Visual motion perception depends on information integrated at various levels of the processing hierarchy: first-order motion is perceived in primary areas, while second-order motion requires a network of associative regions. High-level perception involves the matching of constructed configurations with memorized templates as the hierarchy of perceptual processing becomes gradually more domain specific. In turn, domain-specific perception

includes face and emotion perception, language perception, and, for dynamic information, perception of biological motion.

Perception typically feeds to and receives information from other major functions in the cognitive architecture, including emotion, language, memory, attention, expectations, and conscious reasoning. Thus, perceptual configurations may be associated with innate or memorized patterns of biological significance, pattern construction is influenced by language categories, and pattern recognition involves an active comparison of perceived and stored configurations. Perception is a dynamic process which modifies (bottom-up) and is modified by (top-down) higher-level cognitive processes.

Historical Background

Kanner's initial writings emphasized autistics' attention to and production of perceptual information (e.g., gazing at moving objects, lining up objects by color) as essential elements of autistic repetitive movements and behaviors. He vividly described extraordinary autistic achievements in memory, construction, and attention to detail. Perception-based behaviors, he noted, were associated with extreme emotions, such as being "ecstatic" while watching spinning objects or displaying panic in response to sounds. In his later writing, Kanner (1965, p. 412) underlined that being "so concerned with the external world that they watch (it) with tense alertness to make sure that their surroundings remain static (. . .) in full photographic and phonic identity" is inconsistent with the withdrawal into one's own world implied by the label autism.

Early models such as *perceptual inconstancy* (Ornitz, 1973) were formed around the apparently paradoxical co-occurrence, within the same modality, of overt hypo- and hyperreactions to perceptual information (e.g., to voices and vacuum cleaners, respectively). Atypical social and nonsocial representations were linked to subcortical abnormalities distorting perceptual input. However, absence of replicated brainstem event-related potential (ERP) abnormalities coupled with lack of empirical confirmation that perception in autism is unstable led to these models being abandoned in the early 1980s.

Meanwhile, early studies by Hermelin, O'Connor, and Frith in the 1960s and 1970s (Hermelin & O'Connor, 1970; Frith & Hermelin, 1969) established alternatively the absence of gross abnormalities in low-level processing. Performance in pattern reproduction, recognition, and memory was therefore considered to be unremarkable in autism. These studies were focused on the detection and imposition of a structure on visual or verbal materials, corresponding partly to pattern construction and partly to what would be now called top-down influence on perception. They concluded that autistic cognition was skewed toward meaningless or raw information, while structure imposition and recoding were diminished or absent. However, examples brought to support these positions – hyperlexia, echolalia, and 3-D drawing – implied pattern manipulation and not raw material. A decisive synthesis by Frith and Baron-Cohen (1987) concluded that "low level processes are intact in autistic children" (p. 98) and "what appear to be signs of a lower level dysfunction can be explained more powerfully in terms of a higher level cognitive dysfunction" (p. 87).

Those two conclusions, that autistic perception was unremarkable and that apparent atypicalities resulted from higher level impairment, dominated autism research for two ensuing decades, including by influencing the interpretation of autistic perceptual strengths. When administering visuospatial tasks, autistics were found to perform better than predicted by their other abilities and better than groups of intellectually disabled individuals matched on apparent IQ. In testing with Wechsler scales of intelligence, Rutter (1966) reported superior autistic performance in the block design subtest, which is based on visuospatial abilities. In 1983, this early accidental finding was extended by Shah and Frith in a deliberate investigation of autistics' performance on the embedded figure task, which is also based on perception and manipulation of visual patterns. Autistics performed at a level superior to that predicted by their IQ (Shah & Frith, 1983).

The weak central coherence (WCC) model, elaborated by Frith (and later, with Happé) starting in the late 1980s, accounted for such autistic peaks in performance by positing a causal deficit: autistics were not displaying atypical perceptual *strengths* but a *failure* to form global or high-level representations. WCC-based interpretations were consistent in direction with the period's cognitive research, which in the 1980s and 1990s remained oriented toward multiple high-level processing deficits, such as deficits in theory of mind, executive functioning, and complex tasks in general. In addition, Minshew's group discouraged diagnostic use of perceptual peaks by emphasizing that they were not found in all autistics. Fine-grained research on autistic perception emerged in the 1990s as a minority current.

The tenets of WCC were questioned in 1993 in the first study extensively investigating visual perception in an autistic adult, according to the concepts and instruments of cognitive neuropsychology at the time (Mottron & Belleville, 1993). The local–global hierarchical aspect of visual perception was atypical in the form of greater interference from local to global levels and random access to features of perceptual representation but without deficits in pattern construction. Findings inconsistent with WCC-predicted deficits in auditory and visual pattern construction at the group level, together with discoveries of superior discrimination of low-level visual arrangements (Plaisted, O'Riordan, & Baron-Cohen, 1998) and superior pitch processing (Heaton, Hermelin, & Pring, 1998), then led to the enhanced perceptual functioning (EPF) model. This model originally aimed to relocate autistic perceptual peaks within an overall enhanced activity and performance of the perceptual system, including enhanced pattern construction mechanisms. However, EPF did not initially question Frith's or Minshew's preconception that autistics' overall superior perceptual performance was a secondary consequence of deficits in high-level processes. This step was accomplished in an update of EPF (Mottron, Dawson, Soulieres, Hubert, & Burack, 2006) based on the blossoming of studies on perception in autism after 2000.

The updated EPF model proposed that autism is characterized by enhanced perceptual *performance* in low-level (e.g., pitch processing) and mid-level (e.g., pattern detection) perception, enhanced *autonomy* of perception toward nonperceptual systems (emotional and higher-order architecture), and enhanced *role* of perception in higher cognitive processes (e.g., enhanced role of perception in intelligence and in social tasks). In other words, enhanced perception in autism was therefore proposed as such, rather than as evidence for speculated high-level deficits. Multiple other groups (including A. Bertone, P. Heaton, R. Joseph, C. Kemner, E. Pellicano, K. Plaisted, E. Milne, N. Minshew, & P. Mitchell) now investigate the relation between low-level perceptual processing and various aspects of autistic cognition.

Distant from the expanding interest in research, the importance of perception has also evolved within formal autism diagnostic criteria. Autism in DSM-III included indirect reference to perception-guided repetitive behaviors: "Bizarre responses to various aspects of the environment, e.g., resistance to change, peculiar interest in or attachments to animate or inanimate objects." DSM-III-R referred to "Persistent preoccupation with parts of objects (for example, sniffing or smelling objects, repetitive feeling of texture of materials, spinning wheels of toy cars)" and DSM-IV to "Persistent preoccupation with parts of objects." Perceptual issues are now explicitly included in DSM-5 draft, albeit as "unusual sensory behaviors." Perception-related behaviors are included in ADI-R and ADOS-G diagnostic instruments as atypical positive and negative reactions to sensory information ("unusual sensory interest," "undue general sensitivity to noise," and "abnormal, idiosyncratic, negative response to sensory stimuli") or as repetitive behaviors possibly related to perception, as in "repetitive use of objects, hand and finger mannerisms."

Current Knowledge

Perception-Related Behaviors

Perception-related behaviors are usually investigated under the overgeneral definitions of

"repetitive" or "sensory" behaviors and by means of wide-ranging scales (e.g., Infant Toddler Sensory Profile; Dunn, 2002) using a posteriori scoring in natural, nonempirical settings, with imprecise behavior definitions (e.g., scoring a behavior as present or absent). Their reported lack of specificity and poor sensitivity therefore reflect major methodological issues (Rogers & Ozonoff, 2005). In a limited number of cases, studies of perception-related behaviors in empirical settings or using strict definitions have provided evidence regarding their specificity to autism and mechanisms involved in these behaviors. This is the case for atypical visual exploratory behaviors and lateral glances, which are linked to periodic motion (Mottron et al., 2007) and nonrandom visual (geometric) or multimodal (audiovisual synchrony) structures (Klin, Lin, Gorrindo, Ramsay, & Jones, 2009); and for shorter visual fixations to and faster disengagement from face images, which are associated with an absence of a mandatory bias for faces (Chawarska, Volkmar, & Klin, 2010).

Psychophysical Studies of Low-Level Perceptual Processing

The lowest levels of cortical visual processing, located in V1, include perception of first-order luminance-defined information, to which autistics show enhanced sensitivity compared to nonautistics, when detecting orientation of gratings. Six-month-old siblings of autistic spectrum children also demonstrate enhanced sensitivity to luminance-defined stimuli. Whereas autistics appear to discriminate high and low spatial frequencies at the same level behaviorally as nonautistics, EEG and fMRI reveal between-group differences in brain activity, mainly during high spatial frequency processing. Visual stimuli that fall within the mid-frequency range may be processed using the same mechanisms as those devoted to the processing of high spatial frequency information, providing EEG correlates for the autistic "local bias" evident in pattern analysis. At a higher level of integration, crowding is the deleterious influence of nearby contours on visual discrimination of a target, attributed to lateral inhibitory interaction of neurons encoding visual properties of nearby distracters. Diminished crowding effects, for which there is preliminary evidence in autism, may allow enhanced segregation of a target from close distracters, offering an explanation for superiorities in visual search.

Autistics have demonstrated atypicalities in some low-level but integrative tasks (Bertone, Mottron, Jelenic, & Faubert, 2005), but as of now, findings are insufficiently homogeneous to posit a deficit in integration. Second-order texture-generated perception requires an integration of primary V1 and associative brain regions V2/V3. The threshold for discriminating the orientation of static second-order gratings is elevated in autism. Early local "binding" mechanisms of contour integration have been investigated, in a search for the lowest-level indication of a putative deficit in grouping processes. However, most recent studies using this method have shown typical behavioral performance in autism, although electrophysiological investigations of contour integration reveal processing differences between autistics and nonautistics. Colors are processed in a complex stream (V1, V2, V4, V8), as second-order visual information, and careful studies show diminished discrimination performance at this level in autistics compared to nonautistics. Components of motion perception, which involve areas V1, V2, and V5/MT, have been studied thoroughly, based on initial findings of diminished influence of perceived motion (optical flow) on postural control and higher thresholds for global motion coherence. When motion perception is decomposed according to the neural complexity required to perceive the motion, perception of first-order motion is preserved, but second-order motion is diminished. Motion coherence tasks measure the ratio of dots within a dot set that have to move together in order to produce a perception of movement, and this perception specifically requires the middle temporal (MT) area. Most recent studies report no group differences, but the variability of results for motion coherence does not permit firm conclusions with respect to its typicality in autism or its influence on overt behaviors. Sporadically reported autistic differences may result from atypical feeding of

information from lower levels and may not be motion specific. Overall there are multiple sources of evidence for atypical low-level visual perceptual processing in autism, some being associated with enhanced behavioral performance, but low-level causative roles in superiorities in pattern detection and manipulation remain to be specified.

In the auditory modality, multiple types of tasks involving pitch perception are performed at a superior level by autistics, representing one of the most replicated areas of autistic superior performance. Task types have included discriminating and categorizing pitches, mapping tonal intervals in a visual schema, memorizing tone-picture associations, determining the direction of pitch-interval correspondence, detecting a named pitch within a chord, memorizing isolated tones and sequences of tones, and detecting a deviant pitch in a sequence of complex sounds. Absolute pitch is considerably more frequent in autistic than nonautistic individuals and, frequently but not always, is associated with savant musical ability. Superior pitch processing has been observed in autistics with or without intellectual disability (according to various measures) but is more frequently observed in autistics whose measured intelligence is in the normal range and who have a history of speech delay.

There are currently no behavioral task findings involving nonsocial simple or complex sounds and a matched group that demonstrate a deficit in autistics. The predicted auditory parallel with possibly diminished processing of second-order visual information has not been found. Robustness of superior pitch processing in autism is confirmed by event-related potentials, which also indicate enhanced detection of pitch changes, mostly in the form of shorter mismatch negativity, shorter latency, or enhanced amplitude. Enhanced low-level auditory perception has a firmly established relation with frequent giftedness in music as well as with atypical language processing and behaviorally observed speech delay.

Other modalities – tactile, olfactory, and taste – have not yet been sufficiently studied to allow any conclusive report. Multimodal integration, which was prematurely considered to be dysfunctional, results in behaviorally normal performance by autistics for integration of low-level perceptual stimuli. However, autistics' verbal labeling of audiovisual integrative patterns may demonstrate sporadic, variable atypicalities.

Cognitive Studies on Pattern Detection, Construction, and Manipulation

Autistics display enhanced performance in tasks requiring detection of a pre-identified local target embedded in a larger probe. Visual search tasks typically consist of detecting the presence or absence of an item among a series of distractors sharing one or several features with the target. The superiority of autistics in visual search is well replicated, encompassing shorter visual fixations, superior discrimination of targets, as well as parallel processing of a larger number of distractors than controls (Caron, Mottron, Berthiaume, & Dawson, 2006). Embedded Figures Task (EFT) consists of detecting a simple figure hidden within a complex one. Here also autistics demonstrate a well-replicated superior performance, mostly in the form of increased speed. Another type of task, using hierarchical stimuli, also reveals increased detection of local targets and diminished bias for processing global aspects of a pattern in autistics. Hierarchical or Navon stimuli are typically large "global" letters, numbers, or geometric shapes, composed of small "local" elements, such as a big H composed of small Bs. The task consists of detecting, naming, or matching a component situated at either global (e.g., H) or local levels (e.g., B). Autistics can show more accurate local target detection than typical individuals, while global-level stimuli reaction times are more affected, compared to those of typical individuals, by incongruent local stimuli. In the auditory modality, with musical hierarchical stimuli, autistics reliably display a typical global advantage but either a superior detection of local changes or a diminished global to local interference.

Pattern construction and manipulation are also autistic strengths, first quantitatively reported in Wechsler block design. In this task, the participant has to reproduce a red and white geometric design with a set of red, white, and bicolor blocks. Autistics usually perform one to three SDs above

their level of IQ, and they outperform controls both in accuracy and RT. In autism, a block design (BD) peak is associated with the presence of speech delay. The BD peak has two proposed sources, enhanced perception (e.g., autistics with BD peak are also superior in visual memory, visual search, and discrimination) and diminished mandatory influence of global aspects of the figure to be reproduced on local parts matching and manipulation. Superior performance in mental rotation tasks in autistics also suggests enhanced construction and manipulation of mental images, which in turn may be attributed to an overall superiority in perceptual performance and to a particular strength in *veridical mapping*, the ability to efficiently detect isomorphisms among entities and make correspondence between these isomorphic features.

Domain-Specific Perception: Biological Motion, Faces, and Language

Biological motion tasks consist in recognizing typical human or animal activity from point-light displays. Although the verbal labeling of the motion may be less salient or less automatically produced by autistics, a large fraction of studies have found typical perceptual performance at this level. An fMRI study reporting both similarities and differences in task performance suggests in autistics a diminished involvement of the superior temporal sulcus (STS), an associative region considered central for perception of biological motion in nonautistics.

Atypical overt behaviors toward human faces are diagnostically important in autism. Face processing has therefore been the focus of intense research interest in the past 40 years, yet results are surprisingly tenuous. Following early experiments suggesting a domain-general local bias, and based on perceptual theories of autism, research on face perception in autism has often focused on the processing of holistic versus local properties of face images. Empirical strategies have included comparison of impact of low- versus high-pass filtering on face image processing, inversion effects including the Thatcher illusion, composite face effects, natural versus nonnatural segmentation of face images, and effects of face context on face part recognition. No clear autistic deficit in the processing of holistic aspects of face images has been found; for example, autistics can display typical face inversion effects, even if not under all experimental conditions. In contrast, there are indications of superior use of face parts for further processing of face images, consistent with an amodal and domain-general local orientation. Typical performance may be obtained through an equalization of relative informative values of low and high spatial frequencies (Simmons et al., 2009).

Studies of ERP responses similarly do not overall indicate an autistic deficit in face processing. Differences reported between responses to face and object manipulation are observed in autistics, indicative of diminished specialization or category specificity. In the same direction, a meta-analysis of regions involved in face-processing tasks indicates that despite activity in typical face-processing regions, other regions are active only in autistics. Autistics show, for example, greater activity bilaterally in extrastriate (BA 18, 19) and striate (BA 17) cortex compared to nonautistics when processing face images (Samson, Mottron, Soulières, & Zeffiro, 2011).

In sum, it cannot be stated, as was routinely written in the previous decade, that autistics are characterized by a face-processing *deficit* in that their performance in perceptual tasks involving face images has been comparable to that of nonautistics in most of the tasks used. The ability to use specific parts for face recognition cannot accurately be reduced to a simple deficit; instead, autistics are less strategic and more versatile when scanning faces for whatever purpose. Face processing in autistics seems to rely on a large network of occipital and temporal areas specifically responsive to certain visual categories in nonautistics.

Atypicalities in speech development and behaviors when exposed to vocalizations are key diagnostic features of a large fraction of the autistic spectrum, such that one could expect perceptual processing of speech to be precociously impaired. The most reliable finding on the relation between auditory perception and speech processing is the coexistence of speech

delay in infancy and superior pitch processing at an adult age, albeit the latter is not predictive of speech level at an adult age. Behaviorally, discrimination of the physical aspect of speech (pitch contour) may be superior in autistics, whereas nonautistics cannot attend to a physical property of an auditory pattern without being distracted by its linguistic dimension (Jarvinen-Pasley, Wallace, Ramus, Happé, & Heaton, 2008). A perceptual component may be implicated in the reported difficulty in speech recognition in noise or atypicalities in prosody perception. In terms of material-specific cortical specialization, a reduced leftward asymmetry has been reliably observed for speech processing. Discrimination and orientation to spectrally and temporally complex speechlike material results in atypical, generally diminished brain activity for ERP components indicative of attention to sounds. Autistics exhibit diminished activity in nonprimary auditory cortex and increased activity in primary auditory cortex in response to the presentation of temporally, but not of spectrally complex sounds. Greater temporal complexity effects in primary auditory regions sensitive to acoustic features and reduced temporal complexity effects in auditory regions sensitive to more abstract sound features could represent a greater focus toward perceptual aspects of speech sounds in autism.

Relation with Other Elements of the Cognitive Architecture

Perception is a multilevel system that provides information to but also receives information from multiple other components in the cognitive architecture. Both feedforward and feedback influences involving perception present some atypicalities in autistics. For example, in nonautistics, feedback from pattern formation to low-level perception sometimes produces visual illusions and distortions. In a visual illusion, the judgment on properties of a visuospatial element is altered by its inclusion in a larger visual context. Autistics display less (but still some) susceptibility to some visual illusions when compared to typical individuals. Categorical perception also produces distortions in nonautistics, as feedback influences from learned categories alters the saliency of perceptual properties of a stimulus. Despite similar categorization abilities, autistics' discrimination is less influenced by categorical knowledge.

There are indications that in autism, visual perception plays a superior role in high-level cognitive processes, which are more language-mediated in nonautistics. For example, lateral glances toward faces and prolonged lateral inspections of rotating objects influence the course of directed attention in autistic toddlers. One of the strongest findings in autistic visual perception, robust enough to be valid across tasks, is revealed by a functional imaging meta-analysis of all tasks implicating visually presented material, in which autistics present superior activity across a broad expanse of brain regions involved in visual perception and perceptual expertise. This suggests that perception plays a superior role in complex cognitive operations – encompassing language, problem-solving, reasoning, etc. – with effects on performance that are not necessarily detrimental and are sometimes beneficial (Samson et al., 2011).

Connections and influences between perceptual brain regions and other brain regions have recently been studied through investigations of structural and functional connectivity. Six structural studies included the visual cortex, all of them reporting altered connectivity in the direction of a diminished integrity of white matter fibers in autistics compared to nonautistics. Despite the small number of studies and the variability in the participants' diagnoses and age, these investigations revealed that visual areas are atypically connected mainly to regions in the temporal lobes but also in frontal and parietal lobes. Task-related functional connectivity studies mainly show results in the same direction, that is, less correlation between the activity of visual areas and other cortical regions in the frontal, parietal, or temporal lobes, during a wide range of tasks.

Conclusion

Atypical autistic perception was one of the key elements of Kanner's seminal description.

The early accounts of perception in autism hypothesized either an abnormal and inconsistent distorting of perceptual input or, alternatively, an unremarkable perception, producing a raw, uncoded representation of the world. First accounts of perception-related behaviors concluded that there was a lack of specificity compared to other neurodevelopmental conditions. The role of these behaviors in diagnosis was minimized, as they were merged with other repetitive behaviors in DSM definitions of autism.

Within the last two decades, these views have profoundly changed. There is now a consensus that the autistic visual and auditory systems provide the rest of the brain with qualitatively, and quantitatively, different information than in nonautistics. Superior performances in nonsavant auditory perception have as yet mainly been found through investigations limited to low-level processes. However, wider-ranging studies have revealed that superior performances in visual perception often imply pattern detection and manipulation, indicating that autistic perception does not produce a raw, uncoded representation of the world. In both modalities, peaks in perception can be correlated with speech delay, suggesting a relation between the two factors. Relations with nonperceptual components of the autistic cognitive architecture are asymmetrical. On the one hand, perception is more autonomous with regard to emotions, expectations, and language-mediated processes. Autistic perception is more veridical and immune to distortions resulting from top-down influences than in typical individuals. On the other hand, superior brain activity in perceptual associative visual areas is evident in a large array of tasks, suggesting that perception plays a superior role in complex, language-loaded, intelligent cognitive operations, without mandatory detrimental effects on performance.

Concerning relations between perception and other areas of atypicality, autistic perception cannot be straightforwardly explained by cognitive models focused on high-level processes: "perceptual alterations are present in ASD, independent of social function" (Behrman, Thomas, & Humphreys, 2006, p.263). However, non material-specific peculiarities in perception have the potential to explain autistic characteristics in the diagnostic sociocommunicative as well as in the repetitive behaviors and restricted interests domains. This potential remains underexplored, but there is growing recognition of the "great need for further exploration" of fundamental low-level perceptual atypicalities in autism (Belmonte et al., 2004, p. 658).

Future Directions

- The cartography of autistic low-level perceptual processes is far from complete. Still to be sufficiently investigated are the following: in vision, contrast and (to a lesser extent) colors; and in audition, lateral inhibition, inspection time, among others.
- Multiple auditory equivalents of visuospatial peaks have not yet been investigated.
- The aggregation of auditory and visual perceptual peaks in the same individual is yet unknown.
- The biological substrates, at the cellular level, of enhanced discrimination of low-level information (e.g., pitch) are unknown.
- The role of access to and atypical use of (e.g., overtraining with) materials or information in the genesis of autistic perceptual profiles has not been investigated.
- What is the relation between actual or proposed delineations of the autistic phenotype and perceptual characteristics?

See Also

▶ Enhanced Perceptual Functioning
▶ Weak Central Coherence

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Perception for Action Systems

Marco Iacoboni
Semel Institute for Neuroscience and Human Behavior, David Geffen School of Medicine at UCLA, Los Angeles, CA, USA

Definition

Perception for action systems are neural systems that are critical for perceptually guided action. Broadly construed, this definition comprises many neural systems. The perceptual stimuli that most commonly guide actions, however, are visual stimuli. Furthermore, the visual system and its interface with the motor system are much better understood than other sensory systems and their interface with the motor system. Therefore, the neural systems supporting vision for action will be mainly discussed here.

There are two main types of visual stimuli that guide action: static ones (e.g., objects to be grasped, obstacles to be avoided) and moving ones (both moving objects and agents, either animals or humans). Neurophysiological studies

have identified neuronal elements relevant to sensory-motor behavior that are specialized for these different classes of visual stimuli.

Historical Background

Visual information is channeled in two major streams in the primate brain, a ventral stream connecting occipital areas with inferior temporal areas and a dorsal stream connecting occipital areas with areas in the posterior parietal cortex and in the temporo-parietal junction. The ventral stream is prevalently specialized in the recognition and identification of objects, and is also called the "what" stream. The dorsal stream, in contrast, is specialized for visual information that is necessary to guide action, for instance, location, size, speed, etc. Because of its functional properties, the dorsal stream has been also called the "where" stream or the "how" stream (Milner & Goodale, 2006).

While information is fairly segregated in the two streams, there are also cross-talks. For instance, area V4 in the ventral stream, a major area for processing color, has important anatomical connections with area MT/V5 in the dorsal stream, a major area for processing moving stimuli. These connections have functional significance, as demonstrated by experiments on motion-direction adaptation. When moving stimuli with the same direction are repeatedly presented, neurons in MT/V5 that respond more strongly to those stimuli tend to respond progressively less, a phenomenon of neuronal adaptation. Some neurons in area V4, however, that previously demonstrated no responses to the moving stimuli (being neurons that typically respond to color information), acquire motion-direction selectivity; that is, these V4 neurons now also respond selectively to those moving stimuli that had been repeatedly presented (Tolias, Keliris, Smirnakis, & Logothetis, 2005). These changes in the functional properties of these V4 neurons are most likely mediated by input onto V4 that originates from MT/V5.

Parietal areas in the dorsal stream connect with frontal areas to form fronto-parietal systems for sensory-motor integration that are critical for visually guided action. These systems are important for reaching movements, for grasping three-dimensional objects, for defensive movements that protect the body, for creating peri-personal space maps (maps of the sector of space surrounding the body) and extra personal space maps (maps of the sector of space outside the reach), and for eye movements directing attention to specific objects or sectors of space (Rizzolatti & Luppino, 2001).

Current Knowledge

Patients with autism display a variety of motor disorders, including deficits in motor coordination, deficits in tool use, and delays in skill learning. The question is whether these deficits are due, at least in part, to deficits in perception for action systems.

In classical "dorsal stream" tasks such as reaching for a target, however, patients with autism tend to perform fairly well. Furthermore, it does not appear that patients with autism have problems in generating internal models necessary for motor learning. In sensory-motor learning, there are two main kinds of internal models, the forward model and the inverse model. The forward model allows the prediction of the sensory consequences of a motor plan, whereas the inverse model allows the retrieval of the motor plan that is necessary to achieve a desired sensory state. Obviously, forward and inverse model are tightly interrelated. A variety of brain structures have been associated with the generation of internal models, some of which are known to be affected in autism, for instance, the cerebellum. Thus, it made sense to hypothesize a problem in generating internal models in autism. A recent study that manipulated environmental factors during motor tasks, such that the environmental changes required adjustments in motor output (a classical paradigm to test the proper acquisition of internal models), however, did not show any deficit in internal model acquisition in autism (Gidley Larson, Bastian, Donchin, Shadmehr, & Mostofsky, 2008). Currently, there is no strong

evidence that there is a generalized internal model acquisition deficit in autism. If anything, there may be an increased association between motor plans and proprioceptive feedback during motor learning. Such increased association seems also to correlate with impairment in social functioning (Haswell, Izawa, Dowell, Mostofsky, & Shadmehr, 2009).

A classical function supported by perception for action systems is spatial attention. Spatial attention tasks have revealed a phenomenon called inhibition of return (IOR). When subjects shift their attention to different locations in space, they tend to be slower at shifting attention back to a location that was already attended to. The hypothesis is that IOR is an evolutionarily selected mechanism that bias attention toward unexplored spatial locations. Classically, spatial attention has been studied with abstract cues and stimuli. Recently, however, a series of studies have tested whether social cues, for instance, eye gaze, modulate spatial attention differently from nonsocial cues. Patients with autism do not show difference in performance in spatial attention tasks (including IOR), compared to neurotypical subjects, for both social and nonsocial cues. The pattern of brain activity, however, differs substantially for social cues, compared to neurotypical subjects. Neurotypical subjects show increased activity in the whole fronto-parietal attentional network when the attentional cues are social (eye gaze), compared to nonsocial cues. Subjects with autism, in contrast, show increased activity for social cues in only one area of the network (Greene et al., 2011). Thus, while performance in a relatively simple laboratory task is unimpaired for social attentional cues, brain activity reveals reduced responses in subjects with autism, compared to neurotypical subjects. This suggests that in more complex and demanding situations, for instance, in real life, social attentional cues may be processed suboptimally in autism, producing inadequate perceptually guided actions.

Indeed, very early on in life, 2-year-old subjects with autism show preference for nonsocial contingencies rather than biological motion, which is what neurotypical 2-year-olds prefer (Klin, Lin, Gorrindo, Ramsay, & Jones, 2009). A major cortical center that is critical for processing biological motions is the superior temporal sulcus (STS). Single-cell recordings in macaques have shown that in STS there are visual neurons that fire at the sight of intentional actions of other individuals, actions directed at objects, hand-object interactions, and also to eye gaze. Thus, these neurons respond to a variety of socially relevant perceptual stimuli. Accordingly, imaging studies have shown that human STS is also activated by these stimuli and even by point-light displays of biological motion. A number of studies have reported structural and functional abnormalities in STS in subjects with autism (Zilbovicius et al., 2006). These abnormalities, however, have been observed in subjects much older than the 2-year-old displaying preference for nonsocial contingencies. Thus, what is not clear is the causal relationship between STS abnormalities and preference for nonsocial cues. If the abnormalities in STS are present early on in life, they presumably are the cause of the early preference for nonsocial contingencies. Alternatively the STS abnormalities may emerge later and represent the effect of years of preferential processing for nonsocial cues. Only brain imaging studies performed very early on in life can disambiguate these two possibilities.

Imaging studies of imitation have demonstrated that STS belongs to a core cortical circuitry for imitative behavior (Iacoboni, 2009). Imitation is obviously a complex behavior that engages a multitude of neural systems. However, the imaging data in humans – interpreted in light of single-cell recordings in macaques – suggest that STS provides a visual description of the action to be imitated to a rostral inferior parietal area, which in turn connects with inferior frontal and ventral premotor cortex. The parietal and frontal systems within this core imitation network have both motor and visual properties, because they activate during execution and during observation of the action to be imitated. These three neural systems (STS, rostral inferior parietal cortex, inferior frontal/ventral premotor cortex) most likely implement internal models for

imitative behavior. STS, with its visual analysis of the observed action, provides the input to the inverse model. The parietal and frontal system, on the other hand, provide the output of the inverse model, that is, the retrieval of the motor plan necessary to achieve the sensory state described by STS. Furthermore, the inferior frontal/ventral premotor cortex and the inferior parietal cortex would provide the input to the forward model, that is, a motor plan of the imitative action. A copy of this motor plan is sent back to STS, to generate predictions about the sensory consequences of the planned imitative action (the output of the forward model of the imitative action). STS would implement a comparison between the sensory prediction of the planned imitative action and the visual description of the action. If there is a good match, the imitative action is executed. If the match is not good enough, a correction of the motor plan is needed.

Patients with autism have demonstrated reduced activity in this core imitation network, not only in STS, but also in the inferior frontal/ventral premotor cortex (Iacoboni & Dapretto, 2006). This reduced activity has been observed in imitative tasks but also in tasks that are seemingly unrelated to imitation, such as self recognition. Developmental studies, however, suggest links between the capacity to imitate and self recognition. Self recognition is an ability that develops toward the end of the second year of life. Children that have developed the ability to recognize their own face tend to imitate much more than children that are not able to recognize their own face (Asendorpf & Baudonniere, 1993). In keeping with these developmental findings, a recent brain imaging study has demonstrated reduced activity in the frontal component of the core imitation circuitry in children with autism during a self recognition task (Uddin, Davies, Scott, Zaidel, Bookheimer, Iacoboni & Dapretto, 2008).

Future Directions

The investigations on perception for action systems and their involvement in autism are already benefiting from connectivity studies and will benefit even more in the future. A general pattern that seems to emerge from the connectivity literature is that in autism there is under connectivity in distant regions and perhaps increased connectivity in neighboring regions (Kennedy & Courchesne, 2008). Dorsal stream connections tend to be long range rather than local. This suggests that a potentially reduced connectivity in the dorsal stream in autism may affect perception for action systems in a subtle but distinctive way.

A winning future strategy to study autism is to connect the dots from different approaches, for instance, combining genetics with brain imaging. A recent study is a good example of how knowledge from different fields can be combined in an illuminating way. The study found that the gene RORA is downregulated by male hormones (Sarachana, Xu, Wu, & Hu, 2011). This finding might explain why more men than women have autism. RORA is a gene that is expressed less in autism and is important for the development of the cerebellum. The cerebellum has important functional connections with the inferior frontal cortex during motor learning (Tamada, Miyauchi, Imamizu, Yoshioka, & Kawato, 1999), and is a critical structure for the "feed-forward control" of action, as we have seen when discussing internal models. In the presence of an overall reduced long-range functional connectivity in autism (Kennedy & Courchesne, 2008), reduced expression of RORA may produce reduced cerebellar input to the inferior frontal cortex, thereby affecting its functioning to the point that imitative learning is inefficient in autism.

Finally, the development of imaging technology may help studying perception for action systems in more ecologically valid situations. Lab experiments often dramatically reduce the complexity of real life, online interactions with the environment and people. Optical imaging techniques, such as near infrared spectroscopy (NIRS), allow the study of such interactions in lab settings that more closely resemble real life situations.

See Also

- ▶ Biological Motion
- ▶ Superior Temporal Sulcus Region

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Perceptual Development

Jennifer Varley Gerdts
Department of Psychology, University of Washington, Seattle, WA, USA

Definition

The perceptual system recreates the surrounding environment in the brain based on information provided from the senses: vision, hearing, smell, taste, and touch. Therefore, perception provides the *experience* of the environment and is a means to act according to what is occurring in the environment (Berk, 2000; Goldstein, 2002).

The general perceptual process involves a series of steps that originate from the environment and involve the recognition of a stimulus and subsequent action regarding that stimulus (Goldstein, 2002). Perception is not a static process but rather is dynamic and continually changing based on successive actions and perceptions. For instance, an infant's advancing motor development allows the infant to better explore and learn about the world around him/her. The improved perception resulting from advancing motor skills in turn brings about more effective motor activity. Therefore, general motor development and the resulting perceptive experience support each other in providing infants with increasingly advanced motor and perceptual systems (Bertenthal & Clifton, 1998).

Likewise, perceptual development is a continually changing process that advances rapidly in the first years of life and involves an interaction between the environment and innate bodily systems. This entry will review the development of human perception in typically developing infants and discuss what is known about perceptual development in autism.

Historical Background

Knowledge of perceptual development has grown significantly over the centuries. The belief of preformationism abounded during medieval times. This meant that infants and children were considered to be just smaller versions of adults, with the same perceptual capabilities (Berk, 2000). Later centuries watched the pendulum sway in the other direction, with respect to child development. The writings of the British philosopher John Locke propelled the belief that human infants were born as a "tabula rasa" or "blank slate." Experience was deemed to be necessary for perception to occur (Thorne & Henley, 2001). For example, Locke believed that a blind man given sight would have to learn to recognize objects visually. Newborn infants were believed to be capable of nothing and required adult teaching to be shaped into a functioning child and adult. Similarly, nineteenth-century psychologists believed that young infants were not able to perceive or make sense of the stimulation received from their environment (Goldstein, 2002). Infants were believed to be functionally deaf until they experienced stimulation from the environment.

G. Stanley Hall, an influential psychologist in the early twentieth century, was inspired by Charles Darwin's work in evolution. He put forth the idea that child development is genetically predetermined and unfolds automatically (Berk, 2000). James Mark Baldwin was an American psychologist publishing at approximately the same time and believed that both the child's innate capabilities and the surrounding environment are crucial to development. Baldwin's line of thinking can be seen in many modern-day views on perceptual and general development in children.

More accurate ways of measuring infant perception have allowed psychologists to discover that babies are able to perceive input from all five senses at birth and that these abilities advance rapidly in the first months of life. While perceptual development tends to follow a general trend that is partially dictated by biological capabilities, perceptual development is dependent on appropriate experiences with the environment.

Current Knowledge

Perceptual Development in Typical Children

Overview

In typical development, most perceptual capacities develop rapidly during the first year of life. Those abilities that are not present at birth generally surface during an infant's first month. Perception serves as an infants' first knowledge of the world gathered through the senses and provides the basis for cognitive development (Berk, 2000). Many researchers posit that an infants' general development shifts from an early emphasis on perception and understanding sensations in the first year of life to a later focus on cognition (e.g., Mandler, 1998). Infant perception of the environment is informative and influential in other aspects of development as well (Hatton, Bailey, Burchinal, & Ferrell, 1997). For instance, hearing is clearly very important in the development of language. Touch, vision, and hearing provide a means for humans to interact with one another and are therefore fundamental in emotional and social development.

Additionally, infants are able to combine information from various modalities and sensory systems. This intermodal perception appears to be present from birth as demonstrated by studies examining infants' ability to combine diverse sensory inputs. For instance, one study demonstrated that newborns preferred to look at a pacifier shape that they had previously sucked versus one they had not, indicating that infants can integrate touch and vision from birth

(Meltzoff & Borton, 1979). Additionally, by 7 months of age, typically developing infants were able to match emotional facial expressions that they saw on a screen to varying vocal expressions in an adult's voice (Soken & Pick, 1992). This finding suggests that older infants can integrate relatively advanced input received from vision and hearing senses.

The development of perceptual abilities is a dynamic process that depends on the interaction between the environment and biological capabilities. A baby's desire to explore its environment coupled by neural and central nervous system development, capabilities of the body, and environmental support provides the medium in which typical development occurs (Berk, 2000; Goldstein, 2002).

Certain aspects of stimulation are particularly important to young infants, without which deviations from typical development can occur. For instance, a number of studies have been conducted on orphans from Romania who were raised in institutions with horrific conditions (Rutter, & The English and Romanian Adoptees Study Team, 1998). Noticeable differences in outcome were observed in infants who were adopted between 0–6 months, 6–12 months, and 12–24 months of age, with those infants living in the conditions longer demonstrating greater impairment (Rutter, & The English and Romanian Adoptees Study Team).

White and Held (1966) describe a study examining the timing of reaching in infants living in institutions who were provided with high, moderate, and low levels of stimulation. They reported that institutionalized infants who received a moderate amount of stimulation in the first months of their lives reached for objects 6 weeks earlier than those given low levels of stimulation. Although babies receiving a high amount of stimulation also reached for objects sooner than those babies given low levels of stimulation, these infants tended to cry and fuss more often than the other two groups. The authors interpreted findings to mean they were perhaps overwhelmed by the amount of stimulation provided in their environment and suggested that appropriate levels of stimulation (not over- or understimulation) are important to development and adjustment in human infants (White & Held, 1966). Studies such as this and the studies on Romanian adoptees demonstrate that typical development cannot occur without proper environmental support.

Assessment of Infant Perception

Infant perception is difficult to assess because babies cannot clearly express what they are thinking or perceiving. This can be especially difficult in newborns and young infants when researchers need to wait for infants to enter a "quiet alert" phase, obtain permission from new mothers, and adapt to rapid changes in infant attention (Goldstein, 2002). Therefore, researchers have altered their research questions and methodologies to answer the more basic question: Can infants tell the difference between stimulus A and stimulus B (Goldstein, 2002).

A number of creative methodologies are used to examine perception in infancy. One procedure uses visual attention and is called "preferential looking." If infants look longer at a particular stimulus versus another, researchers assume that the infant can tell the difference between the two. If they look at the two stimuli for the same amount of time, then experimenters assume that infants cannot tell the difference (Goldstein, 2002).

An additional methodology takes advantage of infants' preference for novel versus familiar stimuli. Using a procedure called "habituation," a stimulus is shown repeatedly to an infant over a number of trials. When the infant's looking time significantly decreases (because the novel stimulus has become familiar), they are considered "habituated." Once the infant is habituated, a novel stimulus is introduced, and researchers note if the infant's looking time significantly increases with the novel stimulus ("dishabituation"). If it does, researchers assume that the infant can tell the difference between the old and new stimulus. If not, it is assumed that they cannot tell the difference. A variation on this procedure involves following the infant's sucking patterns on a pacifier. After habituation occurs, a novel stimulus is introduced, and researchers track whether or not the

sucking pattern changes with the new stimulus. If it does, researchers again assume that infants can differentiate the two stimuli. If not, it is assumed they cannot. This procedure is often used to assess perceptive abilities in response to other sensations (e.g., hearing and smell).

Vision

Vision is the least well-developed sensation at birth. However, visual acuity significantly improves over the course of the first year of life, beginning at approximately 20/400 acuity at birth and advancing to adult visual acuity (20/20) after 1 year (e.g., Courage & Adams, 1990). Although newborns can see objects with high contrast at very close distances, they cannot distinguish objects with low contrast and those at a distance. Poor visual abilities at birth are present because the visual cortex is not fully developed and cones in retina (fovea) have poorly developed receptors (Goldstein, 2002).

Visual perception contributes substantially to other aspects of development as well. Infants who have limited visual input (i.e., those infants who are blind or have very poor vision) have been found to be delayed in other areas, including cognition, motor, and language (Hatton et al., 1997). Social development in blind infants is also impacted. Infants who are blind do not make eye contact and show limited insight into other nonverbal cues as well. Compared to sighted infants, blind infants less often initiate social interactions and have difficulty interpreting others' reactions and responding appropriately (Preisler, 1991). Emotional expressiveness is also limited in this population (Tröster & Brambring, 1992). These factors can impact the parent-child relationship in infants with visual impairment, and increased stimulation combining other senses (e.g., sound and touch) is recommended to address the social needs of blind infants. Research in this area provides further evidence that perceptual abilities have a direct association on other aspects of human development.

Faces and Facial Expression

The lack of contrast in human faces makes it difficult for typical newborns and very young infants (i.e., less than a month of age) to differentiate faces and recognize facial expressions. Studies do show that 2–3-day-old infants can recognize their mother's faces as demonstrated by a tendency for infants to look longer at their mother's face (both in person and on videotape) versus an unknown woman (e.g., Bushnell, Sai, & Mullin, 1989). However, follow-up studies reported that it seems to be the mother's hairline that the infants recognize rather than the face itself because when scarves covered the women's hairlines, newborns showed no preference for one versus the other (Pascalis, deSchonen, Morton, Deruelle, & Fabre-Grenet, 1995). By 3–4 months, typical infants can see facial expressions because their contrast perception has improved and can discriminate happy faces from angry, surprised, and neutral faces (e.g., LaBarbera, Izard, Vietze, & Parisi, 1976). Other studies show these skills emerging at 7–10 months of age (Ludemann, 1991).

Infants as young as 2 months scan between the eyes and mouth of a human face (Bronson, 1991) and track face-like patterns moving across their visual field farther than they will track other objects (Morton & Johnson, 1991). While some researchers interpret this to mean that humans have a built-in capacity for perception of faces, others have argued that infants younger than 2 months cannot do so, and therefore, the skill cannot be innate. It is possible that the high level of face-to-face interaction that occurs between infants and caregivers contributes to the refinement of face perception. Whether it be innate versus environmental, infant sensitivity to the human face paves the road for the earliest social relationships (Berk, 2000).

Refinement of Visual Abilities

Movement may be the earliest form of visual attention. Infants prefer stimuli that move across their visual field, and movement helps define boundaries of objects, likely allowing very young infants to distinguish two objects (Kellman, 1996). Infants have a preference for biological motion representing the visual phenomenon of moving, animate objects. By 4–6 months, infants prefer to look at biological motion versus random dots on a screen (Fox & McDaniel, 1982). Color

perception develops in the first few months of life, and by 2–3 months of age, infants experience a wide range of colors (Brown, 1990).

Depth perception involves the ability to judge the distance of objects from one another and ourselves. In order for infants to reach for objects, they must have a sense of depth. Since each retina of the eye captures images in two-dimensional images, a translation is necessary to perceive three-dimensional input. Binocular disparity (when retinal images of an object fall on different points of the two retinas) helps in depth perception and develops in typical infants by 3 months (Birch, 1993). Visual cues also help to detect depth: pictorial depth cues such as overlap, relative height, and relative size develop by 7 months (Yonas, Grandrud, Arterberry, & Hanson, 1986).

Depth perception has also been assessed using a paradigm called a "visual cliff," in which a "deep" side of a box is covered with glass. Researchers found that crawling infants do not cross from the "shallow" to the "deep" side, suggesting that they can perceive apparent differences in depth (Gibson & Walk, 1960). Those with more experience crawling were less likely to cross the cliff (Bertenthal, Campos, & Barrett, 1984), suggesting again that experience with the environment is important in developing perceptual abilities. Independent motor movement (such as crawling) is crucial in developing problem-solving skills and promotes a new level of brain organization (Bell & Fox, 1996). Specifically, it encourages synchrony across the regions of the cerebral cortex and strengthens neural connections involving vision, motor planning, and understanding of space.

Hearing

By approximately 6 months of age, an infant's ability to hear is similar to that of an adult. Prior to 6 months, infants can hear high- but not overly low-intensity sounds (Olsho, Koch, Carter, Halpin, & Spetner, 1988). In terms of sound location, by 8 weeks, infants can locate two objects that are within 27°. By 18 months, they locate objects within 5°, which is close to adult levels of 1° difference detection (Morrongiello, 1988).

Preference for Speech

Typical infants prefer complex sounds, such as the human voice, to other pure tones (Bench, Collyer, Mentz, & Wilson, 1976). Specifically, babies show a preference for human speech that is high pitched, expressive, and rises in tone at the end of words and phrases (Aslin, Jusczyk, & Pisoni, 1998). This type of speech is often termed "motherese." Infants also seem to prefer the sound of their mother's voice to that of a stranger. After a learning trial, 2-day-old infants changed their sucking patterns on a pacifier to hear their mother's voice over a stranger's voice (Spence & Decasper, 1987). Infants as young as 1 month can identify differences between certain speech sounds (such as "ba" vs. "pa," Eimas, Siqueland, Jusczyk, & Vigorito, 1971). Infants are also able to classify vowels regardless of whether the speaker is a male or a female, which demonstrates "equivalence classification" (Kuhl, 1983). This is important because when babies begin to make their own sounds, their voices will be much higher pitched than adults, yet they still need to know that their sound production is equivalent. Infants are also able to obtain information about emotions through the human voice. They are able to distinguish happy versus sad-sounding voices by 3 months (Walker-Andrews & Grolnick, 1983).

Speech perception is also influenced by experience. At birth, infants are able to distinguish all speech sounds within all languages. Over the course of the first year of life, they begin to specialize in their native language and are then only able to distinguish sounds that are in their native language. For instance, young Japanese infants can distinguish the English/r/versus/l/but cannot at 1 year old (e.g., Kuhl, Williams, Lacerda, Stevens, & Lindblom, 1992).

Smell and Taste

Smell and taste are the most highly developed senses at birth. Young infants show a disgusted facial expression to the smell of rotten eggs and shrimp and a happy expression to the smell of bananas and vanilla (Steiner, 1979). Nursing infants can distinguish the smell of their mother's breast from that of another nursing mother. In one

study, infants spent more time turning toward their own mother's breast pads than another woman's pad (Marlier, Schaal, & Soussignan, 1998). Newborn babies can discriminate sweet-, sour-, and bitter-tasting stimuli (Steiner, 1979). The perception of salty tastes comes a few months later, perhaps in preparation for infants to eat solid foods (Beauchamp, Cowart, Mennella, & Marsh, 1994). These findings suggest that infants can perceive differences in smell and taste at very early ages.

Touch

Sensitivity to touch is also well developed at birth. Newborns respond to touch, especially around the mouth, palms, and soles of feet. They also react to changes in temperature as well as pain. Sensitivity to touch makes babies more responsive to their environment. In one study, the soft touch of an experimenter caused infants to smile and become more attentive to the adults' face (Stack & Muir, 1992). Once infants are able to grasp and reach for objects themselves, touch becomes the primary means through which they explore the world. For instance, they often mouth new objects, then remove the object, then look carefully at it, and then return it to their mouth. Mouthing declines as infants are able to do more elaborate touching with hands by, for example, turning it over, poking it, and feeling the surface while looking intently (Ruff, Saltarelli, Capozzoli, & Dubiner, 1992). The famous developmental psychologist Jean Piaget considered touch to be crucial for early cognitive development.

Perceptual Development in Autism Spectrum Disorder

Overview

As discussed above, typical infants have a seemingly innate preference for human interaction and a perceptual system that is prepared to remember and discriminate human faces and voice from a very early age. However, perception of human faces and voice in young children with autism spectrum disorder (ASD) appears to be different. As such, the majority of studies of perceptual development in ASD have involved visual processing, in particular processing of human faces. Preference and processing of particular sounds has also been well studied in ASD. Touch, smell, and taste are less frequently examined in ASD and will not be reviewed in this entry. However, in general, children with ASD often demonstrate sensory sensitivities in these areas and are frequently sensitive to particular textures, tastes, and smells. At times, children react negatively to certain tastes, textures, and smells, while other children are interested in these sensations and actively seek them out. Therefore, perceptual development of these senses may be different in ASD but has been not extensively studied.

Visual Processing

Many studies of visual perception in ASD have focused on face processing and the derivation of organized wholes from perceptual parts.

Local Versus Global Processing

Local processing involves the tendency to focus on parts of a stimulus instead of an organized whole, while global or holistic processing involves perception of the overall stimulus rather than its parts. Weak central coherence is a related concept and involves a difficulty in integrating components to create an overall picture due to an overfocus on parts rather than whole. Children with ASD tend to exhibit weak central coherence and perform well on tasks that capitalize on a local versus a global focus, such as the block design subtest of the Wechsler Intelligence Scale for Children (e.g., Happé, 1999). Additionally, they are successful at identifying hidden figures within larger drawings (e.g., Jolifee & Baron-Cohen, 1997). However, a number of studies have reported intact global processing in individuals with ASD (e.g., Ozonoff, Strayer, McMahon, & Filloux, 1994).

Faces

As mentioned, the perception of faces and memory for faces is impacted in ASD (e.g., Klin et al., 1999). Perception of facial affect also seems to be impaired in ASD (Hobson,

Ouston, & Lee, 1988) as well as the perception of direction of eye gaze (Jolifee & Baron-Cohen, 1997).

Different brain responses to familiar versus unfamiliar faces and various emotional expressions are noted in 6–7-month-old infants (Nelson & De Haan, 1996). In typical individuals, the right fusiform gyrus is more activated during faces than nonfaces stimuli (e.g., Haxby et al., 1994). However, both behavioral and neuroimaging studies indicate that individuals with ASD demonstrate face-processing impairments (e.g., Klin et al., 1999).

Infants at risk for developing ASD due to the presence of an older sibling with the disorder fail to show different brain responses to faces versus objects compared to infants who are not at risk for ASD (McCleery, Akshoomoff, Dobkins, & Carver, 2009). Young children with ASD again do not show different brain responses to familiar versus unfamiliar faces (Dawson et al., 2002) or faces versus objects (Webb, Dawson, Bernier, & Panagiotides, 2006). Additionally, inconsistent patterns of fusiform gyrus activation have been reported with some researchers reporting that areas of the brain involved in processing objects show increased activation during perception of face stimuli (e.g., Schultz et al., 2000). This difference may continue into later adolescence and adulthood (McPartland, Dawson, Webb, Panagiotides, & Carver, 2004). The trait is likely familial as parents of children with ASD also show an atypical brain response to faces (Dawson et al., 2005). These face-processing challenges all occur in spite of a normal visual system and retina in ASD. It is important to note that a number of studies have failed to report face-processing differences in ASD (e.g., Webb et al., 2010).

A tendency for configural/local processing and unusual face perception may be related in ASD. Individuals with ASD tend to process faces in a feature-based fashion rather than a holistic approach (Hobson et al., 1988). For instance, when looking at faces, individuals with ASD attend to different elements of the face, such as the lower mouth, compared to individuals without autism (Joseph & Tanaka, 2003). Merin and colleagues (2007) found that infants at risk for ASD spent more time looking at their mother's mouth versus her eyes compared to a low-risk infant group. Additionally, inverting a face does not impact face processing as much in ASD as it does in typical individuals (e.g., McPartland et al., 2004). This lack of difference between processing upright versus inverted faces provides evidence that individuals with ASD may process the face in parts rather than whole. Behrmann and colleagues (2006) reported that the speed in discriminating novel from familiar faces was related to the ability to identify local versus global elements in stimuli, suggesting that the bias for local processing might negatively impact the ability to process faces.

Visual Attention and Disengagement in Infancy

Prospective studies have followed infants at heightened risk for ASD due to having an older sibling with ASD. These studies have documented difficulty disengaging visual attention and increased attention to nonsocial stimuli in a subgroup of high-risk infants compared to control infants (e.g., Bryson et al., 2007; Zwaigenbaum et al., 2005). In fact, the smoothness of visual tracking at 12 months (but not 6 months) successfully differentiated infants who eventually developed ASD from those who did not (Zwaigenbaum et al., 2005). Infants who would later develop ASD took longer to disengage from an active stimulus to view another stimulus between the ages of 6 and 12 months. Bryson and colleagues (2007) indicated that high-risk infants at 6 months demonstrated an unusual visual interest and reactivity to objects and lacked smooth visual tracking. High-risk infants in another study spent more time looking at a toy than their caregivers during free play (Bhat, Galloway, & Landa, 2010). Overall, these studies suggest that ASD-related difficulties with visual disengagement and/or with nonsocial interest in the environment are present in infancy.

Hearing

Delays and impairments in both verbal and nonverbal (e.g., ▶ Gestures) communication are often present in ASD and emerge at approximately 12 months of age. As such, perception

of speech has been studied in young children with ASD to better understand how infants and toddlers with ASD process and perceive speech.

As discussed, typical infants prefer "motherese" to other types of sounds and speech tones. The use of motherese is influential in other aspects of development, including babies' attention to speech and general language development. Because of this, the responses of young children and infants at risk for ASD to motherese have been examined. Nadig and colleagues (2007) reported that 6-month-old infants at risk for ASD were more likely to show a preference for adult-directed speech over motherese compared to low-risk infants. Furthermore, those infants who preferred adult-directed speech had lower language scores (Nadig et al.). Preschoolers and older children with ASD continue to demonstrate atypical responses to motherese (e.g., Kuhl, Coffey-Corina, Padden, & Dawson, 2005). Children with ASD preferred listening to mechanical-sounding auditory signals ("sine-wave analogs" that are acoustically matched to speech) over motherese (Kuhl et al., 2005). This preference predicted lower language ability, more severe ASD symptoms, and abnormal brain response to speech sounds.

Social Motivation Theory

Some autism experts believe that perceptual abnormalities such as abnormal face and speech perception are not primary to ASD but are secondary to a fundamental impairment in social motivation (likely due to genetic risk factors). Called the "social motivation hypothesis," this theory posits that a primary deficit in social motivation causes infants with ASD to fail to attend to and tag relevant stimuli within a social context (e.g., Dawson et al., 2002).

According to this theory, infants at risk for ASD spend less time attending to and truly engaging with people. They may instead be overly focused on objects (Zwaigenbaum et al., 2005). The resulting decreased social engagement discourages the development of a specialization in the processing of the human face and speech. Because experience drives cortical specialization (Nelson, 2001), reduced attention to people, including their faces, gestures, and speech, also results in a failure of specialization and less efficient function of brain regions that mediate social cognition (McPartland et al., 2004).

The abnormal perception of interactive stimuli such as face and speech perception is not attributable to a lack of exposure to people. Parents of infants with ASD interact with their infant just as parents of typically developing infants do. Therefore, despite faces and speech being directed at them, ASD infants may not be attending and learning from that context because it may not be interpreted as relevant to them. Social interaction is crucial for many aspects of development. For instance, Kuhl, Tsao, and Liu (2003) indicate that mere exposure to speech in infancy is not enough to learn a language. For language acquisition to develop normally, it must be experienced within a socially interactive environment. Early intervention administered when the brain is still plastic can help guide brain and behavioral development back toward a normal trajectory (Dawson et al., 2010).

Future Directions

Perceptual development is well understood in typically developing infants. While abnormalities in perception have been documented in older children with ASD, they only recently have been examined in infants at risk for ASD due to the presence of an older sibling with the diagnosis in the family. Prospective studies examining this population from very early in life have provided insight into the development of the disorder in infancy. Additionally, they provide an understanding of how perceptual abnormalities in ASD develop. The few studies examining perceptual development in ASD in infancy have suggested that high-risk infants indeed show different perceptive abilities compared to control infants. Specifically, high-risk infants have difficulty shifting visual attention and show unusual face processing. Expanding these studies to examine the perception of other sensations in ASD, such as hearing and touch, as well as following high-risk infants into preschool and older childhood will broader understanding of perceptual development in ASD.

See Also

- ▶ Face Perception
- ▶ Perception
- ▶ Sensorimotor Development
- ▶ Visual Processing

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Perceptual Organization Index (POI)

Sara D. Rosenblum-Fishman and Danielle Forbes
Psychology, University of Massachusetts Boston, Boston, MA, USA

Synonyms

POI

Definition

The *Perceptual Organization Index* is part of the Performance Scale of the Wechsler cognitive assessment measures, the Wechsler Intelligence Scale for Children, 3rd edition (WISC-III, 1991), and the Wechsler Adult Intelligent Scale, 3rd edition (WAIS-III, 1997). The POI measures visual-spatial organization and visual-motor skills within a time limit. For the WISC-III, the subtests *Picture Completion, Picture Concepts, Block Design*, and *Object Assembly* load onto the POI. For the WAIS-III, the subtests *Picture Completion, Block Design*, and *Matrix Reasoning* load onto the POI.

The WISC-III and WAIS-III are older versions of the Wechsler cognitive assessment measures, and have since been replaced by the WISC-IV (2003) and WAIS-IV (2008). For both the WISC-IV and the WAIS-IV, the Perceptual Organization Index has been renamed the Perceptual Reasoning Index (PRI). The PRI measures fluid reasoning (use of sequential, inductive, and deductive reasoning) and visual processing (the ability to synthesize and process visual stimuli). Unlike the POI, scores on the PRI are less influenced by speed and the ability to work quickly.

Research has shown that performance on the Block Design task, which loads onto the POI for both the WISC-III and the WAIS-III, is often an area of strength for children with ASD.

See Also

► Psychological Assessment

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Perfectionism

Marilyn Van Dyke[1] and Jeffrey J. Wood[2]
[1]Psychological Studies, UCLA's Graduate School of Education and Information Systems, University of California, Los Angeles, Los Angeles, CA, USA
[2]Departments of Psychiatry and Education, University of California, Los Angeles, CA, USA

Synonyms

Compulsiveness; Exactingness; Preciseness

Definition

Perfectionism refers to the setting of unrealistically high standards accompanied by negative self-evaluations when those standards are not met. When these unrealistic goals are not attained, people with perfectionism characteristics engage in overly negative self-evaluations, anticipation of catastrophic future consequences, and experience difficult emotions. Perfectionism is linked with psychological disorders including anxiety and depression. Perfectionism may occur in individuals with autism spectrum disorder with some frequency. Perfectionistic tendencies may occur due to cognitive inflexibility that is associated with executive dysfunction of the frontal lobe. Difficulty with shifting attention has been found in this population, with an individual repeatedly performing a task or attempting to solve a problem in the same way over and over. Repetitive behaviors of this type may increase when the person with ASD is under stress or is anxious about something, similar to the type of anxiety that occurs in obsessive-compulsive disorder (Spiker et al., 2012).

In the typically developing population, perfectionism has been linked to social anxiety, depression, and obsessive-compulsive disorder. Perfectionism research in the typically developing population has been conducted using multidimensional models (Frost, Marten, Lahert, & Rosenblate 1990; Hewitt & Flett, 1991). Frost and colleagues (1990) proposed that perfectionism is theoretically comprised of four dimensions: (a) excessive concern with mistakes, (b) a self-doubt about one's abilities, (c) overemphasis on parental expectations and evaluations, and (d) an excessive preference for precision, order, and organization. The maladaptive self-evaluative dimensions of perfectionism have been found to be significantly correlated with anxiety disorders in the typically developing population, specifically social anxiety (social phobia), trait anxiety, and worry (Kawamura, Hunt, Frost, & DiBartolo 2011). When depression was controlled for, the maladaptive self-evaluative component of perfectionism was not associated with OCD, only with social phobia.

Within the ASD population, it has been found that anxiety disorders occur with great frequency. Recently, there has been research investigating the cognitions and attributions of people with ASD who have anxiety and depression (Greenaway & Howlin, 2010). Results indicated that children and youth with ASD exhibited more dysfunctional attitudes and perfectionism than normal controls. The dysfunctional attitudes were significantly associated with obsessive-compulsive symptoms, and cognitive inflexibility along with social impairments was implicated.

See Also

- ▶ Cognitive Behavioral Therapy (CBT)
- ▶ Obsessive-Compulsive Disorder (OCD)
- ▶ Social Phobia

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Performance Objectives

- ▶ Objective

Performance Reviews for Direct Care Staff

- ▶ Feedback on Provider Work Performance

Peridol

- ▶ Haloperidol

Period Prevalence

- ▶ Prevalence

Peripatetic Teacher

- ▶ Itinerant Teacher

Periventricular Hemorrhage

Jennifer M. Kwon
Department of Neurology & Pediatrics (SMD), University of Rochester, School of Medicine and Dentistry, Rochester, NY, USA

Synonyms

Intraventricular hemorrhage

Definition

Periventricular hemorrhage or intraventricular hemorrhage (PVH-IVH) is a common complication seen in preterm infants. PVH-IVH occurs in this population because of the metabolically active germinal matrix in preterm infants (before 32 weeks gestation). This germinal matrix is supplied by a highly vascular and fragile capillary network that is vulnerable to flow and pressure changes. Bleeding in this region may damage the nearby white matter tracts leading to later motor disability and other cognitive deficits.

See Also

- ▶ Periventricular Leukomalacia

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Periventricular Leukomalacia

Jennifer M. Kwon
Department of Neurology & Pediatrics (SMD), University of Rochester School of Medicine and Dentistry, Rochester, NY, USA

Synonyms

PVL

Definition

Periventricular leukomalacia (PVL) is the most common ischemic brain injury in premature infants and occurs in the white matter adjacent to the lateral ventricles, just distal to the regions supplied by the deep branches of the middle cerebral arteries. PVL is diagnosed by the typical findings of echodensities on cerebral ultrasound or signal abnormalities of MRI. PVL is an important finding because of the high association with later development of nonprogressive developmental impairments such as cerebral palsy.

See Also

► Intraventricular Hemorrhage
► Periventricular Hemorrhage

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Perphenazine

Lawrence David Scahill
Nursing & Child Psychiatry, Yale University School of Nursing, Yale Child Study Center, New Haven, CT, USA

Synonyms

Trilafon

Definition

Perphenazine is a phenothiazine that continues to be used for the treatment of schizophrenia. Compared to chlorpromazine, perphenazine is a more potent medication which may translate into decreased likelihood of sedation and hypotension. The increased potency may increase the risk of neurological adverse effects.

See Also

► Chlorpromazine

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Perseveration

John T. Danial
Psychological Studies in Education, University of California, Los Angeles, Los Angeles, CA, USA

Definition

Perseveration refers to the tendency for behaviors or thoughts to persist independent of social

consequences or feedback from the environment. This includes inappropriate maintenance of a current category, repetition of a previous response to a new stimulus, or continued and uninterrupted repetition of a behavior. Perseveration is a deficit in executive functioning and manifests through an inability to shift from one cognitive strategy to another.

See Also

- ▶ Echolalia
- ▶ Obsessive Desire for Sameness
- ▶ Repetitive Behavior
- ▶ Self-injurious Behavior
- ▶ Stereotypic Behavior

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Persistent Toe Walking

- ▶ Toe Walking

Personality

- ▶ Temperament

Personality Disorders

Bram Sizoo[1] and Ernst Horwitz[2]
[1]Psychiatry, Center for Developmental Disorders, Deventer, Netherlands
[2]Department of Psychiatry, Groningen University Medical Center, Groningen, The Netherlands

Synonyms

Personality structure in autism spectrum disorders

Short Description or Definition

Personality disorders in autism refer to comorbidity (co-occurring psychiatric disorders). In medicine, comorbidity is relatively straightforward because it mostly concerns well-defined disease entities with known causes (e.g., a fractured leg co-occurring with diabetes). In psychiatry, however, disorders are defined as clusters of signs and symptoms (syndromes), with complicated and uncertain causal pathways. As a consequence, psychiatric disorders show a considerable overlap. This makes it difficult to decide whether symptoms have to be ascribed to either disorder A or disorder B (differential diagnostics) or to both A and B (comorbidity). This issue is important for achieving diagnostic clarity and for managing treatment.

This chapter deals with the dilemma posed when signs and symptoms point to a personality disorders (PD) as well as to an autism spectrum disorder (ASD).

Categorization

Autism Spectrum Disorders (ASD)

In the current version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), pervasive developmental disorders are subtyped by the Autistic Disorder (AD),

Asperger's Syndrome (AS), and the Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS). In the proposed new DSM version (DSM-5), these subcategories are likely to be replaced by a single category: Autism Spectrum Disorder.

For the purpose of this chapter, it is important to note that whereas DSM-IV requires an onset of symptoms before the age 3 years for the autistic disorder, in DSM-5 this restriction will probably be less strict. Symptoms must be present in early childhood but may not become fully manifest until social demands exceed limited capacities, mostly in adolescence. ASD is diagnosed when there are persistent deficits in social communication and social interaction across contexts and restricted, repetitive patterns of behavior, interests, or activities.

Personality Disorders (PD)

In DSM-IV, 10 categorically defined personality disorders are characterized by enduring and pervasive patterns of inner experiences and behavior (manifested in the areas cognition, affectivity, interpersonal functioning and impulse control); the onset of the patterns can be traced back to adolescence or early adulthood (American Psychiatric Association [APA], 2000). The categorical nature of personality disorders in DSM-IV poses clinicians with classification problems when symptoms are subtle or can also be explained (but not necessarily better) by other disorders or comorbid conditions.

In DSM-5, in its current iteration, ratings from three assessments combine to comprise the essential criteria for a personality disorder (impairments in identity, sense of self, and in the capacity for effective interpersonal functioning). The provision for clinicians to rate dimensions of personality traits reflects a more dimensional approach than in DSM-IV. The intention is to describe the personality characteristics of all patients, whether they have a personality disorder or not (www.DSM5.org). This implies that in DSM-5, every patient with an ASD diagnosis is also entitled to a thorough evaluation of his or her personality profile. Although this evaluation will largely concern the same area of functioning as has been covered in an ASD diagnosis, the personality assessment sheds light on strengths and weaknesses from a different perspective, which in practice often enhances the understanding of the patient.

Personality Disorder and/or Autism Spectrum Disorder

The relationship between personality disorders and symptom disorders is complex. Different models have been postulated to describe the shared etiological and pathophysiological factors, such as the predisposition/vulnerability model and the complication/scar model. A promising approach is the model which describes the development and co-occurrence of syndrome and personality disorders as psychobiological in scope (Dolan-Sewell, Krueger, & Shea, 2001). The Cloninger model (see further below) is an example of this conceptualization. The relationship between PDs and ASD is even more complicated because of the developmental nature of both disorders. While the onset of PDs is theoretically in early adulthood, the first manifestation of behavioral maladaptive patterns occurs in many instances much earlier on in life. In the diagnostic process of distinguishing PD from ASD, untangling the pathways of symptoms along the lifespan, especially in retrospect, can be a daunting task.

Comorbidity is defined by the presence of two or more disorders present at the same time (Angold, Costello, & Erkanli, 1999; Goldsmith, 1999). DSM-IV, however, dictates that if a consistent pattern of experiences or behavior can be better ascribed to the expression or consequence of another psychiatric disorder (e.g., ASD), a PD cannot be diagnosed.

A practical answer to the comorbidity question is that if the clinical presentation of ASD is dominated by major symptoms that would be left underreported if only ASD were classified, it is possible to speak of comorbidity without violating the classification rules. So by classifying a comorbid personality disorder, the clinician draws attention to the complexity of the presentation requiring more than the usual ASD treatment.

However, for clinical purposes, it can be worthwhile to assess personality pathology and traits regardless of whether or not a personality disorder is classified. This is much in line with the proposed DSM-5 methodology.

Epidemiology

There is no reliable data on the prevalence of personality disorders in autism. This is partly due to the earlier mentioned classification rules discouraging diagnosing both at the same time. Like in ASD, assessment of PDs with the "golden standard" (semistructured interviews) is time consuming.

Recent studies that examined personality profiles in adults with ASD with the Temperament and Character Inventory (Cloninger, Svrakic, & Przybeck, 1993) show that ASD is characterized by high harm avoidance compared with the norm population, pointing to worrying and pessimistic individuals who are tense in unfamiliar situations or with strangers. In addition, patients with ASD had low scores for reward dependence, indicating little sentimentality and social attachment, and little dependence on approval of others. (Anckarsäter et al., 2006; Sizoo, van den Brink, Gorissen van Eenige, & van der Gaag, 2009; Söderstrom et al., 2002). The clinical significance of the temperament and character patterns found in patients with ASD is that these profiles sketch in a broad outline the nature and problematic quality of interpersonal relationships between them and others. Other studies showed similar patterns using other instruments like the Autism Spectrum Quotient and the Neuroticism Extraversion Openness Personality Inventory Revised (NEO-PI-R). (Austin, 2005; Wakabayashi, Baron-Cohen, & Wheelwright, 2006).

Murphy et al. found that particular personality traits may also aggregate in the family members of autistic individuals (broad autism phenotype) and furthermore that some of these traits may be a manifestation of the liability to autism (Murphy et al., 2000; Piven, Palmer, Jacobi, Childress, & Arndt, 1997).

In summary, little is yet known about the epidemiology of comorbidity patterns with ASD and PD.

Natural History, Prognostic Factors, Outcomes

In general, comorbidity with personality disorders becomes manifest in adolescence. In the current system of DSM-IV, ASD often presents with symptoms that also address the criteria for a PD. This may cause confusion however when the first symptoms of ASD occur in adulthood. ASD can then be mistaken for a personality disorder, and vice versa, depending on the focus of the clinical assessment. Intelligence is an important prognostic factor in ASD (Seltzer, Shattuck, Abbeduto, & Greenberg, 2004), meaning that children with higher IQs have a better functional outcome in adulthood than those with lower IQs. Although it is possible that this is also the case in ASD comorbid with PD, clinical practice indicates that there are adults with ASD and high IQs whose functioning is severely hampered by comorbid personality traits. The outcome of ASD with PD has however not been studied in a systematic way. The clinical evidence suggests that, like in other symptom disorders, the presence of a PD in ASD increases the burden.

Clinical Expression and Pathophysiology

In ASD, impaired information processing in the brain is especially invalidating in complex situations involving social interaction and emotional communication. In addition, the insight in mental processes of others, but also the self, is often limited because of an impaired intuitive understanding of social relationships and contextual conventions. This implies that people with ASD require more time to evaluate (social) situations because cognitive compensation strategies are utilized to understand what people without ASD know without consciously thinking (Frith, 2003).

The developing personality is also influenced by environmental factors, like in ASD. In this respect, the presence of ASD contributes to a pertinent environmental factor because impaired communication and difficulty interpreting social contexts lead to negative reactions of others, which in turn lead to avoidance, anxiety, or a lack of flexibility. The adverse experiences with social interaction may accentuate schizoid, avoidant, or dependent traits when looked at from the personality perspective. The impaired information processing and difficulty with correctly evaluating social contexts in ASD make a clear demarcation between reality and fantasy difficult, enhancing schizotypal personality traits (Towbin, 2005). Early trauma and insecure attachment are risk factors for developing a borderline personality disorder (Fonagy & Bateman, 2008). When a person with autism is exposed to these risk factors, the resulting phenotype can resemble both disorders. On the other hand, extremes in temperament that are distinctive of personality disorders can color the clinical picture of ASD. Social typologies used in ASD like "active but odd" are in part an expression of personality traits.

Evaluation and Differential Diagnosis

In the assessment, a reliable developmental history is mandatory to diagnose or rule out ASD and to find evidence for causal factors that could contribute toward the development of the personality disorder. An assessment of personality should also be a part of the ASD assessment. Early trauma, insecure attachment (Fonagy & Bateman, 2008) in the case of borderline personality disorder, and an arrested developmental phase in the case of narcissistic personality disorder (Fernando, 1998) are among the descriptive etiological hypotheses.

The assessment can lead to a classification of ASD and/or a PD. However, more informative is a comprehensive descriptive diagnosis in which traits and behavior, neuropsychological and other impairments, and an overview of contributing (causal) factors combine to serve as an explanatory model for the patient, his close relatives, and the clinician.

Treatment

In case of ASD comorbid with a PD, the effect of programs for personality disorders can be seriously reduced if no account is taken of the impairments that accompany ASD. For example, exposure therapy for social anxiety in an avoidant PD will be less effective when the origin of the avoidance is rooted in a fundamental inability to understand the other in social encounters, as in ASD. In fact, it may for some patients even be considered undesirable to change the avoidant behavior in autism as this could, in the worst case, deteriorate functioning by inducing more (disturbing) social stimuli.

In ASD comorbid with borderline personality disorder, clinical in-patient settings can undermine the autonomy of the individual, leading to serious regression with self-harm and aggressive behavior. Here, the clinical dilemma is between insisting that the patient takes her own responsibility (autonomy) while bearing in mind the cognitive and affective impairments resulting from ASD that prevents her from fully taking this self-responsible stance.

There is currently no systematic evidence to guide treatment of ASD comorbid with a PD or with prominent personality traits. Understanding the impairments (and adaptive aspects) of the individual is the best approach to tailor treatment. This requires a clinician to be familiar with treatment programs for personality disorders, and to study the ins and outs of ASD in order to be able to adopt the content or pace of the programs targeting the comorbid PD. Unadjusted PD treatment in patients with ASD probably has a high failure rate, although this had not been systematically studied.

See Also

► Clinical Assessment
► Comorbidity

▶ Diagnostic Process
▶ Personality Inventory for Children
▶ Personality, Clinical Assessment

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Personality Inventory for Children

Nicole Slade
Department of Psychology, University of Massachusetts-Boston, Boston, MA, USA

Synonyms

PIC

Description

The Personality Inventory for Children, or PIC, is used to assess the emotional, behavioral, cognitive, and interpersonal adjustment of children from kindergarten to 12th grade (Lachar & Gruber, 2007). It is a series of statements that the parent or guardian rates as true or false in relation to their child. The goal of this clinical assessment tool is to learn more about the child and his or her problems in order to recommend clinical treatment (Sattler & Hoge, 2006). It is used in a clinical and school setting.

Historical Background

Introduced in 1956 by Robert D. Wilt, the original 600-question booklet has gone through extensive testing and revision. After the first

introduction, and extensive reliability testing, the PIC was altered in 1973. Thirteen questions that could be interpreted as offensive were removed (Lachar, 1982). The first version of the PIC was officially published in 1977 (Sattler & Hoge, 2006). It is currently in its second version, which is referred to as the PIC-2 (Lachar, 1982). The normative tables and scores for the PIC-2 were derived from tests done on two samples of 2,306 parents of children; Children in these samples were in Kindergarten through 12th grade, resided in 12 states, attended both urban and rural schools, and included 1,551 parents of children who had been referred for clinical support (Personality inventory for children, 2007). It takes approximately 40 min to an hour for a parent or guardian to complete the PIC-2. It also has a shortened form called the Behavioral Summary (Sattler & Hoge, 2006). The Behavioral Summary contains only 96 items and can be completed in 15 min (Sattler & Hoge, 2006).

Psychometric Data

The PIC-2 is comprised of 275 true or false questions (Lachar & Gruber, 2007). The test-retest reliability rate is 0.82–0.92 with internal consistency rate of 0.81–0.92 (Lachar & Gruber, 2007). There are 9 scales, composite scales, and 21 subscales in the PIC. The test can be administered as a whole, administering only the Behavioral Summary, or administering the subscales that comprise the composite scores. The following scales and subscales, presented with brief descriptions, comprise the PIC-2:

Cognitive Impairment (COG)

Questions on the Cognitive impairment scale assess the child's difficulty in thinking or processing information (Molano, 2010). There are three subscales in Cognitive Impairment in the PIC. Each subscale has 13 questions (Herson, 2004). The first subscale is called Inadequate Abilities. This is designed to measure how the parent/guardian feels their child understands information in their environment. The second subscale within Cognitive Impairment is Poor Achievement. This is designed to measure how the parent/guardian feels about the child's performance in their school setting (Herson, 2004). The third subscale is Developmental Delay. This is designed to measure how the parent/guardian evaluates specific developmental milestones, such as riding a bike or talking (Herson, 2004).

Impulsivity and Distractibility (ADH)

Impulsivity and Distractibility has two subscales. The first subscale is Disruptive Behavior. Disruptive Behavior consists of 21 questions about how the child is able to focus on tasks in multiple settings (Herson, 2004). The second subscale measures Fearlessness. It contains nine questions that address how the child would respond to dares, challenges, or other possibly dangerous situations (Herson, 2004).

Delinquency (DLQ)

Delinquency is the lack of conformity to social norms. Delinquency has the following three subscales: Antisocial Behavior, Dyscontrol, and Noncompliance. Antisocial Behavior has 15 questions regarding how the child behaves in social situations (Herson, 2004). Dyscontrol, or regulation of behavior (Grigsby, Kaye, & Robbins, 1992), which has 16 questions, is designed to assess how the parent interprets their child's behavior in social situations (Herson, 2004). Noncompliance has 11 questions that focus on how the child responds to rules and consequences (Herson, 2004).

Family Dysfunction (FAM)

Family Dysfunction has the following two subtests: Conflict Among Members and Parent Maladjustment. Conflict Among Members has 15 questions about the relationship of family members and the strategies that they employ to deal with different family situations (Herson, 2004). Parent Maladjustment has 10 questions that focus on how parents deal with stress (Herson, 2004). For example, there is an item about parent drinking habits on the Parent Maladjustment subscale (Herson, 2004).

Reality Distortion (RLT)

Reality Distortion has the following two subscales: Developmental Deviation and Hallucinations and Delusions. Developmental Deviation has 14 questions about how the child perceives everyday dangers (Herson, 2004). Hallucinations and Delusions has 15 questions about the child's level of paranoia (Herson, 2004).

Somatic Concern (SOM)

Somatic Concern has the following two subtests: Psychosomatic Preoccupation and Muscular Tension and Anxiety. Psychosomatic is a physical ailment caused by mental processes, stress, or unhappiness (Shorter, 1992). Psychosomatic Preoccupation is measured by 17 questions about how the child perceives or feels illness (Herson, 2004). Muscular Tension and Anxiety has 11 questions about how often the child feels stress-related pain or other physical symptoms of stress (Herson, 2004).

Psychological Discomfort (DIS)

Psychological Discomfort is comprised of the following three subtests: Fear and Worry, Depression, and Sleeping Disturbance/Preoccupation with Death. Fear and Worry has 13 questions about how child handles unknown situations (Herson, 2004). Depression has 18 questions about how the child expresses emotions (Herson, 2004). Sleeping Disturbance/Preoccupation with Death is measured with 8 questions about how the child sleeps and whether the child evidences any suicidal thoughts or tendencies (Herson, 2004).

Social Withdrawal (WDL)

Social Withdrawal has the following two subtests: Social Introversion and Isolation. Social Introversion has 11 questions about the child's shyness and social competence (Herson, 2004). Isolation has eight questions regarding the child's social preferences. For example, Isolation addresses whether the child stays in rooms most of the time (Herson, 2004).

Social Skill Deficits (SSK)

Social Skill Deficits has the following two subscales: Limited Peer Status and Conflict with Peers. Limited Peer Status has 13 questions about the child's social standing with peers, types of friendships, and number of friends (Herson, 2004). Conflict with Peers has 15 questions about how other children react socially to their child (Herson, 2004).

Composite Scales

The PIC has the following three composite scales: Externalizing, Internalizing, and Social Adjustment. The Externalizing composite scale focuses on disruptive behavior and inattention. It is measured in the PIC by adding the scores of Impulsivity and Distractibility and Delinquency (Herson, 2004). The Internalizing composite scale focuses on negative cognitions, feelings, and emotions. It is computed by adding the scores from Reality Distortion and Somatic Concern (Herson, 2004). The Social adjustment composite provides a measure of overall social adaptation. It is computed by adding the Social Withdrawal and Social Skill Deficits (Herson, 2004).

Composite scales can be used to look at one aspect of the child's behavior. For example, a researcher could use a selection of subscales to assess one area of a child's abilities (e.g., social adaptation). Researchers often use composite scores when their research does not require all of the information that is collected in the full PIC-2.

Clinical Uses

In the past, clinicians used the PIC to separate children who needed clinical support into the following six groups: Delinquent, Hyperactive, Cerebral Dysfunction, Somatizing, Mental Retardation (now termed intellectual and developmental disability), and Psychotic (Lachar, Gdowski, & Snyder, 1982). Cerebral Dysfunction is also known as brain damage. Somatizing is a physical illness due to stress, unhappiness, or other mental processes (Molano, 2010). Currently, the PIC-2 is used to obtain a profile of a child's problem behaviors along with indicators for family dysfunction.

The PIC has used been used in a wide range of research projects. For example, it has been

included in studies of child achievement (Gough, 1946), effects of behavioral treatment for children with autism (Sallows, Tamlynn, Graupner & MacLean Jr., 2005), psychosocial effects of siblings of children with Autism and Mental Retardation (Bagenholm, & Gilberg, 1991), Psychosocial adjustment of refugees (Rohr, 1996), and anxiety studies. In Autism research, the PIC-2, along with other diagnostic tests, is administered before behavioral intervention and re-administered after intervention to understand whether behavior therapies have had an impact on social and emotional aspects of a child's behavior. The PIC-2 can also be used to determine eligibility of participants for a research study.

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Personality Structure in Autism Spectrum Disorders

▶ Personality Disorders

Personality, Clinical Assessment

Marjorie Solomon
Department of Psychiatry and Behavioral Sciences, UC Davis M.I.N.D. Institute, Sacramento, CA, USA

Definition

Clinical assessment is an evaluation of a patient's physical condition and prognosis based on information gathered from behavioral, physical, and laboratory examinations and the patient's medical history (Mosby, 2009). Psychologists or physicians typically assess and diagnose autism spectrum disorders. These clinicians generally are trained as clinical or educational psychologists, psychiatrists, behavioral and developmental pediatricians, and

neurologists. Specialized speech and language pathologists and occupational therapists also may provide ASD evaluations. Gold standard assessments consist of thorough parent and child interviews about history and current behavior, consider the role of development, and employ standardized measures.

Historical Background

Practice parameters for ASD assessment have been published by the American Academy of Neurology (Filipek et al., 2000), by the American Academy of Child and Adolescent Psychiatry (Volkmar, Cook, Pomeroy, Realmuto, & Tanguay, 1999), and by a consensus panel with representation from multiple professions (Filipek et al., 1999). Each describes two levels of screening consisting of routine developmental surveillance that provides services for young children (i.e., pediatricians) and more comprehensive diagnostic assessment by experienced clinicians for children who fail screening. Prior to the issuance of these practice parameters, oral traditions and subjective observations dominated the assessment of ASD.

The publication of two standardized assessment tools – the parent interview known as the Autism Diagnostic Interview-Revised (ADI-R; Lord, Rutter, & Le Couteur, 1994; Rutter, LeCouteur, & Lord, 2003) and the observer rated semi-structured play interview known as the Autism Diagnostic Observation Schedule (ADOS; Lord et al., 2000), also resulted in greatly standardized and reliable ASD diagnoses. These measures currently are considered the "gold standard" in ASD diagnosis. They both require specialized training to administer.

Current Knowledge

A thorough clinical assessment of the child with ASD includes multiple steps. The first of these is to review the child's developmental history and the parents' current concerns. This history must include the review of communication, social and behavioral development, and screening for comorbid medical and psychological conditions including anxiety and depression, and attention deficit symptoms. A review of existing records (medical, school, previous testing, and intervention reports) rounds out the perspective provided by the parent interview. In addition to the history, good assessment includes observation of the child. If possible, this observation should be supplemented by teacher reports of child functioning in the less-structured school setting.

As mentioned above, one of the "gold standard" autism measures – the ADI-R – can be used to interview the parent about the development of autism symptoms in their child. ADI-R is a semi-structured interview that takes approximately 3 h to administer. The much briefer Social Communication Questionnaire (Berument, Rutter, Lord, Pickles, & Bailey, 1999) is a parent-report instrument that contains the same questions as are used to make a diagnosis on the ADI-R, but they are presented in yes/no format and parents can complete it on their own.

The other "gold standard" instrument, the ADOS is a semi-structured interactive play-based assessment of symptoms. It consists of four age and language-graded modules containing social "presses." Module 1 is used with children who do not consistently use phrase speech, module 2 with those who use phrase speech but are not verbally fluent, module 3 with fluent children, and module 4 with fluent adolescents and adults. Activities used in ADOS modules 1 and 2 are designed to assess joint attention, communication, symbolic play, and atypical behaviors (restricted and repetitive behaviors and sensory interests) and consist of toy, bubble, and pretend play, reading simple books, and participating in common social scripts like a birthday party. Activities used in modules 3 and 4 assess conversation skills, empathy, and insight into social relationships and include reading books, discussing pictures, engaging in pretend play with toys and objects, acting out stories presented in pictures, and discussing ones feelings, social relationships, and school and/or work situation. Participants are rated based on their level of social interaction and social language, taking their chronological age into account.

In addition to the assessment of ASD symptoms, a good clinical evaluation should include measurement of cognitive abilities. This is important because cognitive level often influences the expression of autism symptoms and may be associated with the ability to acquire skills and the individual's potential level of adaptive functioning. Longitudinal studies also suggest that cognitive ability level is the best predictor of long-term outcome for persons with ASD, with those with intellectual disability typically faring worse. Studies also consistently point out that, even in persons with ASD with cognitive abilities in the average range, adaptive functioning tends to lag behind. Recently, it also has been demonstrated that persons with autism and Asperger syndrome perform better on intelligence tests that assess their perceptual reasoning abilities (Raven's Progressive Matrices) versus more language-based tests like the Wechsler Scales. There also are tests that are more appropriate for children with lower mental ages like the Leiter International Performance Scales-Revised (Roid & Miller, 1997). For children less than 5 years of age, the Bayley Scales of Infant Development-II (Bayley, 1993) and the Mullen Scales of Early Learning (Mullen, 1995) can be used.

After IQ, expressive language ability is the most consistent predictor of outcomes. Those who fail to develop spoken language by early childhood (age 5 or 6) tend to remain minimally verbal, although there have been recent advances that challenge this widely held assertion. There are many general language tests that can be used to provide a clearer picture of expressive and receptive language abilities. Two such tests are the Peabody Picture Vocabulary Test (Brownell, 2000) and the Clinical Evaluation of Language Fundamentals (Semel, Wiig, & Secord, 2003).

However, even when children with autism have adequate spoken language, they frequently demonstrate challenges with language pragmatics or social language, which involves:

Using language for different purposes, like greeting, informing, demanding, and requesting.

Changing language according to the needs of a listener and/or the situation like talking differently to a child than to an adult, providing background information to an unfamiliar listener, and following topic and reciprocity norms for conversations (turn taking, appropriate topics, staying on topic).

Individuals with pragmatic language problems may say inappropriate or unrelated things during conversations, tell stories in a disorganized manner, and without meaning to, say things that are blunt or offensive. It is difficult to assess pragmatic language, and not all speech and language pathologists are equipped to do so. There are several measures developed to assess this form of language. They include the Test of Language Competence (TLC; Wiig & Secord, 1989), which is administered by a trained professional, and the Children's Communication Checklist-2 (Bishop & Baird, 2001), which is a parent, teacher, or other caregiver report questionnaire that assesses aspects of language pragmatics.

Adaptive behavior is the final domain that should be assessed in a comprehensive evaluation. To make a diagnosis of intellectual disability, information about functioning must be considered alongside information about cognitive ability level. Furthermore, knowing about an individual's adaptive functioning is important for setting appropriate treatment and educational goals.

In individuals with ASD, the most widely used measure of adaptive functioning is the Vineland Adaptive Behavior Scales (Sparrow, Balla, & Cicchetti, 1984). It assesses functioning in domains of communication, daily living skills, socialization, and motor skills (under age 5). It is a parent or teacher report interview. There are also several questionnaire-based measures of adaptive functioning including the Adaptive Behavior Assessment System (ABAS; Harrison & Oakland, 2003).

There are several domains that frequently also are assessed beyond this core diagnostic battery. A neuropsychological assessment may provide greater clarity about the individual's pattern of strengths and challenges in information processing. This can provide valuable information for schools and transition planning. Neuropsychological assessments in autism frequently focus on executive functions, and selective attention, and generally are administered by the

examiner. Recently, more investigators and clinicians are using the Behavioral Rating Inventory of Executive Function (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000). This parent- or teacher-rated questionnaire measures inhibition, cognitive flexibility, organization, planning, metacognition, emotional control, and initiation. A neuropsychological assessment also may examine whether the individual displays a nonverbal learning disability profile (Rourke, 1995). Children with this profile exhibit well-developed rote verbal skills, verbal memory, and auditory learning capabilities, but have problems with psychomotor coordination, math problem solving, and visuospatial organization. Some children with Asperger syndrome are thought to display this set of strengths and challenges.

Academic assessments can provide additional school-relevant information. Children with ASD have many relative academic strengths related to reading decoding and memory for facts (especially those about their circumscribed interests). Others may possess strong math and/or computer skills. Alongside these strengths, however, they frequently display deficits in reading comprehension, expository writing, and mathematics story problems. It takes considerable skill to tear apart this pattern of strengths and challenges. An understanding of such information is essential for helping affected individuals to achieve their potential.

Finally, as mentioned above, it is important to assess comorbid psychiatric conditions in individuals with ASD. Approximately 30–40 % of them display symptoms of anxiety, depression, and behavioral problems. These can be assessed using instruments from the Achenbach System of Empirically Based Assessment (ASEBA; Achenbach, 2009) or the Behavioral Assessment System for Children (BASC-2; Kamphaus, Reynolds, & Hatcher, 1999). The psychosocial and cognitive symptoms found in autism can make it difficult to diagnose psychopathology in individuals with ASD. For example, their restricted and repetitive behaviors may intensify during periods when they are anxious – a symptom of anxiety not found as commonly in the general population.

Although DSM-IV-TR does not permit the diagnosis of attention deficit hyperactivity disorder (ADHD) symptoms in persons with ASD, in reality, attention symptoms are present in about half of them. This precedence rule is likely to change in DSM 5. ADHD symptoms can be assessed using the Conners Scales.

Finally, when assessing autism, it is critical to maintain a developmental perspective as symptoms change with age. For example, what would be considered a normal level of reciprocal conversational ability for a young child would be quite different than that of a teenager. Similarly, normal levels of overactivity also decline with age.

Future Directions

Assessment-related research and information are badly needed in several areas. First, given what is known about the benefits of early intervention, one critical area is improving our ability to diagnose autism very early. Diagnosis should be across multiple settings and leverage the perspectives of multiple types of service providers. At the present time, considerable research dollars are being spent on developing early behavioral and biological markers of ASD.

Second, as mentioned above, it has been demonstrated that persons with autism and Asperger syndrome perform better on intelligence tests that assess perceptual reasoning abilities (i.e., Raven's Progressive Matrices) versus more language-based abilities that are tapped in more commonly used measures such as the Wechsler Scales. Additional work is needed to better understand this finding and to use results to help design more comprehensive estimates of the strengths in the cognitive abilities of individuals with ASD and intellectual disability who are nonverbal.

Third, there are several areas that warrant the development of new, more comprehensive and ecologically valid assessment instruments. These include pragmatic language, treatment efficacy, cognitive flexibility, and social skills measures. Better measurement of these areas would provide excellent information for treatment planning.

Finally, as in many areas of autism research, we know little about adults with the disorders.

Better measures are needed to diagnose autism in adulthood in individuals with higher levels of functioning. The field also currently lacks good and specific measures of functional outcomes for this population.

See Also

► Executive Functions

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Person-First Language

Corey Ray-Subramanian
Waisman Center, University of Wisconsin-Madison, Madison, WI, USA

Synonyms

People-first language

Definition

Person-first language is a method of referring to individuals with disabilities, medical conditions, or functional impairments that emphasizes the person over their disability, condition, or impairment. The term "a child with autism" would be consistent with person-first language, whereas the term "an autistic child" would not. Proponents of person-first language assert that individuals with disabilities should not be defined by their disabilities to avoid dehumanization and equating the individual with his or her impairment (Folkins, 1992; Research and Training Center on Independent Living, 2008; Smart, 2001). However, some disability self-advocacy groups do not prefer person-first language when referring to members of their group, as they do not necessarily view their labels as disabilities, characteristics of which to be ashamed, or traits that can be separated from themselves as individuals (Autistic Self-Advocacy Network Australia, n.d.; Smart, 2001; Streeter, 2010).

See Also

- ▶ Advocacy
- ▶ Disability

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Pertofrane

▶ Desipramine

Pertussis and Autism

Paul A. Offit
Division of Infectious Diseases, Department of Pediatrics, The Children's Hospital of Philadelphia, Philadelphia, PA, USA

Definition

On April 19, 1982, a local NBC affiliate in Washington, DC, aired a 1-h documentary titled *DPT: Vaccine Roulette*. The program featured the stories of several children: all had received the whole-cell pertussis vaccine and all had subsequently developed epilepsy and mental retardation. Several parents who watched this show – and collectively believed that their children's developmental delays were caused by pertussis vaccine – formed an advocacy group called "Dissatisfied Parents Together." By the early 1990s, this group changed its name to the National Vaccine Information Center, one of the most powerful anti-vaccine organizations in the United States.

The head of the National Vaccine Information Center, Barbara Loe Fisher, later wrote a book titled *A Shot in the Dark: Why the P in the DPT Vaccination May be Hazardous to Your Child's Health*. In that book Fisher wrote, "With the increasing number of vaccinations American babies have been required to use has come increasing numbers of reports of chronic immune and neurological disorders being suffered by older children and young adults including asthma, chronic ear infections, autism, learning disabilities, attention deficit disorder, diabetes, rheumatoid arthritis, multiple sclerosis, chronic fatigue syndrome, lupus, and cancer." This book gave birth to the notion that vaccines, especially the pertussis vaccine, could cause developmental delays, including autism.

During the next 10 years, several groups of investigators examined children who either had or had not received pertussis vaccine to determine whether there were differences in the incidence of developmental delays or epilepsy in the two groups. All investigators found that the pertussis vaccine did not cause permanent neurological damage. In 2006, a neurologist working at the University of Melbourne in Australia, using genetic tools that had only recently become available, found that many children whose parents had claimed that pertussis vaccine had caused brain damage actually had a neuronal sodium channel transport defect, specifically, an SCN1A mutation. One hundred percent of children with this mutation will develop seizures and developmental delays in the first year of life independent of vaccination. From the standpoint of scientists, the combination of epidemiological and biological studies put an end to the notion that the whole-cell pertussis vaccine, which has not been used in the United States since the mid-1990s, caused permanent harm.

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Pervasive Developmental Disorder

Oana De Vinck
Department of Pediatrics, Yale University School of Medicine, New Haven, CT, USA

Synonyms

Autism spectrum disorders

Definition

Pervasive developmental disorders are a group of neurodevelopmental conditions and include autistic disorder, Asperger's disorder, childhood disintegrative disorder, and Rett's disorder. These disorders are characterized by some or all of the following: significant social skills deficits, language abnormalities, restricted interests, and

repetitive motor mannerisms. Although there is a strong genetic basis for all except Rett's disorder, the precise genetic cause has not been delineated. Typically, the diagnosis of these conditions is made clinically on the basis of characteristic developmental criteria described in the *Diagnostic and Statistic Manual of Mental Disorders, 4th Edition Text Revision* (DSM-IV-TR). These diagnoses have a wide range of symptom complexes that are within the scope of the spectrum, and children vary widely in abilities, intelligence, and behavior.

See Also

► Pervasive Developmental Disorder Not Otherwise Specified

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Pervasive Developmental Disorder Not Otherwise Specified

Fred R. Volkmar
Director – Child Study Center, Irving B. Harris Professor of Child Psychiatry, Pediatrics and Psychology, School of Medicine, Yale University, New Haven, CT, USA

Definition

The equivalent, if somewhat ambiguous, terms PDD-NOS, "subthreshold" autism, and "atypical" autism refer to the broad range of conditions characterized by problems in social communication as well as in communication and/or restricted interests and behaviors that are suggestive of more strictly defined autism but fall short of the latter concept in terms of symptom thresholds.

Historical Background

The concept has, in many respects, its origins in Rank's use of the term atypical personality development to describe a range of difficulties in social-emotional development and regulation (Rank, 1949, 1955). In DSM-III (1980), the word atypical was used to describe "subthreshold" autism as the latter diagnosis was included in the PDD class for the first time as an official diagnosis. This use of the term unintentionally hearkened back to Rank's earlier use of the same word yo describe a rather similar diagnostic concept. In recent years, an awareness of the "broader autism phenotype" and the complex genetics surrounding autism have lent increased interest to work on this concept (Towbin, 2005; Towbin, Pradella, Gorrindo, Pine, & Leibenluft, 2005) which clearly outnumbers more classical autism (Fombonne, 2005).

Current Knowledge

At present, this and related terms refer to a "residual" category included in DSM and ICD for individuals whose problems do not meet the threshold for diagnosis but which are sufficiently severe as to serve as a source of impairment/distress and are relevant focus for treatment. In reality, the term refers to a relatively large group (probably about 1 in 150 children) of children. Clearly, there is even greater heterogeneity within this condition than there is with autism. Understandably, many attempts have been made to define specific subgroups/subtypes, e.g., individuals with greater intentional difficulties versus those with more mood/affective problems (Hellgren, Gillberg, Bågenholm, & Gillberg, 1994; Landgren, Pettersson, Kjellman, & Gillberg, 1996). Study of the condition may be particularly relevant to the delineation of specific genetic mechanisms (Rutter, 2005; Towbin et al., 2005).

In terms of clinical presentation, individuals with this condition frequently exhibit social difficulties, emotional lability, and unusual sensitivities, although, as a group, they probably have cognitive and language abilities than in more "classical" autism. Frequently, clinicians equate the concept with Asperger's disorder, although some data suggest that in the latter condition social deficits are more severe (Klin, Pauls, Schultz, & Volkmar, 2005; Volkmar et al., 1994; Volkmar & Klin, 2000). Treatment approaches are rather similar to those for autism but with an awareness of often reasonably good cognitive potential and the presence of comorbid conditions like anxiety and mood problems as well as affective lability (Towbin, 2005).

Future Directions

Over the coming years, the identification of specific genetic subgroups/subtypes of autism will likely lead to a refinement of this concept.

See Also

- ▶ Autistic Disorder
- ▶ Childhood-Onset Pervasive Developmental Disorder
- ▶ DAMP Syndrome
- ▶ DSM-III

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Pervasive Developmental Disorder not Otherwise Specified (PDD NOS)

▶ Atypical Autism

Pervasive Developmental Disorder, Unspecified

▶ Atypical Autism

Pervasive Developmental Disorders

▶ Childhood-Onset Pervasive Developmental Disorder

Pervasive Developmental Disorders Rating Scale (PDDRS)

Zachary Warren and Elizabeth Howell Dohrmann
Vanderbilt Kennedy Center, Treatment and Research Institute for Autism Spectrum Disorders (TRIAD), Nashville, TN, USA

Synonyms

PDDRS

Description

The PDDRS is a behavior rating scale designed to identify individuals potentially meeting criteria for a pervasive developmental disorder (PDD). It was developed by Eaves (1990; Eaves & Hooper, 1987–1988) and contains 51 items that measure three dimensions: arousal, affect, and cognition. The "arousal" domain contains 22 items dealing with avoidance of others, sensory stimulation, and fascination with objects; "affect" includes 19 items concerning aggression, fear, anxiety, or distorted affect; and "cognition" contains 10 items regarding speech and language, skill development, and savant skills. Raters are requested to answer each item using a five-point Likert scale according to the degree to which the child generally shows the behavior described. The total score is obtained by summing the separate scores for each subscale. Raw scores can be transformed into standard scores and percentile ranks as an indicator of autism symptoms.

Historical Background

The PDDRS was developed in the early 1990s by Ronald Eaves of Auburn University based on his theory that central nervous system processing in all humans, including those with PDD, can be reduced to three internal processes: arousal, affect, and cognition (Eaves, 1993). The author attempted to utilize his theory of human behavior to adapt DSM-III-R criteria into an measure for indexing PDD. The integrated theory of human behavior suggests that individuals with PDD, in addition to individuals with other disabilities, experience problems in one or more of these three internal human attributes. As such, the scale attempted to identify PDD through alterations in these attributes. The items were selected based on the developer's theory, a review of clinic files of individuals with PDD, as well as existing instruments and DSM-III-R criteria for PDD.

Psychometric Data

Published psychometric data regarding the PDDRS from research groups not directly affiliated with the primary author is very limited (Eaves, 1993). According to the instrument developer, the PDDRS was initially normed on a sample of 500 individuals diagnosed with PDD. The authors purported high initial levels of internal consistency (.92 total score) and high test-retest reliability over short intervals of time. Data from the same sample suggested less robust reliability characteristics with varying raters over longer periods of time. Final instrument structure was also reportedly based on a factor analysis within this same sample of 500. Subsequent studies from groups affiliated with the test developer have demonstrated substantial agreement with other measures, including the Autism Behavior Checklist (see Eaves, Campbell, & Chambers, 2000) and the Gilliam Autism Rating Scale (see Eaves, Woods-Groves, William, & Fall, 2006). Limited data regarding the ability of the instrument to

discriminate autism spectrum disorders from other complex neurodevelopmental disorders is available.

Clinical Uses

The PDDRS is a rating scale administered to caregivers and designed to be a screening instrument for autism. It is not currently in wide use in either clinical or research settings. The author/developer discourages the use of the instrument for eligibility determinations.

See Also

- ▶ Gilliam Autism Rating Scale (GARS)
- ▶ Social Communication Questionnaire
- ▶ Social Responsiveness Scale

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Pervasive Developmental Disorders Screening Test (PDDST)

Bryna Siegel
Autism Clinic, Department of Child & Adolescent Psychiatry, University of California, San Francisco, San Francisco, CA, USA

Synonyms

Pervasive Developmental Disorders Screening Test-II (PDDST-II)

Description

The PDDST-II is validated for early screening of autistic spectrum disorder (ASD) in children 18 months to 48 months of age based on both positive signs (symptomatic behaviors) and negative signs (delayed milestones) weighed in a manner that numbers of specific signs additively yield a sensitive and specific screen. The PDDST-II is designed around three key principles: First, parents are uniquely positioned to report on both habitual as well as low-frequency behaviors that may correlate with an ASD, so they are the best starting point for diagnostic identification process; second, parents of a not-yet-diagnosed child will be inexpert in calibrating quality and severity of reported behavior in the same manner as a skilled clinician, so screening must include a clinician-validated final scoring; and third, a screener should aim to minimize false positives both for humane reasons and for diagnostic efficiency.

Historical Background

Development of the PDDST began in 1986 as an effort to create a brief screen for autism that would be helpful in recognizing autism across (1) primary care settings, (2) specialized developmental care settings, and (3) tertiary diagnostic

clinics specializing in autism spectrum disorders. It was clear from the outset that the contrast populations in which potential cases would be embedded would be very different in each of these three settings, and therefore, the sensitivity and specificity of screening items would vary depending on the contrast population. The plan was to test a pool of items and examine relative predictive validity in each of the three settings in index and contrast populations. Items with highest predictive validity in each setting would be retained as screener items and assigned to the screener where the item had high predictive validity. Items with high sensitivity but low specificity (but overall lower predictive validity) would be retained as descriptive items.

Data collection began at the Stanford Autism Clinic in 1986, where a pilot screener was completed for all clinically referred cases under age 5. When the author moved to UCSF in 1989, data collection carried on there until approximately 2005. In addition, in the early 1990s, a comparison group of toddlers who had been very low birth weight (<1,000 g) and experienced neonatal interventricular hemorrhage (VLBW/IVH) were sampled at 2 years of age as a "developmentally at high-risk, but not specifically autism-risk," contrast group. Ultimately, the stage 1 screening for pediatric clinics was normed on the all clinically autism-referred cases against the VLBW/IVH cases as it was felt that overall sensitivity of an instrument that detected no-risk children from autism-referred children would lack specificity. The stage 2 screener for developmental clinics was normed within the population of ASD-referred cases with the index sample being confirmed ASD cases and the contrast population being those for whom an ASD had been ruled out. The stage 3 severity screener which aimed to identify more from less severe cases of autism based on these early signs used autism-confirmed cases as the index population and non-autistic disorder ASD as the contrast population.

An initial version of the three-stage PDDST was compiled in 1991. Data analyses reported in the late 1990s and early 2000s reflect work on this initial version (essentially the PDDST-I), and then in 2004, the final data set with revised psychometrics plus the manual, glossary, and supplemental items (those not included in stage 1 or 2 or 3 but highly sensitive) was compiled and published by PsychCorp as the PDDST-II. The manual gives the psychometrics for the final sample of over 1,000 cases, and the glossary is an item by item inventory of the qualities, thresholds, and examples for each item and is intended for the clinician who scores the parent-completed form to use and to validate a parent-reported positive screen – before referring the child on for further assessment.

Psychometric Data

The PDDST-II Kit (consisting of the technical manual, scoring glossary, and three stages of screeners) (in English or Spanish) is available at http://www.pearsonassessments.com/haiweb/cultures/en-us/productdetail.htm?pid=076-1635-106&mode=summary.

Depending on the clinical or research application, one or more stages of screening can be used together. Questions on each screener are organized by age at which the sign/item has typically been reported present. Table 1 shows numbers of items, cutoff number, and sensitivity (Se) and specificity (Sp) for each screener stage.

The *PDDST-II Stage 1 Primary Care Screener* was shown to be very efficient, with few false positives (<10%), correctly classifying over 90% of cases that had been clinically screened to an autism-specific clinic after extensive telephone screening. The PDDST-II was validated on 977 cases (N of ASD = 519, N of non-ASD = 458), including ASD-confirmed, ASD-referred, and VLBW control cases. Table 2 gives examples of key items for each screening stage. Importantly, unique (high Sp) items were readily identifiable in analyses that contrasted clinical (telephone) screened ASD-positive cases from a sample of at-risk cases (VLBW) Ss. At stage 2, when ASD-assessed positive cases were contrasted with ASD-assessed negative cases, specificity was more difficult to ascertain than sensitivity, as was the case when examining signs within the

Pervasive Developmental Disorders Screening Test (PDDST), Table 1 Item # cutoffs, Se and Sp by screening stage in norming sample

Stage	Cutoff	Se	Sp	N
I	5/22	.92	.91	577
II	5/18	.73	.49	379
III	8/13	.58	.60	260

ASD-positive population for indicators of severity based on early signs. Table 2 shows exemplar items at each screening stage.

The PDDST-II Glossary – When the parent submits a positive PDDST-II screen, the clinician is directed to the PDDST-II glossary which contains specific verbal probes to query the parents' response to each positive item to validate that the parent has understood the definition, qualities, and threshold at which this item should be considered truly positive. If a positive score remains after clinician validation, a referral for an ASD assessment is supported; see Table 3.

Supplemental Descriptive Items – In addition to items contained on the three screener stages, there are 41 additional items that characterize common parental observations about delays and atypical development in young children with autism. These additional items are not useful in predicting a positive screening score on stage I, II, or III (mainly because they reflect concerns common, but not unique to ASD) but do provide a more full picture of parental concerns and may be useful, especially where time constraints mandate obtaining a concise, highly focused parent-reported developmental history. While low in specificity, the supplemental items also may help identify a differential diagnosis to pursue in further assessment; see Table 4.

Pervasive Developmental Disorders Screening Test (PDDST), Table 2 Sample items by stage of screener

	Item	
Stage	*Se*	*Sp*
Stage I: primary care screener		
Seems bored or uninterested in conversations around him	.79	1.0
Alert to some sounds but not to others	.68	1.0
Ignores new toys	.60	1.0
Stage II: developmental clinic screener		
Cries when left, does not greet upon reunion	.38	.87
Not using gestures to communicate	.47	.83
Fixates on fingers	.31	.87
Stage III: autism versus PDD (severity) screener		
Not interested in peers	.88	.26
Uninterested in talking	.82	.23

Pervasive Developmental Disorders Screening Test (PDDST), Table 3 Sample PDDST-II glossary entry

If you talked to your baby in baby talk, was it hard to get him to "talk" back to you?
Qualities: This measures prelinguistic communicative reciprocity, the first component of which is vocal turn-taking. It is like an early "sound check" that tells us the baby can hear, process what he hears, and reproduce it with some accuracy.
Threshold: By the end of the first 6 months, most parents know some sounds that they can sometimes get their baby to repeat back once or more when the baby is "in the mood."
Probe for:
Babbling of prespeech sounds
Ability of baby to anticipate and wait for a parent response

Clinical Uses

Insuring Clinical Validity

The key issue in the development of any screening test is to be useful by detecting cases and at-risk cases readily, but not so readily that there is a high false-positive rate, rendering the screener highly inefficient. The first "cut" in collection of effective screening data is often reliance on the effected individual (or as is the case in autism, the parents). Parents can underreport because of lack of familiarity with child norms or because of fear of the consequences of a positive screen. Likewise, parents may overreport if a positive screen is seen as leading to more clinical attention – and that is deemed a good thing. The second "cut" therefore is validation of the reporter. In screening, it is desirable if the validation can quickly and efficiently be done on the site of screening. The PDDST utilizes a glossary for the administering

Pervasive Developmental Disorders Screening Test (PDDST), Table 4 Sample supplemental items (one sample item per age group)

Birth to 6 months
1. Did your baby seem to stare too much at moving objects or moving lights?
6–12 Months
4. Did your baby not show he/she wanted to go "up" with his/her arms – even when he/she was fussing to be picked up?
12–18 Months
5. Did your baby only rarely or never babble?
18–24 Months
16. Did your toddler ever pose or wave his/her fingers or hands when excited?
24–30 Months
24. Would your toddler pull you to a desired object as his/her way of showing you what he wanted?
30–36 Months
38. Did your child seem more of a perfectionist than other children his/her age?

clinician to check items reported with positive scores by reading a few sentences about the qualities linked to an autism diagnosis (specificity) and needed threshold for the item to reach clinical significance. For each item, the glossary provides verbatim probes the clinician can use to elicit further report that should clarify whether the positive score is a valid one. Likewise, an item the parent reported as negative but observed as potentially positive by the clinician can be further probed using guidance from the glossary.

Three Clinical Settings for the Identification of ASDs

The PDDST-II has been developed for use in three different clinical settings where children with ASD are regularly seen because children with ASD will be compared to different samples of other children depending on where they are assessed. *Stage 1 Primary Care Screener* is for use in primary care settings where children with ASD need be distinguished from among all children of the same age, so screen-positive children can be referred to specialized developmental assessment centers. *Stage 2 Developmental Clinic Screener* is for point of entry to developmental services (Child Find, Early Start, special education, or Department of Developmental Services or Public Health) where children with ASD will need to be distinguished from other children at risk for some neurodevelopmental disorder, so screen-positive children can be referred for more extensive (and costly) confirmatory assessment of an ASD. *Stage 3 ASD Severity Screener* is for use in an autism clinic where it may be helpful clinically or for research purposes to predict severity of ASD (e.g., AD vs. PDD, NOS) from early signs.

Referral for Assessment of Other Neurodevelopmental Disorders

If a positive result is *not* obtained on the PDDST-II, the next clinical question is "What instead might be the nature of this child's difficulties?" Most commonly, children who screen ASD negative on the PDDST-II may have some form of transient developmental delay (especially under 2 years), overall intellectual disability, a receptive-expressive language disorder, an anxiety disorder, a severe attention deficit, or some combination of these. Additionally, very unstructured parenting combined with extreme temperamental variations, coupled with nonspecific neurodevelopmental signs, can be very difficult to delineate from an ASD without in-depth assessment. This complexity speaks to the importance of not mistaking a screening test for comprehensive diagnostic assessment. Children who do not screen positive for an ASD should be referred to another tertiary diagnostic clinic if something other than transient delay is suspected.

See Also

▶ Pervasive Developmental Disorder

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Pervasive Developmental Disorders Screening Test-II (PDDST-II)

► Pervasive Developmental Disorders Screening Test (PDDST)

PET

► Positron-Emission Tomography

Petit Mal Seizure

Jennifer M. Kwon
Department of Neurology & Pediatrics (SMD), University of Rochester, School of Medicine and Dentistry, Rochester, NY, USA

Synonyms

Absence seizures; Infantile absence epilepsy; Pyknolepsy

Short Description or Definition

A petit mal seizure or absence seizure is the term commonly given to a seizure that consists of staring as the behavioral change which accompanies abnormal electrical activity in the brain. The electrical brain activity seen in "typical" absence or petit mal seizures is generalized 3-Hz spike and wave discharges. Petit mal seizures are brief (usually less than 15 s) and do not usually result in falling, loss of muscle tone, or jerking of the arms and legs.

Categorization

Petit mal (or absence) seizures are categorized as primarily generalized seizures. Childhood absence epilepsy has onset between 3 and 8 years of age, and juvenile absence epilepsy has onset after 10 years.

Epidemiology

Childhood absence epilepsy (CAE) has an incidence of 6.3−8/100,000 in children less than 15 years of age, and the majority are girls.

CAE represents about 10% of all epilepsies and as such is among the most frequent types of epilepsy. Other seizure types may also occur in children with CAE. It is more common to have other seizure types with JAE.

Absence epilepsy is not reported to occur with greater frequency among children and youth with autism spectrum disorders. It has been associated with specific genes related to GABA function and calcium channel function.

Natural History, Prognostic Factors, Outcomes

Petit mal (absence) seizures occur most commonly in people under age 20, usually in children ages 6–12. Children who develop typical childhood absence epilepsy (CAE) are usually normal in the development. The seizures are brief, lasting just seconds, but can occur many times a day. Many children can become seizure-free but the percentage varies. It has been reported that up to 90% of affected children will be seizure-free by adolescence. There may be school and learning difficulties seen in patients with CAE. Inattention is reported.

When absence seizures have atypical features, such as EEG findings that are not simply 3-Hz spike and wave, or when the seizures can also be associated with convulsions or myoclonic jerks, it may be harder to become truly seizure-free.

Clinical Expression and Pathophysiology

Absence seizures are related to GABA and voltage-dependent calcium channel functions. Thalamocortical tracts are implicated. Most absence seizures are considered idiopathic or of unknown etiology.

While a genetic association has been identified for a small number of patients, absence epilepsy is idiopathic at this time. It has been reported in children with Angelman syndrome, but has not been specifically associated with autism. It may be difficult to clinically differentiate staring episodes from behaviors that occur for other reasons in individuals who are inattentive, who stare, and who might have motor mannerisms on the basis of autism. Absence seizures may be accompanied by a glassy expression (look absent), and affected children may drop things. They may have brief eyelid fluttering or other automatic, subtle movements.

Evaluation and Differential Diagnosis

Evaluation is indicated if staring episodes lasting 5–30 s are observed in children or youth. They may or may not have repetitive motor movements. They will not turn to their name or alert when touched. People do not recall absence seizures.

EEG is the diagnostic study. Characteristic general synchronous, bilateral 2.5–4-Hz spike

and slow-wave discharges are seen. If they are frequent enough, a conventional EEG will capture an episode. If less frequent, prolonged monitoring with video may be necessary to identify if a staring episode is a seizure.

As noted, it may be difficult to clinically distinguish absence seizures from inattention, overfocus, and staring in patients with ASD who might also have stereotyped movements. They are sometimes difficult to distinguish from atypical absence epilepsy and may occur with other seizure types as well.

Since absence epilepsy may result in inattention, there may be a negative effect on school work and social interaction. This may also result in psychosocial stress. The medications used to treat the seizures may further impact attention and learning. Decision on what medication to use must balance all of these factors.

Treatment

The medications used to treat petit mal or absence seizures include ethosuximide, valproic acid, and lamotrigine. The first two have equivalent efficacy but ethosuximide may have fewer cognitive side effects. Forty to seventy percent of children are seizure-free within 4–5 months of therapy. The utility of other anticonvulsants such as leviracetam and topiramate is under study.

See Also

- ▶ Absence Seizures
- ▶ Electroencephalogram (EEG)
- ▶ Seizures

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Pharmacokinetics

Marcel Moran[1], Kate S. Perri[2], Kimberly Stigler[3] and Christopher J. McDougle[4]
[1]Indiana University School of Medicine, Indianapolis, IN, USA
[2]Christian Sarkine Autism Treatment Center, Riley Hospital for Children, Indianapolis, IN, USA
[3]Christian Sarkine Autism Treatment Center, James Whitcomb Riley Hospital for Children, Indianapolis, IN, USA
[4]Lurie Center for Autism/Harvard Medical School, Lexington, MA, USA

Definition

Pharmacokinetics is the study of the time course of bodily absorption, distribution, metabolism, and elimination of a drug in a living organism. Clinical pharmacokinetics deals with the application of pharmacokinetic principles for safe and effective drug management in human patients.

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Phenocopies

Paul El-Fishawy
State Laboratory, Child Study Center,
Yale University, New Haven, CT, USA

Definition

In some cases, particular phenotypes can be attributed directly to a specific known genetic change in an individual or family. When identical or very similar traits result from some other factor, including environmental causes, these traits or the individuals carrying them are called phenocopies.

A condition called "congenital cataracts" serves as a useful example of the difference between a phenotype and a phenocopy. Congenital cataract is a disorder in which children are born with clouded lenses in their eyes. In this condition, mutations in certain genes have been found to result directly in the phenotype-clouded lenses (Churchill & Graw, 2011). These forms of congenital cataracts are often inherited. Sometimes, however, the same phenotype can result from an environmental cause that mimics the phenotype caused by the abovementioned specific genetic changes. For example, in utero infection by the Rubella virus can lead to clouded lenses in the absence of the genetic changes that lead to the inherited form of congenital cataracts (Churchill & Graw). The trait of having this form of congenital cataracts caused largely by an environmental factor or the individual with this form of congenital cataracts would be referred to as a "phenocopy."

Phenocopies must be considered in efforts at gene discovery. For example, in certain types of genetic analyses, the a priori assignment of affected status within a family is an essential prerequisite. Here the presence of a phenocopy may lead to contradictory evidence with regard to the presence or location of a disease-related mutation. With regard to autism, certain factors such as drug exposures, "profound institutional privation," (Volkmar, 2005) or other conditions, such as congenital blindness and severe disorders of receptive language (Brown, Hobson, Lee, & Stevenson, 1997; Volkmar, 2005), may lead to ASD phenocopies.

See Also

▶ DNA
▶ Receptive Language Disorders

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Phenomenological Approach

Fred R. Volkmar
Director – Child Study Center, Irving B. Harris Professor of Child Psychiatry, Pediatrics and Psychology, School of Medicine, Yale University, New Haven, CT, USA

Definition

The term phenomenology has several different meanings (including an entire body of work within philosophy about ways of knowing the world). In medicine and science, it is more

frequently used to refer to an approach in which empirical observation, rather than theory, plays a central role. Within psychiatry and medicine, this approach has guided recent editions of the Diagnostic and Statistical Manual starting in 1980 with DSM-III. Prior editions of DSM had been strongly based in theory, but this complicated the usefulness of the classification schemes and, paradoxically, inhibited research. With DSM-III and subsequent editions, the emphasis has been less on theory-driven descriptions and much more on observable phenomena.

The emphasis on observable phenomena as opposed to theory has led to a dramatic increase in research. Theories have been developed over time using data gathered from phenomenologically based classification schemes. In reality, boundaries between theory and phenomenology can become blurry. Further, as Andreasen (2006) notes, unfortunately, this approach itself has tended to become somewhat reified with an overemphasis on the descriptions provided in DSM and a lack of attention to the entire context of the patient and context in which problems develop.

See Also

▶ DSM-III

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Phenomenology

▶ Qualitative Versus Quantitative Approaches

Phenothiazine

Lawrence David Scahill
Nursing & Child Psychiatry, Yale University School of Nursing, Yale Child Study Center, New Haven, CT, USA

Definition

Phenothiazines were the first type of antipsychotic medication introduced to the marketplace. This class of medications includes chlorpromazine (Thorazine), perphenazine (Trilafon), and fluphenazine (Prolixin) to name a few. These medications block dopamine receptors in particular brain areas. The blockade of these dopamine receptors is presumed to be the mechanism of action that reduces the hallucinations and delusions of schizophrenia. The success of these medications in reducing these so-called positive symptoms of schizophrenia had a major impact on mental health care worldwide. For example, the reduction of these disabling symptoms made it possible for individuals with chronic schizophrenia to leave institutions and be treated in outpatient settings.

Despite the major advance of the traditional antipsychotic medications, they are associated with adverse effects. Of particular importance are the neurologic adverse effects such as tremor, dyskinesia (abnormal movements), and dystonia during the acute phase of treatment. In some cases, dystonia can be an urgent adverse effect with neck stiffness and oculogyric symptoms (eyes tend to roll up backward into the eyelid). This is an acute situation and often quite disturbing to the patient. Dystonias, dyskinesia, and oculogyric crisis are treated with anticholinergic medications (▶ Anticholinergic). Long-term treatment with the traditional

antipsychotics can also be associated with tardive dyskinesia, which is a potentially chronic movement disorder.

See Also

- ▶ Anticholinergic
- ▶ Dystonia
- ▶ Thorazine
- ▶ Trilafon

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Phobia

Shulamite A. Green[1], Jeffrey J. Wood[2] and C. Enjey Lin[3]
[1]Department of Psychology, University of California, Los Angeles, CA, USA
[2]Departments of Psychiatry and Education, University of California, Los Angeles, CA, USA
[3]Departments of Education and Psychiatry, University of California, Los Angeles, Los Angeles, CA, USA

Synonyms

Simple phobia

Short Description or Definition

The DSM-IV-TR (American Psychiatric Association, 2000) defines specific phobia as a "marked and persistent fear that is excessive or unreasonable, cued by the presence of a specific object or situation." Exposure to the feared stimulus must immediately provoke an anxiety response, and the individual must experience avoidance or intense distress that significantly interferes with his or her daily functioning.

Categorization

The DSM-IV-TR lists five categories of specific phobia: animal type, natural environment type (e.g., heights, storms, water), blood-injection-injury type, situational type (e.g., airplanes, elevators, enclosed places), and other type.

While the most common phobias in typically developing (TD) children are doctors, dentists, thunderstorms, and the dark (Muris, Sterneman, Merckelbach, Holdrinet, & Meesters, 1998), children with ASD have been found to have more phobias related to situations and to medical procedures (Evans, Canavera, Kleinpeter, Maccubbin, & Taga, 2005). For example, the most common fears in children with ASD include needles or injections (De Bruin, Ferdinand, Meester, de Nijs, & Verheij, 2007; Leyfer et al., 2006), the dark (De Bruin et al., 2007), and crowds (Leyfer et al., 2006). Fear of loud noises is also far more common in children with ASD than in TD children (Leyfer et al.).

Epidemiology

Rates of specific phobia in the typically developing population are as follows: 5% of children in community samples have specific phobia, while 15–20% of children presenting to anxiety clinics have specific phobia (Gadow, Devincent, Pomeroy, & Azizian, 2004; Kessler, Chiu, Demler, Merikangas, & Walters, 2005; Ollendick, King, & Muris, 2002).

Specific phobia is one of the most prevalent anxiety disorders in children with ASD (De Bruin et al., 2007; Leyfer et al., 2006; Muris et al., 1998; Sukhodolsky et al., 2008), with rates cited from 31% to 63% in school-age children and adolescents with ASD (De Bruin et al., 2007; Gadow et al., 2004; Leyfer et al., 2006; Muris et al., 1998; Sukhodolsky et al., 2008) and closer to 20% in preschool children with ASD

(Gadow et al., 2004). Specific phobia also tends to be more severe in children with ASD than in TD children (Gadow, Devincent, Pomeroy, & Azizian, 2005). There is much less research focusing on anxiety disorders in adults with ASD, but Hofvander et al. (2009) found that 6% of adults with ASD and with normal intelligence had specific phobia.

Natural History, Prognostic Factors, and Outcomes

There is little research on prognostic factors or outcomes of specific phobia in ASD, but in typically developing populations, it is thought that genes, temperament, and environment contribute to the etiology and prognosis of specific phobia. Children with specific phobia are more likely to have parents with specific phobia, which may be due to both genetic factors and parenting style (Ollendick et al., 2002). For example, parents with phobias may be more likely to set an example of phobic avoidance and/or be overprotective towards their children, which may increase the likelihood of their children developing specific phobia (Ollendick et al., 2002). Temperament also appears to play a role: children who have inhibited temperaments are at elevated risk for developing specific phobia. Those whose inhibited temperaments are stable between about 2 and 7 years develop specific phobia at rates close to 50% (Kagan, Reznick, & Snidman, 1987, 1988). Children with ASD have been found to have more withdrawn and less adaptable temperaments than typically developing children (Bailey, Hatton, Mesibov, Ament, & Skinner, 2000; de Pauw, Mervielde, Van Leeuwen, & De Clercq, 2011), and it has been theorized that this may lead to higher rates of anxiety (Bellini, 2006).

Genetic factors seem to be involved in an individual's propensity towards general "fearfulness," but the environment (e.g., a frightening experience) contributes to the specific fear (Ollendick et al., 2002). However, while most adults attribute a specific phobia to a direct experience of fear conditioning, most children attribute specific phobia to observing a fear response in others, to reading or hearing about a phobia, or to no obvious cause (Ollendick et al., 2002).

Clinical Expression and Pathophysiology

Clinical Features. Individuals with specific phobia experience excessive or unreasonable fear of a particular object or situation. The fear can occur in the presence of the object or in anticipation of encountering it. When exposed to the phobic object or situation, the individual will almost always experience intense anxiety. In children, this may be expressed by crying, tantrums, or freezing. Individuals with specific phobia often avoid the phobic situation. According to the DSM-IV-TR (American Psychiatric Association, 2000), adults must recognize that the fear is excessive or unreasonable, but this may not be true for children. This feature therefore may also not be present in individuals with developmental disabilities such as autism or mental retardation. Several typical manifestations of phobia in children are as follows: Children with a phobia of loud noises may cover their eyes, cry, or have a temper tantrum when exposed to sounds like fireworks, sirens, or thunder, and they may also avoid situations with loud noises, for example, refusing to go to school when they know there will be a fire drill. Children with a phobia of animals or insects often experience fear when exposed to the animal. They may check a room for an insect or refuse to go into a room where the insect had previously been seen. Children may avoid outdoor activities such as going to a park or going camping due to their fear of insects. Other common behaviors include tantrumming or running out of the room when receiving an injection (medical fears), insisting on sleeping with a nightlight on and refusing to walk through the house at night (fear of the dark), or walking up multiple flights of stairs to avoid an elevator (elevator phobia).

Relation to Age. TD children generally follow a natural developmental progression of fears, i.e., fears related to situations, their natural environment, and strangers decrease as they get older,

while fears of harm and medical fears increase (Evans et al., 2005). Children with ASD do not seem to follow this same developmental progression; unlike for TD children and children with intellectual disability, mental age does not correlate with fears for children with ASD.

Relation to IQ and Severity of ASD. As with other types of anxiety, rates of specific phobia are higher in children with ASD and average IQ than in those with ASD and intellectual disability. However, even in children with ASD and below average IQ, rates are still much higher than in the general population. Sukhodolsky et al. (2008) found rates of 31% and 37% in children with ASD with and without intellectual disability, respectively. The majority of studies of anxiety in the ASD population have examined individuals with high-functioning ASD or pervasive developmental disorder–not otherwise specified (PDD-NOS). However, those studies that have compared rates of specific phobia in autism and autism spectrum conditions (e.g., PDD-NOS) have found that rates of specific phobia are much higher in PDD-NOS (e.g., Muris et al., 1998). Nonetheless, given that much research has also illustrated the difficulty with accurately differentiating between autistic disorder and PDD-NOS (e.g., Chawarska, Klin, Paul, & Volkmar, 2007; Lord et al., 2000), it is unclear how to interpret these findings.

Relation to Other Problems. In children with ASD, specific phobia is associated with conduct problems, impulsivity, hyperactivity, and somatic complaints. In particular, specific phobia is more related to behavioral problems and other types of anxiety in children with ASD than in TD children (Evans et al., 2005). Children with ASD may be more likely to display challenging behaviors such as tantrums rather than communicate their fears verbally due to their deficits in communication skills.

Pathophysiology. There is little research on the pathophysiology of specific phobia in ASD, but there is emerging research linking anxiety to neurological and genetic abnormalities in individuals with ASD. For example, amygdala volume in children with ASD has been found to be positively correlated with anxiety (Amaral, Schumann, & Nordahl, 2008; Juranek et al., 2006), and a particular polymorphism (the 10–10 repeat allele) of the dopamine transporter gene (DAT1) has been associated with greater severity of social anxiety in children with ASD (Gadow, Roohi, DeVincent, & Hatchwell, 2008).

Evaluation and Differential Diagnosis

Evaluation. Diagnostic markers of specific phobia include an intense and irrational fear of a specific stimulus or situation, an exaggerated reaction to the feared stimulus (e.g., crying, tantrumming, running away), and extreme measures to avoid the feared stimulus. Individuals with specific phobia may also display physical symptoms such as shortness of breath, pounding heart, sweating, nausea, or light-headedness. Individuals with blood or injection phobias may feel dizzy or faint.

In clinical practice, specific phobia is commonly assessed through clinical judgment and parent-report measures, such as the Fear Survey Schedule for Children–Revised (Ollendick, 1983), on which parents report how fearful their children are of particular situations and objects. This measure has been used to assess fears of low-functioning children with ASD (Matson & Love, 1990).

Research studies often diagnose specific phobia and other anxiety disorders in children with high-functioning ASD using a structured diagnostic interview such as the Anxiety Disorders section of the Diagnostic Interview Schedule for Children (DISC; Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000), the Kiddie Schedule for Affective Disorders and Schizophrenia (KSADS; Ambrosini, 2000), and the Anxiety Disorders Interview Schedule (ADIS; Silverman & Albano, 1996). The DISC is usually administered with parents only, while the KSADS and ADIS are administered with both parents and children. The Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-1; First et al., 1994) is the adult version of the DISC and has been used with adults with ASD and normal IQ (Hofvander et al., 2009). These standardized

interviews assess DSM-IV criteria for anxiety disorders, including the presence of symptoms, the frequency and severity of symptoms, and the extent of functional impairment. Leyfer et al. (2006) created a modified version of the KSADS for use in children and adolescents with ASD, which is called the Autism Comorbidity Interview-Present and Lifetime Version (ACI-PL).

Many research studies also use parent rating scales to examine fears or symptoms of specific phobia in children with ASD. One commonly used parent rating scale is the Child Symptom Inventory (Gadow & Sprafkin, 1997), which has slightly different versions for children of different ages, including the Early Childhood Inventory-4, ages 3–5; Child Symptom Inventory-4, ages 5–12; and the Adolescent Symptom Inventory-4, ages 12–18. However, these checklists measure a number of childhood symptoms and include only one specific phobia item: "Excessive fear to specific objects."

While some of these measures have not been used with low-functioning children, they may still be appropriate for individuals with cognitive delays. The DISC, the Early Child Inventory and Child Symptoms Inventory, and the Fear Survey for Children (as well as its counterpart, the Fear Survey for Adults) have been used with individuals with mental retardation (Davis, Saeed, & Antonacci, 2008). The Fear Survey for Adults has been adapted for adults with mental retardation, and this version demonstrated good internal consistency and correlations with other measures of anxiety (Ramirez & Luckenbill, 2007).

Differential Diagnosis. Specific phobia may present similarly to other types of anxiety such as separation anxiety disorder (SAD) or social phobia (SOP) as well as to symptoms associated with ASD such as sensory sensitivities.

Children who have fear of or avoid specific places or situations such as school, extracurricular activities, or playdates may present with similar symptoms as children with SAD or SOP. Children who experience distress around going to school or other places due to separation from their caregivers and/or excessive fear that harm may befall themselves or their caregivers while separated may be more accurately diagnosed with SAD (DSM-IV-TR). However, if children fear or avoid school due to fear of school itself rather than fear of separation, they may meet criteria for school phobia. Likewise, children who avoid school or playdates due to fear of social situations or fear of being judged may be more accurately diagnosed with social phobia.

Specific phobia may also overlap with sensory issues in individuals with ASD. For example, the finding that over 10% of children with ASD have a fear of loud noises (Leyfer et al., 2006) may be due to their sensory sensitivity (Baranek, David, Poe, Stone, & Watson, 2006; Ben-Sasson et al., 2007). Reports of fear of objects such as balloons (Muris et al., 1998), which can make loud, startling noises, may also be related to children's sensory issues. Individuals with ASD who display fears should be evaluated for sensory sensitivities as well.

Treatment

Behavioral Treatments. Well-established treatments for TD children with fears and phobias usually combine behavioral exposures with a reinforcement system. A core mechanism of the exposure is systematic desensitization (e.g., Wolpe, Brady, Serber, Agras, & Liberman, 1973) in which the child is gradually exposed to increasingly anxiety-provoking stimuli. Other specific effective components of these treatments include reinforced practice, participant modeling, contingent reinforcement, prompting, modeling, extinction/blocking, and use of distracting stimuli (Davis & Ollendick, 2005; Ollendick & King, 1998). No randomized controlled trials or even larger-scale treatment studies have examined the effectiveness of behavioral treatments for specific phobia in children with ASD. However, a number of case studies have used this type of treatment (i.e., gradual exposure with reinforced practice, modeling, and contingent reinforcement) with children with ASD and found it to be effective in reducing

their fears (Ellis, Ala'i-Rosales, Glenn, Rosales-Ruiz, & Greenspoon, 2006; Gillis, Natof, Lockshin, & Romanczyk, 2009; Love, Matson, & West, 1990; and Ricciardi, Luiselli, & Camare, 2006). For example, Love et al. (1990) treated a child with a fear of going outside by dividing the front yard into seven distances from the front door and putting a retrievable object (e.g., a sticker or newspaper) in each marked-off section. In this treatment, the parent led the intervention and was coached by the therapist. The parent first modeled walking into the yard, then led the child into the yard, and then prompted the child to go into the yard on his own. The child received praise and a reward (e.g., food or a sticker) contingent upon attempting the exposure. The child was gradually prompted to go further and further into the yard.

Cognitive behavioral therapy (CBT) has been shown to be efficacious in treating anxiety in children with ASD (e.g., Chalfant, Rapee, & Carroll, 2007; Reaven & Hepburn, 2003; Reaven et al., 2009; Sofronoff, Attwood, & Hinton, 2005; Sze & Wood, 2007; Wood et al., 2009). The CBT in these studies is similar to CBT used with TD children in that it includes psychoeducation, cognitive restructuring, self-talk, relaxation, and exposure to feared stimuli. However, it has been adapted for children with ASD by simplifying the cognitive aspects and emphasizing concrete aspects such as relaxation and exposure and, in some cases, by addressing poor social and adaptive skills in addition to anxiety (e.g., Wood et al.). While none of these studies examined effects on specific phobia in particular, the CBT used does include similar methods (e.g., graduated exposure, contingent reinforcement) to the behavioral treatments often used to treat specific phobia.

Pharmacological treatments for anxiety have been used off-label with some children and adolescents with ASD, including SSRIs, buspirone, and dextromethorphan. However, these drugs have not yet been tested against a control group or placebo condition in this population (White, Oswald, Ollendick, & Scahill, 2009), and none of these medications have been tested in specific phobia.

See Also

- ▶ Cognitive Behavioral Therapy (CBT)
- ▶ General Anxiety

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Phonemes

Karen Chenausky
Boston University, Boston, MA, USA

Definition

Speech is produced more or less continuously, in terms of the acoustic signal, but it is perceived segmentally. This means that a recording of a word like "wad" contains energy over a large range of frequencies and no gaps in the energy from the beginning to the end of the word. On the other hand, speakers of English know that the word is composed of three sound units, which can be written *w-a-d*. These units are *phonemes*. A phoneme is not the same as a letter because the same letter can stand for different phonemes (e.g., *a* as in "wad" or *a* as in "lad"). A phoneme is also not the same as a unique utterance because repeated utterances of the phoneme /*a*/ will differ from each other acoustically, but they will be perceived as being in the same category – the vowel /*a*/. Thus, a phoneme is a cognitive unit encoding a particular speech sound. Speech is a continuous acoustic signal that is interpreted as consisting of a series of distinct phonemes.

The inventory of phonemes differs for each language. Some languages possess a large number; others a much smaller number, but certain phonemes occur in almost every language. Phonemes combine with each other in ways that are determined by each language individually. For example, some languages permit syllables to end with consonants (i.e., the monosyllabic word "deep"), while in others syllables must end in vowels. In order to standardize the representation of speech sounds across languages, the International Phonetic Association (IPA) has devised an alphabet used to transcribe normal and disordered speech.

See Also

► Phonetics

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Phonemic Awareness

Margaret Snowling
Department of Psychology, Centre for Reading and Language, University of York, Heslington, York, UK

Definition

Phoneme awareness is a metalinguistic skill involving the ability to reflect on and manipulate the phoneme units in spoken words. Phonemes are the smallest units of spoken language which distinguish word meaning, e.g., the difference between "bat" and "back." An important component of phoneme awareness is "phoneme invariance." This refers to the fact that the acoustic-phonetic differences between different realizations of a given phoneme (e.g., the /s/ at the start of "song" and the /z/ at the end of dogs) are not marked in the writing system.

Phoneme awareness and letter-sound knowledge together form the foundations of the "alphabetic principle" and are believed by some to be the precursors of literacy development. A contrasting view is that phoneme awareness is not a cause but a consequence of learning to read, and consistent with this, levels of phoneme awareness are low in adults who have learned to read in a nonalphabetic language, such as in logographic Chinese. Arguably, a parsimonious view is that phoneme awareness has its roots in oral language (phonological development) and it has a reciprocal relationship with reading development. Thus, as children get more familiar with the writing system, their orthographic knowledge feeds back to fine-tune their phonological skills; in turn, better phoneme awareness fuels further reading development.

There are, however, important crosslinguistic differences in the contribution of phoneme awareness to variations in reading ability. In transparent languages, phoneme awareness asymptotes within the first year of school, whereas development of phoneme awareness is much slower in the less regular English language. Moreover, even within transparent languages, the structure of the ambient language plays a role in determining levels of phoneme awareness. For example, one study contrasting Czech and German reported differences between children in their ability to segment initial and final parts of words which they associated with the availability of significantly more complex cluster onsets in Czech and more complex codas in German. In more complex orthographies such as alphasyllabaries, which embody both syllabic and phonemic markers, the acquisition of phoneme awareness takes many years and is associated with increasing reading skill.

Given its importance in learning to read, it is not surprising that training in phoneme awareness is an important component of reading interventions for poor readers who struggle with decoding and spelling skills. However, training phoneme awareness alone has small effects. Effective interventions are those that involve training in segmenting and blending of sounds and linking emergent skills in these areas with print through writing and reading practice.

Children with ASD may often experience difficulty in acquiring phoneme awareness. For some, this difficulty will be a facet of concomitant language impairment. Others will experience difficulty because of the abstract nature of the skill or because of the fact that performance demands executive skills.

See Also

► Phonological Awareness

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Phonemic Errors

▶ Phonological Disorders

Phonemic Fluency

▶ Verbal Fluency

Phonetically Consistent Form

▶ Protowords

Phonetics

Karen Chenausky
Boston University, Boston, MA, USA

Definition

Phonetics is the study of human vocal sounds, and linguistic phonetics is the study of those sounds that are used in speech. Some authors use the term "phonetics" to refer only to the study of speech sounds, but nonspeech vocal sounds such as infant cries, coughs, and singing can employ many of the same methods as are used in linguistic phonetics even though speech per se is not involved.

There are many aspects to the study of phonetics, but three main ways of investigating it are by using *perceptual* methods, *acoustic* methods, or *instrumentation*. Perceptual methods involve the auditory analysis of speech or vocal sounds, using either live or recorded stimuli. Since much research concerns the intelligibility, comprehensibility, or other type of impression of the vocal sound on another human, perceptual methods are considered the most ecologically valid. However, the human speech perceptual system is noted for its biases, many gained through experience with speech. These biases help humans filter extraneous information from the speech signal and extract just the information that will be useful for making quick decisions about what is being communicated. However, information which is "extraneous" in this sense is often scientifically useful, so *acoustic* methods are often paired with perceptual ones to provide a fuller picture of the speech signal.

Acoustic research in phonetics incorporates knowledge of normal and disordered vocal tract physiology, mathematical acoustics, signal processing, and perceptual psychophysics. Recordings of vocalizations are digitally processed (generally using an algorithm of the Fourier transform) and displayed on a computer screen in the form of a spectrogram, which is a graph showing the changes in frequency and amplitude of the utterance over time. From this, visual-perceptual analyses can be performed, along with quantitative measurements of frequency and amplitude at various points in the utterance.

Other instrumentation is also used in phonetic research. For example, a palatometer shows where the tongue contacts the hard palate during speech production. A nasometer measures airflow through the nasal passages during speech. X-ray videography and electropalatography give views of how the articulators of speech (lips, tongue, palate, velum, pharynx, and others) move during utterances.

In order to standardize the representation of speech sounds across languages, the International Phonetic Association (IPA) has devised an alphabet used to phonetically transcribe normal and disordered speech.

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Phonics, Learning to Read with

Margaret Snowling
Department of Psychology, Centre for Reading and Language, University of York, Heslington, York, UK

Definition

"Phonics" is the term used in relation to the use of systematic letter-sound translation and blending skills. It is also used to refer to a form of reading instruction which focuses on sounding out words.

The primary goal of reading is understanding, and in order to accomplish this, a crucial step is the development of fluent decoding skills. Decoding is vital to reading comprehension; if a child cannot decode, then he or she will be unable to extract meaning from the written word.

Learning to read in an alphabetic system, such as English, requires the ability to translate between letters and sounds – a process sometimes referred to as "phonics." In the early stages of learning to read within an alphabetic system, children's attention is devoted to establishing decoding skills ("*phonics*"). Later, children begin to rely increasingly on word meanings to gain fluency in their reading, and they use broader language skills including vocabulary, grammar, and pragmatics to understand what they read. It is now well established that individual differences in the ability to decode using phonic strategies in English depend upon early letter-sound knowledge and phoneme awareness. However, the reading curriculum can also make a difference to how quickly children acquire these skills. The term "phonics" is often used to refer to a type of reading instruction which emphasizes the translation of letters into sounds and blending the sounds together. There is a substantial body of evidence suggesting that reading develops more quickly in children who are taught using such a systematic phonic approach which includes teaching not only about letter-sound relationships (e.g., "s" = /s/) but also more complex grapheme-phoneme correspondences, e.g., "ea" = /E/.

Another important factor which affects the rate at which children develop phonic skills is the regularity or transparency of the language in which they are learning. Transparent languages, such as Finnish or Italian, present much less of a challenge for decoding than English because in these languages, the mappings between letters and sounds are typically consistent (there are few irregularities). It follows that learning to read in transparent languages is faster than in English though importantly, the predictors of individual differences in reading skills are comparable across these languages. Thus, letter knowledge and phoneme awareness are robust cross-linguistic predictors of reading achievement during the early and elementary school years. In addition, performance on tests which require the rapid naming of familiar items, such as digits or colors, is a universal predictor of reading fluency, and a deficit on such tasks is a marker of reading disorder.

Many standardized tests are available for the assessment of decoding skills and the efficiency/fluency with which they can be applied. Nonword reading provides a pure test of decoding ability since it requires children to read words they have not seen before.

Decoding is a relative strength in a substantial proportion of individuals with ASD. Somewhat surprising in this light is that nonword reading is often impaired. The term "hyperlexia" has often been applied to individuals on the autism spectrum whose word-level decoding skills are in advance

of mental age and significantly ahead of their reading comprehension abilities. The reasons for such fractionation of skills are unknown.

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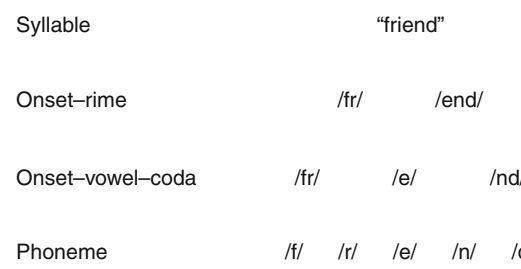
Phonological Awareness

Margaret Snowling
Department of Psychology, Centre for Reading and Language, University of York, Heslington, York, UK

Definition

Phonological awareness is the term used to refer to the ability to reflect on the speech-sound segments of spoken words. It is a conscious metacognitive ability that emerges during the late preschool years and is refined during the process of reading acquisition. Although phonological awareness is essentially an aspect of oral language skill, a persistent difficulty with its acquisition is an important universal marker of reading disorder.



Phonological Awareness, Fig. 1 Hierarchical structure of the English syllable

It is generally believed that the development of phonological awareness proceeds from large to small units. However, the rate of development also depends upon how accessible the units are in the spoken language and the nature of the mappings between the phonology and the orthography of the language.

English has a complex syllable structure as well as mappings between phonological and orthographic units at varying sizes. In phonological terms, all syllables contain a vowel, e.g., a simple CVC syllable (e.g., man) comprises an onset (the consonant before the vowel /m/) and a rime (the unit comprising the vowel and the final consonant or coda – /an/). Rime units can in turn be segmented into phoneme units, namely, the vowel /a/ and the coda /n/. In more complex syllables, both the onset and the coda may include consonant clusters (e.g., /clasp/). Figure 1 shows how a syllable in English can be split into units of different sizes. In English, mappings between phonemes and letter units (graphemes) are less consistent than mappings between rime units and graphemes, and hence, the relationships between phonological awareness, reading, and spelling are complex.

Phonological awareness is also involved in learning to read in nonalphabetic systems, but within these, the units which are important may differ. Syllabaries are writing systems that map between syllables (in Japanese "mora") and units of meaning, and progress in reading is related to

syllable awareness. In logographies, such as Chinese, the mappings between characters and sounds are abstract and complex, and evidence suggests that awareness of the tonal structure of the language as well as morphological awareness are important predictors of learning to read.

Measuring phonological awareness is challenging, and method variance can often account for differences in the findings of different studies both within and between languages. Generally, tasks involving the manipulation of larger units (e.g., syllables or rime units) are easier than tasks involving smaller units (phonemes). Tasks involving the deletion or transposition of sounds within words are typically harder than tasks requiring judgments about the similarity between sounds in words. However, more importantly, the difficulty of a phonological awareness task depends on the size of the phonological unit and the nature of the manipulation that is required. Given the diverse range of skills required to complete phonological awareness tasks, including the abstract nature of task instructions, it is not surprising that many children with ASD struggle with such tasks.

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Phonological Deficits

► Phonological Disorders

Phonological Development

Elizabeth R. Eernisse
Department of Language and Literacy, Cardinal Stritch University, Milwaukee, WI, USA

Definition

Phonological development refers to the gradual acquisition of an adultlike system of speech sounds that are used to convey meaning in a language. Phonological development can be considered in terms of both perception and production of speech sounds.

Historical Background

Historically, the development of speech sounds has been characterized in terms of the development of articulation abilities, with recent attention being paid to the notion that a larger set of rules and linguistic representations may also govern how individuals acquire speech sounds.

Current Knowledge

Perception

Research has demonstrated that infants are aware of speech sounds long before they are able to produce them. For example, infants at 1 month of age are able to discriminate speech sound categories such as the difference between phonemes /p/ and /b/ (i.e., categorical perception; Eimas, Siqueland, Jusczyk, & Vigorito 1971). Over time, infants also develop the ability to track features of speech such as prosody (i.e., changes in pitch and loudness or the "melody" of speech) and stress patterns, as well as realize which distinctions between sounds are not meaningful in their native language (e.g., variability between speakers producing the same sound as in the case of a male versus female

speaker, versus the meaningful difference between two distinct speech sounds). In addition, infants as young as 6 months of age have been shown to track the frequency with which speech sounds occur within a speech stream (i.e., phonotactic characteristics) (Saffran, Aslin & Newport, 1996), a skill that has been linked to later vocabulary learning. In addition, by 10–12 months, infants demonstrate a reduced ability to recognize nonnative speech sound contrasts as the infant appears to have honed in on the sounds that occur within the language(s) to which he or she has regularly been exposed. It is in this early period that infants typically begin to demonstrate recognition of single words. During the second year of life, infants refine their vocabulary comprehension abilities to be able to discriminate between words that sound very similar (e.g., "bih" and "dih") and associate those words to new objects that are encountered in the environment, recognize words when provided with only a portion of the relevant phonetic information, and are able to comprehend words even if they are mispronounced. Perceptual abilities continue to progress as the child begins to associate phonological features with aspects of spoken language (see ▶ Phonological Awareness).

Production

Infants begin to explore and experiment with their vocal tracts from birth. The earliest sounds that are produced are reflexive vocalizations, such as sneezing and breathing. As the infant matures, sounds include cooing and laughter, with increased variety of consonant and vowellike sounds. Vowel sounds are typically produced the earliest, followed by consonant-like approximations that are produced in the back of the throat (e.g., /g/ and/k/) which are then followed by sounds that are produced in the front of the mouth (e.g., /m/, /n/, /b/, /p/). In addition to adding new sounds to the repertoire, the speech sounds are combined in sequences of increased length and complexity as the infant engages in vocal play. From 6 to 10 months, infants typically produce "reduplicated" syllables (i.e., repeated syllables containing the same consonant and vowel, e.g., "babababa"). From 10 to 14 months, babbling incorporates more variety in terms of sounds/syllables and pitch contours and is referred to as "nonreduplicated". In addition, at approximately 1 year of age, infants use speech sounds to produce their first spoken words. In typical development, spoken vocabulary continues to grow well into school age and beyond.

As the child acquires more and more words, systematic patterns of sounds often emerge known as phonological processes (see examples of English phonological processes below, Hoff, 2005).

- Weak syllable deletion: omission of an unstressed syllable in the target word, e.g., "nana" for "banana."
- Final consonant deletion: omission of the final consonant in the target word, e.g., "ca" for "cat."
- Reduplication: production of two identical syllables based on one of the target word syllables, e.g., "baba" for "bottle."
- Consonant harmony: target word consonant takes on features of another target word consonant, e.g., "guck" for "duck."
- Consonant cluster reduction: omission of a consonant in a target word cluster, e.g., "top" for "stop."
- Velar fronting: a sound that is typically produced at the back of the mouth (e.g., /k/ or /g/) is replaced by a sound that is produced further forward, e.g., "ti" for "key."
- Stopping: a fricative (i.e., a consonant that is produced with friction such as/s/, "sh," "f," or "v") is replaced by a stop consonant in which airflow is completely obstructed (e.g., "ti" for "sea").

By early school age, most phonological processes have resolved in typical development, as the child's productions more closely match the adult form. However, some children demonstrate lingering phonological processes that impact intelligibility (see ▶ Phonological Disorders).

Future Directions

Current research in phonological development is exploring the existence of what would be considered linguistic universals that govern all languages versus the acquisition of language-specific phonological rules.

In addition, a body of research exists that explores phonological development and its impact on the acquisition of reading and writing skills, in hopes of developing targeted instructional techniques for academic success.

See Also

► Articulation

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Phonological Disorders

Maura Moyle and Steven Long
Speech Pathology & Audiology, Marquette University, Milwaukee, WI, USA

Synonyms

Phonemic errors; Phonological deficits

Short Description or Definition

A phonological disorder is an inability to articulate speech sounds accurately. The disorder may have a motoric (phonetic) component as well as a linguistic or cognitive (phonemic) basis. Therefore, phonological disorders may affect both the intelligibility of a child's speech and his or her internalized knowledge of the language's sound system. The errors committed are usually rule governed, i.e., they show a pattern across all words spoken.

Categorization

The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR; American Psychiatric Association, 2000) specifies three criteria that must be present in order for a phonological disorder to be diagnosed. First, an individual must exhibit a failure to use speech sounds that are developmentally appropriate for his or her age and dialect. Second, the phonological deficits must interfere with academic, occupational, and/or social functioning. Third, the speech difficulties must be above and beyond those that are typically associated with environmental deprivation or conditions that may be present in the individual, such as mental retardation, speech-motor impairments, or sensory deficits.

Epidemiology

Phonological disorders are among the most prevalent communication disabilities diagnosed in preschool and school-age children, affecting 10% of this population. Children with phonological disorders are also at risk for reading and writing disabilities. If left unresolved, phonological disorders have long-term consequences that may interfere with an individual's future social, academic, and vocational well-being, largely resulting from persistent, reduced intelligibility of speech.

For individuals with ASD, impairments of phonological skills may be present, but compared to the difficulties shown in other language domains (social communication, stereotyped lexical usage, etc.), these skills are relatively preserved. Approximately one-third to one-half of individuals with ASD present with significant difficulty using speech as a functional and effective means of communication. In these individuals, it is not uncommon for vocal attempts to be of limited intelligibility due to difficulties producing a variety of consonant sounds and using more complex syllable structures, such as those in multisyllabic words. The nature of these difficulties is not well documented in the literature; however, underlying difficulties may include challenges with oromotor planning and/or delays in phonological development (Lord & Paul, 1997; National Research Council, 2001). An estimated one-fourth of children with ASD are nonverbal, i.e., they lack spoken language. Most children with ASD who speak begin to do so by age 7 and almost never after age 13 (Pickett et al., 2009).

Among speaking children with ASD, there is typically no specific developmental impairment at the level of segmental phonology (consonant and vowel production). The speech that they produce will generally be understood, though, as with all children, it will undergo a process of developmental change to become more and more adultlike. Although unintelligible speech is not a core feature, atypical cases have been reported in the literature of children with ASD who exhibit severe phonological difficulties (e.g., Wolk & Giesen, 2000). Moreover, there is evidence that distortion errors – which represent a phonetic rather than phonemic disorder – may persist into adulthood (Shriberg et al., 2001). Perception of speech sounds appears to be different in individuals with ASD. Functional imaging studies have indicated that both children and adults with autism show deficits in speech sound processing (Boddaert et al., 2004). This impairment is limited to speech sounds; it does not affect the perception of tones (Whitehouse & Bishop, 2008). The relationship between these deficits and the speech production abilities of individuals with ASD is not yet known.

Natural History, Prognostic Factors, and Outcomes

The development of speech begins at birth. As the speech mechanism systems of breathing, voice, and articulation mature, an infant is able to make controlled sound. This begins with soft, repetitive "cooing" vocalizations and by 6–7 months has progressed to repetitive syllables such as "ba, ba, ba" or "da, da, da." This babbling becomes more elaborated and melodic so that it often has the tone and cadence of adult speech but does not contain real words. By the end of their first year, most children are starting to say a few simple words.

During the second year of life, children slowly develop a single-word vocabulary and by the end of that year most are putting words together. During the period of single-word speech, it is believed that children learn the sound structure of words as wholes. After the point where they have learned around 50 words, they begin to show awareness of the individual sounds or phonemes in words. The errors they commit start to show regularity, so that the same mistakes are committed on the same phonemes in different words (e.g., /s/ will be replaced by /t/ in the words sun, see, sick, etc.).

During the remainder of the preschool years and, for some children, extending into the early school years, there is a gradual process of phonological learning that can be described from two

perspectives, one of sound mastery and the other of error suppression. In the first perspective, children are seen to slowly master all the vowels, individual consonants, and consonant sequences of their native language. Certain classes of sounds are mastered earlier than others. For example, many early emerging sounds are made in the front of the mouth by blocking the flow of air or directing it into the nasal cavity: /p, b, t, d, m, n/. Later emerging sounds are either made in the back of the mouth (e.g., /k, g/) or by partially blocking airflow to create fricative sounds (e.g., /s, z, th, sh/). In the second perspective on phonological development, children are observed to show regular ways of simplifying their pronunciations compared to those of adults. These patterns, or phonological processes, include changes to the syllable structure of words (e.g., omitting unstressed syllables or eliminating one of the sounds in a consonant sequence), omissions of sounds (especially at the ends of syllables), and substitutions of earlier/simpler sounds for later/more complex ones (e.g., substituting /t or d or k or g/). Many phonological processes occur commonly in children and are considered to be part of their biological predisposition; these are referred to as "natural" processes. Others may be idiosyncratic or unique to an individual child.

Phonological disorders in children are characterized by speech that is difficult to understand, especially by individuals who do not know the child speaker well. As a rule of thumb, children should be understood by strangers about half the time at age 2, about 75% of the time at age 3, and nearly all the time at age 4. When speech is unintelligible, it is usually due to a combination of common and uncommon errors. Certain of the normal or "natural" phonological processes may persist beyond the ages at which they are normally suppressed. Other atypical or idiosyncratic processes may also be present. There may also be a combination of phonemic (substitution, omission, and addition of sounds) and phonetic (distortions of sounds) errors together in the same child. Individuals with ASD may present unintelligible speech for all these reasons and, in addition, may exhibit disturbances of prosody that further compromise their intelligibility.

Clinical Expression and Pathophysiology

Phonological disorder is an impairment in the ability to comprehend or produce the sound system of a language. This sound system is characterized as having two parts: segmental phonology, which pertains to consonants and vowels and their combination into syllables, and nonsegmental phonology (also called suprasegmental phonology or prosody), which includes speech variables such as rate, stress, intonation, and pause. In the field of speech-language pathology, the term phonological disorder is typically used to refer to segmental problems, specifically difficulty in inducing the rules that govern sound combinations. Thus, a phonological disorder is viewed as a subtype of language disorder (Bauman-Waengler, 2012).

With such disorders, errors are observed in the production of individual speech sounds and in the formation of syllable structures of words. Sounds may be omitted, substituted by other sounds, or added to the normal form of a word. When these errors are numerous or result in sounds quite different from the targets, they may produce speech that is partially to fully unintelligible to a listener, especially one who is unfamiliar with the speaker. Phonological disorders are distinguished from phonetic disorders (also described as articulation disorders) that result from slight misalignments of the articulators during speaking and are manifested as distortion errors. Unlike phonetic disorders, phonological disorders are frequently part of a larger language disorder characterized by impairments of one or more other linguistic domains such as vocabulary, comprehension, morphosyntax, or literacy.

Although nonsegmental phonological or prosodic impairments are normally not considered part of a phonological disorder from a clinical perspective, they clearly belong within the linguistic domain of phonology. Moreover, unusual prosodic features are a concomitant behavior in many individuals with autism. It is one of a number of behavioral red flags that distinguish toddlers with autism from those either developing normally or with other types of developmental

delay (McCann & Peppe, 2003; Wetherby et al., 2004). Among the speech production behaviors where differences are reported to exist are stress, rate, chunking (verbal phrasing), intonation, and expression of affect. Problems have also been noted in the detection and comprehension of prosodic variation in speech. In spite of this, accounts of prosodic disability in autism are inconsistent and have utilized widely varying populations and methodologies.

Evaluation and Differential Diagnosis

Phonological disorders in young children are assessed through standardized and nonstandardized procedures. Optimally, two speech samples are obtained: one of single-word speech, typically elicited through a picture- or object-naming task, and the second of connected speech, gathered through a play interaction or short interview. To elicit the first type of sample, a large number of standardized, norm-referenced tests of speech sound production are available for children 3 years or older (e.g., *Clinical Assessment of Articulation and Phonology*, Secord, Donohue, & Johnson, 2002; *Goldman-Fristoe Test of Articulation-Second Edition*, Goldman & Fristoe, 2000; A*rizona Articulation Proficiency Scale, Third Revision*, Fudala, 2000).

Speech samples of both types are transcribed phonetically and then analyzed to determine whether the child displays primarily speech production deficits (phonetic errors or sound distortions) and/or deficits associated with phonological constraints (phonemic errors of omission, substitution, or addition of sounds). Independent analyses such as a phonetic inventory (listing of all sounds produced, regardless of correctness) are used to evaluate possible sensory or motor limitations. The child is also screened for auditory acuity and is given an oral-peripheral examination to determine whether there exist structural or physiological limitations to speech. Relational analyses such as an assessment of phonological processes (patterns of sound simplification, such as replacing posterior /k, g/ sounds with anterior /t, d/ sounds) are used to determine whether errors are developmentally common or idiosyncratic. The identification of error patterns also forms the basis for treatment to improve speech intelligibility.

Treatment

In the treatment of phonological disorders, the primary goal is to improve a child's speech intelligibility to facilitate effective communication. This entails both teaching the accurate production of speech sounds and improving the conceptual organization of speech sound information so that phonemic contrasts are clearly marked. Effective and efficient treatment relies on generalization of learning. The goal is to induce a widespread change in a child's sound system so that it is more in line with the phonology of the target language.

Treatment often occurs in the context of an interdisciplinary service delivery team that may include speech-language pathologists, audiologists, nurses and physicians, occupational and physical therapists, parents, psychologists, social workers, special educators, and teachers. The composition of this team is dependent on the child's needs not only in the area of communication but in development generally. The team initiates and coordinates the optimal intervention program for the child and facilitates the program's transfer and utility in daily settings.

After assessing the phonological disorder and identifying and prioritizing the errors that exist, a treatment plan is developed to correct speech sound production. The goal of treatment is to improve accuracy and use of speech sounds so that intelligibility is improved in both single words and connected speech. Generalization is sought across all settings in which children communicate. No single treatment approach is used. In general, all approaches utilize structured sound production practice at gradually increasing levels of difficulty.

Intervention for individuals with ASD must often be adapted to suit their unique interests, styles of interaction, and sensory preferences and aversions. For example, the commonly used

technique of saturating the child with auditory models of a target speech sound might prove disastrous with an individual who is auditorily hypersensitive. Another common technique, contrasting minimal word pairs such as "call" and "tall," may be difficult to implement because it relies on role reversal, the teacher playing the student, and vice versa.

See Also

- Articulation
- Articulation Disorders
- Auditory Acuity
- Intonation
- Prosody
- Speech Delay

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Phonology

Elizabeth R. Eernisse
Department of Language and Literacy, Cardinal Stritch University, Milwaukee, WI, USA

Synonyms

Articulation; Speech

Definition

Phonology refers to the system of speech sounds within a particular language. Phonology differs from articulation in that phonology is concerned

with the rule-governed ways in which speech sounds are used and interact with each other to encode meaning within a language, while articulation is generally associated with the movement of structures to produce speech sounds.

See Also

- ▶ Articulation
- ▶ Speech

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Phrase Length

Joshua Diehl
Department of Psychology, University of Notre Dame, Notre Dame, IN, USA

Definition

Phrase length is a measure of the complexity of expressive language. A phrase is a grammatical construction (e.g., noun phrase, verb phrase) that does not contain both a subject and a predicate; therefore, it does not qualify as a full sentence. It is one type of measure that can be used to estimate an individual's level of spoken language.

See Also

- ▶ Grammar
- ▶ Language Acquisition
- ▶ Narrative Assessment
- ▶ Syntax

Phrenology

Joshua Diehl
Department of Psychology, University of Notre Dame, Notre Dame, IN, USA

Synonyms

Craniognomy; Craniology; Cranioscopy

Definition

Phrenology was an early psychological theory that mental abilities were compartmentalized in specific areas in the brain, and that the strength of these abilities could be determined by the size of the bump in the skull for that particular ability. This theory received little research support and is typically only mentioned as a historical prologue to modern psychology. Phrenology was originally proposed by Francis Gall in 1796 and was one of the first to suggest that a brain function could be localized to a specific area of the brain.

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Physical and Neurological Examination

Susan M. Strahosky
School of Medicine and Dentistry, University of Rochester, Rochester, NY, USA

Definition

The physical examination is performed by a physician, nurse practitioner, or other trained

medical care provider to determine the state of health of an individual. It is important for a physical examination to be performed as part of an initial evaluation of a child with an autism spectrum disorder to identify co-occurring medical or etiologic disorders. A standard approach to the assessment of all organ systems is used. The neurological examination determines if abnormalities exist in the central or peripheral nervous system using a standard approach based on the understanding of motor, sensory, coordination, and cognitive systems.

Historical Background

Kanner's original 1943 case reports of children with autism contain few references to the physical or neurological exam. One child was described as resembling his father physically. Several had an "intelligent physiognomy." There was one child with a supernumerary nipple, but no other congenital anomalies are reported. Physically they were described as essentially normal though 5 of the 11 had an increased head circumference. Gross motor clumsiness was also present in several cases. As the diagnosis was more widely evaluated, initially more focus was placed on a psychoanalytic approach to understanding autism. When interest in exploring the biological basis for autism increased, physical findings were still minimally noted. A review of the literature in 1973 indicated physical findings that were primarily soft signs including poor tone, poor coordination, clumsiness, exaggerated reflexes, and strabismus (Ornitz 1973). Maurer and Damasio in 1983 explored the neurological basis for autism relating core behaviors to known diagnoses and their anatomic correlate to localize areas of dysfunction and better understand the etiology of autism. As autism became understood as a neurobiological disorder, there was interest in the role known congenital medical disorders played in autism. Cases associated with a known syndrome or medical disorder were reported at 10–20% (Barton and Volkmar 1998). However, that number is decreasing as fewer children identified with ASD have a coexisting intellectual disability and intellectual disability is associated with a higher rate of identifiable disorders. A distinction is made between syndromic autism and idiopathic autism with an essentially normal exam (Johnson and Mayes 2007).

Current Knowledge

The complete evaluation of a child suspected of having an autism spectrum disorder is a multipart process. The physical and neurological exam is informed by a comprehensive medical and developmental history. While performing a detailed physical, dysmorphologic, and neurological exam is important, the clinical history increases the clinician's index of suspicion. It prompts evaluation of associated findings while performing the exam.

History of delays in reaching multiple developmental milestones can suggest intellectual disability which is a comorbid diagnosis with autism spectrum disorder in some 50% of children. The physical exam can provide findings suggestive of a genetic disorder associated with intellectual disability. History can indicate symptoms of disorders that are increased in children with autism. These include sleep disorders and gastrointestinal problems. Oral findings, body habitus, and growth should be assessed as contributors to these problems.

The history of functional abilities will characterize eating, sleeping, toileting, and other activities of daily living such as dressing. Performance of these tasks can help characterize motor findings associated with autism. Motor clumsiness or dyspraxias (motor planning problems) will present as difficulties learning to chew or drink from a cup or, in the older child, delays in learning to dress or to write. Sensory integration difficulties can present as issues with food textures, temperature, and taste. Tactile sensitivity to clothing tags or tight clothes can complicate getting dressed. The clinician will want to evaluate tone and coordination and motor function to better characterize these presenting concerns.

Family history will indicate others with autism, intellectual disability, genetic disorders, or birth defects. Preconception events such as advanced parental age as well as preterm birth complications may raise the risk for ASD. The exam can identify findings that are familial or complications of prematurity such as chronic lung disease, visual impairment, or growth problems. Prenatal exposures can have effects that are identifiable on exam such as microcephaly and facial findings seen with fetal alcohol syndrome.

Parents who are bringing a child either for further evaluation following diagnosis or with significant behavioral concerns prior to diagnosis may wish to review resources detailing how to approach the exam and prepare the child. This will engender less stress on the child's part and assist the clinician in having time for observation and examination. Children can be prepared visually with videos, social stories, books, or pictures. Doctor kit toys can allow the child to practice the exam. Office staff appreciate a parent letting them know what to expect from the patient. For example, a child who is distressed with noise and movement may be brought in as soon as possible to wait in a quiet room instead of a busy waiting room. Staff may suggest other appointment times that will facilitate this. Vital signs may need to be done by hand rather than machine. In making the appointment, staff can let parents know how much time will be needed and what information they should make available. If the clinician has time to review school reports or testing results before the visit, additional adjustments can be made knowing the child's level of function.

It is not unusual for children with disabilities to have difficulty with office-based screenings of hearing and vision. The child may not be able to follow the directions due to cognitive, verbal, or attention problems, but it may be assumed that the child did "not want to cooperate." A normal newborn hearing screening test does not rule out a progressive hearing loss. Staff will want to tell the examiner about the interaction as well as the results and see that a reliable result is obtained or a referral made to an audiologist where a variety of evaluations are available. There is an increase in hearing and visual impairment in autism spectrum disorders. Autism spectrum disorders are more frequent in children with optic nerve hypoplasia such as septo-optic dysplasia.

Interaction during the physical examination provides opportunities for additional informal observation of core behaviors diagnostic of an autism spectrum disorder including deficits in social interaction and communication and repetitive behavior. A young autistic child may be indifferent to the examiner. Other young children may appreciate the chance to play with the "doctor's toys," and this can be a measure of engagement, enjoyment, and turn taking. Response to the examiner's directions allows observation of eye contact and engagement with the examiner and the ability to imitate. For the verbal child, vocal quality, tone and prosody, and the ability to follow verbal directions as well as the patient's comments and questions can be assessed. Equally important are associated behavioral findings that include pica, self-injury, irritability, ADHD-type symptoms, anxiety, or depression. The physical exam offers opportunities to observe activity level and impulsivity related to ADHD. A child who can talk but will not can be assessed for autism but also for selective mutism, social anxiety, or depression.

Physical evaluation for a child with a suspected autism spectrum disorder includes a comprehensive pediatric assessment. Vital signs and growth parameters should be reviewed. Symmetric growth delays can be familial or indications of a genetic syndrome. Overgrowth can also suggest a genetic contribution (e.g., Sotos syndrome). A short child with a preserved head circumference may have a genetic or endocrine disorder.

Measurement of head circumference is important. Macrocephaly is seen in 25–30% of children with autism. Microcephaly is present in 5–15% and is associated with a poorer outcome. If microcephaly is present at birth, this can indicate prenatal or genetic problems. A normal head circumference at birth followed by poor growth may be due to perinatal event. In Rett syndrome, head growth decelerates in the second half of the first year of life.

Head circumference is normal or below average in autism spectrum disorders at birth followed, in some children, by a rapid increase in growth leading to macrocephaly as a toddler. This does

not persist into adulthood being present in 1–3% of adults with ASD (Myers 2009). Macrocephaly is associated with PTEN along with associated skin findings of lipoma and penile freckling.

Examination should look for comorbid medical conditions. These include, for example, evaluation of middle ear status where infection or fluid can lead to conductive hearing loss. A small midface, high arched palate, or enlarged tonsils with a history of sleep disturbance suggests a risk of obstructive sleep apnea. A child with GI complaints may have abdominal fullness, discomfort, or a palpable mass in the left lower quadrant consistent with constipation. Obesity can complicate the presentation for a child with hypotonia and/or motor delays. The presentation of some disorders changes over time and repeated exams can be informative. Head growth trends can be confirmed, and findings may become more typical of a particular syndrome.

A careful dysmorphology examination is indicated. In general, dysmorphic features and a lower IQ increase the likelihood of finding a medical biologic diagnosis.

Examination of the head includes (in addition to head circumference) examination of head shape and hair whorl patterns. Facial proportion evaluation can identify prominent forehead, frontal bossing, small midface, or chin. Ear placement, size, and structure should be noted, as well as the presence of tags or pits. Eye exam includes eyebrow, eyelids, shape, position, and patterns and pigmentation of the iris. Examination continues with the shape of the nose and formation of the philtrum. Size of the mouth, shape of lips, and position (upturned or downturned lips) should be noted. Oral exam includes tooth shape and enamel defects, shape of hard palate and uvula, and the tongue.

Examination of the hands and feet is also informative. Hand exam includes finger length and relative proportion, separation or syndactyly, clinodactyly, and palmar creases. Significant second and third toe syndactyly is a finding in Smith–Lemli–Opitz syndrome which is associated with autism spectrum disorder. Other findings include ptosis, cleft palate, and microcephaly and growth retardation (Smith's 2006).

Detailed skin exam with an ultraviolet Wood's lamp looks for findings such as café au lait spots or axillary freckling characteristic of neurofibromatosis or shagreen patch and pale areas/ash leaf spots characteristic of tuberous sclerosis (Smith's 2006). Lipomas and penile freckling are associated with PTEN.

Known genetic syndromes include chromosomal and single gene disorders. Down syndrome is a chromosomal disorder (trisomy 21) that is associated with a characteristic pattern of findings. Up to 7% of individuals with Down syndrome are identified as having an autism spectrum disorder. Findings on exam can include microcephaly, flattened occiput, small ears, epicanthal folds and speckled iris, short neck, single palmar crease, and hypotonia.

Fragile X is a single gene disorder (*FMR1* gene) found in 1–3% of children with an autism spectrum disorder. Physical findings include macrocephaly, prominent ears, hypotonia, and macroorchidism identifiable after puberty.

The neurological exam typically includes assessment of cranial nerves, muscle strength and tone, reflexes, and gait. In assessing children on the autism spectrum, hand, finger, and gait stereotypies are often observed. Additional observation may be necessary to discriminate tics from stereotypy. Differences can be seen qualitatively in the performance of skills.

Details of the exam change with the age of the child. In the infant, this will include an assessment of the primitive reflexes and whether they are abnormally persistent. Focal findings and asymmetries of tone leading to delays raise concerns for intracranial processes. In an evaluation of children age 2–6 with an autism spectrum disorder and no diagnosable medical condition, over 60% had hypotonia and/or hyporeflexia (Akshoomoff et al. 2007). Hypotonia with regression and FTT may raise suspicion of a mitochondrial disorder. Assessment of functional abilities provides additional information about delays, regression, or disordered patterns of development. Unusual gait patterns have been associated with autism spectrum disorders, though not all researchers have found differences (Ozonoff et al. 2008). Persistence

of primitive reflexes, regression, or asymmetry of motor findings may appear with repeated exams.

In older children, additional assessment of neurological soft signs will help characterize motor deficits or delays. These include assessments such as posturing or motor overflow when performing stressed gaits, motor impersistence or tremor, synkinesis, and motor movement. A drawing with the child's name offers information about motor and cognitive skills. Additional assessment of verbal and nonverbal language enriches this evaluation.

Future Directions

As noted, autism without a known medical or syndromic diagnosis, referred to as idiopathic autism, is less likely to be associated with intellectual disability (Johnson and Mayes 2007). However, an increased number of dysmorphic findings have been identified in individuals with idiopathic autism (Ozgen et al. 2011). Use of a systematic dysmorphology examination may eventually identify phenotypes that can be correlated with newer genetic information. Currently, microarray analysis can identify genetic differences in up to 10% of cases of idiopathic autism (Miles 2010).

There are also consistent reports of motor delays and deficits in gait and praxis reported in the children with nonsyndromic autism that distinguish them from nonautistic peers (Fournier et al. 2010). It is hoped that a more systematic evaluation of these findings and their course over time can also identify diagnostic subgroups that will correlate with outcome.

See Also

- ▶ Ataxia
- ▶ Congenital Disorders
- ▶ Constipation
- ▶ Down Syndrome
- ▶ Dystonia
- ▶ Eyeblink Reflexes
- ▶ Fragile X Syndrome
- ▶ Genetics
- ▶ Hypotonia
- ▶ Medical Conditions Associated with Autism
- ▶ Microcephaly
- ▶ Periventricular Leukomalacia
- ▶ Tics

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Physical Medicine

► Physical Therapy

Physical Therapy

Beth Garrison
Hartford Hospital Pain Treatment Center, Bristol, CT

Synonyms

Physical medicine; Physiotherapy; PT; Rehabilitation

Definition

Physical therapy involves the treatment and prevention of physical disorders or injuries that cause a person to lose normal mobility, strength, range of motion, or quality of their physical functioning. Physical disorders can be due to medical problems related to congenital conditions, acquired diseases and illnesses, or the result of an individual's inadequate maintenance of proper posture and joint alignment over time.

Physical therapy is performed and overseen by a licensed physical therapist, also known as a PT. Physical therapists are trained healthcare providers who evaluate, diagnose, and treat people of all ages, from newborns to the oldest individuals. PTs use a patients' history, medical records, and a full physical examination to determine a plan of care that involves education, treatment, and maintenance of any gains achieved. PTs are also involved with the training and education of a patients' caregivers, including parents, spouses, teachers, aides, and other individuals.

Physical therapy can utilize many treatment modalities such as specific exercises, manual treatments, gait and movement retraining, manipulations of tissue and/or joints, education, and other interventions. Treatments can also be performed by physical therapy assistants who act under the direction of the physical therapist.

Because autism is a pervasive developmental disorder, it is common for people with autism to have delays, differences, and disorders of their gross motor skills which can benefit from physical therapy intervention. In very young children, physical therapy can improve basic motor skills like sitting, rolling, standing, and playing. PTs can provide education to parents for techniques they can use to help the child gain strength, coordination, and improved movement skills.

As the child grows older, the PT intervention usually shifts to a school-based program that focuses on more advanced skills such as running, throwing, catching, and climbing. These physical skills can facilitate participation in recess, play, and sports which in turn can improve the child's social engagement with other children. These treatments can be performed one-on-one or in

typical school activities. Frequently, physical therapists will pull in non-autistic kids to work in group settings so that the social aspects of the child's physical skills are also developed. The educational training from the PT in the school focuses on tools that help the staff further build the child's social/physical skills.

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Physiotherapy

► Physical Therapy

Piagetian Stages

Suzanne Macari
Yale Child Study Center, New Haven, CT, USA

Definition

Jean Piaget advanced the idea that the growth and development of cognitive skills from infancy through adolescence undergoes a series of defined stages that begin with reflexes and eventually develop into the ability to engage in formal logical thinking about abstract concepts. He described four major stages of development: (1) sensorimotor, (2) preoperational, (3) concrete operations, and (4) formal operations.

Historical Background

Arguably the most influential figure in the field of developmental psychology, Jean Piaget authored seminal work on the development of children's intelligence. He posited that cognitive and intellectual changes are the result of development, an active process that the child brings about through interactions with her environment. This process encompasses a series of successive qualitative changes of cognitive structures or schemata created by the child through experience. Piaget's background as a biologist shaped his thinking about the process as a continuous exchange between the individual and the physical world; in other words, "intelligence finds itself entangled in a network of relations between the organism and the environment" (Piaget, 1952, p. 19). Piaget's body of work emerged based on extensive, meticulously detailed documentation of his own three children's behavior from birth through adolescence (Piaget, 1951, 1952).

The Sensorimotor Stage (Birth to 2 Years)

Piaget (1952) described four stages of cognitive development, the first of which is sensorimotor development. This is the period from birth to approximately 24 months of age that begins with a few reflexes and ends with the appearance of language and symbolic representation of the world. Knowledge in this stage can only be derived from interactions with the physical world, and development proceeds from this exploration. Infants' sensorimotor intelligence proceeds through six increasingly complex stages, each one building on the achievements of the last. In this stage, infants and toddlers do not yet possess the full power of symbolic representation, or language, so must rely on their direct experiences with objects. By around age 2, the child's capacity to represent action in the mind increases, allowing for conceptual thought, thus lessening the dependence on physical and sensory experience.

Substage I: The Use of Reflexes (0–1 Month)

Infants are born with several reflexes, or general action patterns, such as sucking, grasping, and looking. Each reflex constitutes an "organized totality" that includes perceptions, coordinated movements, and a need; it is more than just a "summation of movements" (Piaget, 1952, p. 38). These reflexes differ from simple

reflexes (i.e., blinking) in that they are modified with experience. At first there is no differentiation among stimuli; for example, newborn infants will suck on a blanket and on a nipple with equal vigor. After several weeks, the infants adjust their sucking to the specific object in their mouth.

Substage II: Primary Circular Reactions (1–4 Months)

When action schemes incorporate new objects, infants move into the second substage of sensorimotor development. In this period, reflexes expand into larger coordinated behaviors, primarily centered on the infants' own bodies. Piaget described systematic thumb sucking and tongue protrusion, looking, hearing and phonation, and prehension in this substage. Out of the single behaviors of grasping objects and sucking objects grows the integration of these two actions: grasping an object and bringing it to the mouth to suck. The ability to thumb suck at will is one of the *first acquired adaptations* that develops during this period. Turning to find the source of a voice is another primary circular reaction, reflecting coordination between hearing and vision. The term *primary circular reactions* refer to such behaviors. Reactions are primary because they focus on the infants' own bodies, and they are circular because they form "cycles of movements that repeat an interesting sensation discovered by chance" (Muller, 2009, p. 208).

Substage III: Secondary Circular Reactions, or the Procedures Destined to Make Interesting Sights Last (4–8 Months)

One of the notable changes in this period is that the child's behavior becomes increasingly oriented toward the environment, beyond her own body, including people, animals, objects, and events. At this time, infants begin to reproduce interesting actions, such as banging, shaking, and waving, especially when these actions cause an interesting visual effect or sound. "Everything thus goes back to movements of legs or feet, arms or hands, and it is these 'circular' movements of prehension which become differentiated in movements directed at shaking, swinging, displacing, rubbing, etc." (Piaget, 1952, p. 178). Infants begin to understand that the interesting events are related to their physical activity and thus reproduce the actions. Another characteristic of this period is the shift toward intentional, goal-directed behavior. During this period, infants still lack the concept of object permanence (see section "Substage IV").

Substage IV: Coordination of Secondary Schemata (8–12 Months)

Infants begin to use means to attain ends that are not attainable directly. For example, they will push aside a pillow to reach a toy, or pull a string to obtain an object attached to one end. The main achievement of this period is *object permanence*, the awareness that objects exist when they are no longer in sight. During this period, infants begin to search for objects that disappear, indicating that they understand that objects still exist after they disappear from view. The fragility of this mental representation, however, is exemplified in the *A-not-B error*. Once infants have searched for a hidden object at one location (A), when the location is moved (B) they continue to search for it at location A. Not until around the first birthday is the infant able to inhibit search at the previous location and look for the object at the new location.

Substage V: Tertiary Circular Reactions, or the Discovery of New Means Through Active Experimentation (12–18 Months)

Beginning at 12 months of age, infants begin to explore their worlds more actively, "experimenting" with objects, intent on seeing how they behave in new situations. Once making such discoveries, they are repeated, but these *tertiary circular reactions* differ from the previous kinds in that the infant varies the actions slightly each time. In this stage, rather than applying the same schemata to problems, they now find new means through trial and error. In contrast to secondary circular reactions, in which infants attempt to recreate a certain event, tertiary circular reactions aim to "ferret out new phenomena" (Piaget, 1952, p. 274) in the process.

Substage VI: Invention of New Means Through Mental Combinations (18–24 Months)
In this final stage, the child begins to invent as well as discover. Rather than relying on trial-and-error experimentation, the child begins to be able to devise solutions to simple problems through representation (thinking), independent of immediate experience. In effect, the experimentation happens in thought. This development of mental representation fosters another hallmark of this period, *deferred imitation*, whereby children form mental representations of events so enduring that they can repeat others' behaviors hours or even days after it was first observed.

The Preoperational Stage (Ages 2–7)

During the preoperational stage, the child becomes progressively more able to internally represent events. One manifestation of this is *symbolic play*. In such play, a child might take a piece of bread and play with it as if it were an airplane. Often, but not always, these symbols resemble their targets visually. Piaget recognized the value of symbolic play as "...the creation of symbols at will in order to express everything in the child's life experience that cannot be formulated and assimilated by means of language alone" (Piaget & Inhelder, 1969, p. 61). Spoken language, itself symbolic, begins to develop more fully during this stage, from one-word utterances to two-word phrases followed by short sentences and finally a gradual acquisition of grammatical structures. Childrens' drawings during this period progress from scribbles to realistic representations of objects.

Piaget described two specific limitations to children's cognitive development in this phase, *egocentrism* and *centration*. Preschool children still possess notable *egocentrism*, or the perception of the world strictly from one's own point of view. Illustrating this concept is Piaget's three mountains task (Piaget & Inhelder, 1956), wherein 4-year-olds sat at a table in front of a model of three mountains while a doll was placed in a chair across them. The children were shown photographs of the model from different angles and were asked which one the doll would see, for which most children chose the picture depicting the scene as it looked to them. The ability to take another's perspective does not emerge in most children until the age of 6. Egocentric communication and thinking is also prominent at these ages. In *centration*, children focus on a perceptually salient dimension of a problem at the expense of other less salient but equally important dimensions. For example, Piaget presented children with two trains running on parallel tracks in the same direction, but one ahead of the other. When they stopped, Piaget asked which train traveled for the longer time/the longer distance/at the faster speed. For all three questions, most of the 4- and 5-year-olds answered that the train that was farther ahead on the track was the one that traveled longer/farther/faster, regardless of the actual duration, length, or speed of the journey. Not until several years later do children consider multiple dimensions of a problem.

The Concrete Operations Stage (Ages 7–12)

It is not until about age 7 that children begin to reason logically about physical phenomena. Typifying the abilities of this stage of development is the concept of *conservation*. The basic premise of this concept is that changing the appearance of objects does not change their key properties, such as amount or material. Below the age of 7, children typically cannot hold one dimension constant while it changes in another dimension. Problems of this kind are tested in three phases. First, for example, the child is shown two rows of eight coins parallel to each other, and then watches while one row is stretched out. In the third phase, she is asked if the number of items is the same or different. Before the concrete operations stage, the child will typically say that this longer row now contains more coins, although she observed the process and saw that no new coins were added. By centering on the perceptual feature of length and ignoring the transformation, she mistakenly believes that one row contains more coins. In addition to the conservation of number, there exists conservation of liquid quantity, conservation of area and mass, and conservation of volume. Understanding such transformations in all of these situations is mastered in

the concrete operations stage. As the name suggests, however, understanding is limited to concrete situations, and does not extend to more abstract or hypothetical situations. Through the development of logic, advances are made during this period in the development of seriation and categorization, forming the basis for number concepts, as well as the development of moral concepts such as laws, rules, lying, intentions, and justice.

The Formal Operations Stage (Age 12 and Beyond)

Formal operational thinking involves the development of abstract reasoning and logic to solve a variety of problems. Unlike the other three stages, Piaget believed that formal operations are not universal; not all adolescents fully attain the capabilities of this stage. While concrete thought is limited to tangible concrete problems of the present, formal operations involve propositions, hypothetical problems, or problems in the future. During this stage children can also become aware of their own feelings and thoughts; in other words, they become capable of introspection. Formal thought has three types of structures: hypothetical-deductive reasoning, scientific-inductive reasoning, and reflective abstraction.

Hypothetical-deductive reasoning involves reasoning from premises which are hypotheses rather than verified facts. Problems of this sort are exemplified by questions like the following: "The car is smaller than the SUV and the SUV is smaller than the truck. Is the car smaller than the truck?" The child who can work this out in her head as opposed to needing objects or drawings to illustrate the problem is using deductive reasoning. One can also reason about hypotheses based on false premises and still come to a logical conclusion.

Scientific-inductive reasoning is reasoning from specific facts to general conclusions, much as scientists do. At this stage, children are capable of forming hypotheses, experimenting, controlling variables, and drawing conclusions in a systematic fashion. One feature of scientific reasoning is the ability to think about several different variables at the same time; another feature is the ability to reason systematically about all possible outcomes of a situation. The pendulum problem requires such reasoning. Children are presented with a pendulum consisting of a weight at the end of a string, set in motion. They are then provided with strings of varying lengths and different weights, and are asked to determine what controls the pendulum's rate of movement. Children often consider important the length of the string, the weight at the end of the string, the force in setting the pendulum in motion, and the height from which the weight is dropped. The rate of oscillation, however, is controlled solely by the length of the string. The task is to isolate this factor and be able to exclude the others. Children at the level of formal operations work through this in a systematic fashion, exploring all possibilities and finally determining that a single factor influences the rate of motion.

Reflective abstraction is the key mechanism of the construction of new knowledge. Through internal thought or reflection, one can generate novel information, particularly logical relationships. Understanding of analogies is a prototypical example of this mechanism as it requires construction of relationships between members that comprise the analogy (Wadsworth, 1984, p. 146). What is needed for complete mastery of analogical reasoning is not only which members fit together (this could be solved in an associative manner) but also why they do and the awareness of the relationship between two pairs of items. Reasoning about such a relationship goes beyond what is observable, an ability that does not arise until this stage of development.

Current Knowledge

Piagetian Stages and Autism

(Note: For a review of research on the sensorimotor stage in autism, please see the entry "▶ Sensorimotor Development").

Preoperational

Of all the skills described in Piaget's body of work, the one perhaps most heavily studied in children with autism has been symbolic play.

Wing's (1979) early large-scale study of children with suspected autism even characterized the syndrome by deficits in imagination in addition to the core features of impaired communication and social interaction. Impairments in pretend play have been noted in children with autism of various ages (Bartak, Rutter, & Cox, 1975; Demyer, Mann, Tilton, & Loew, 1967; Doherty & Rosenfeld, 1984) and also when compared to developmentally matched (Rutherford & Rogers, 2003; Sigman & Ungerer, 1984; Stone, Lemanek, Fishel, Fernandez, & Altemeier, 1990; Wing, Gould, Yeates, & Brierley, 1977) or language-matched (Baron-Cohen, 1987; Charman et al., 1997; Jarrold, Boucher, & Smith, 1996; Libby, Powell, Messer, & Jordan, 1998; Riguet, Taylor, Benaroya, & Klein, 1981) controls using a variety of metrics of pretend play. The few studies that have reported no imaginative play deficits may have done so due to floor effects in the comparison groups (e.g., Lewis & Boucher, 1988). Another preoperational skill, visual perspective-taking does not seem to be impaired in children with autism (Hobson, 1984; Reed & Peterson, 1990; Tan & Harris, 1991; but see Yirmiya, Sigman, & Zacks, 1994) or adolescents with Asperger syndrome (David et al., 2010).

Concrete Operations

Relatively few studies have been conducted on conservation and seriation skills; adolescents and adults with autism and intellectual impairment were found to perform at the same level or better than intellectually impaired controls but worse than mental-age-matched typically developing children (Yirmiya & Shulman, 1996). In contrast, categorization abilities of children with autism have garnered much interest in recent years. Results of these studies have been mixed, depending on the type of categorization task employed. Generally, children with autism do not appear to be impaired in categorization tasks that are relatively simple, that is, using relatively simple sorting principles such as color, size, or shape (Sigman & Ungerer, 1984; Tager-Flusberg, 1985). As tasks become more complex and involve more atypical exemplars, for example, categorizing a groomed French poodle among other dogs, individuals with autism show impairments in terms of accuracy or reaction time (Gastgeb, Strauss, & Minshew, 2006; Klinger & Dawson, 1995; Shulman, Yirmiya & Greenbaum, 1995).

Formal Operations

Analogical reasoning has been studied in high-functioning children and adolescents with autism, and was found to be intact both for picture analogies (Morsanyi & Holyoak, 2001; Scott & Baron-Cohen, 1996) and scene analogies with thematic content (Morsanyi & Holyoak, 2011). Furthermore, no group differences were observed in a task of inferential transitive reasoning (Scott & Baron-Cohen, 1996). A number of studies, however, have reported deficits in conceptual reasoning in high-functioning adolescents and adults with autism as measured by various standardized tests (e.g., the Verbal Reasoning domain of the Stanford-Binet; Carpentieri & Morgan, 1994; Minshew, Goldstein, & Siegel, 1997).

See Also

- ▶ Object Permanence
- ▶ Sensorimotor Development

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PIAT-R

▶ Peabody Individual Achievement Test, Revised

PIAT-R/NU

▶ Peabody Individual Achievement Test, Revised

PIC

▶ Personality Inventory for Children

Pica

Cynthia R. Johnson[1] and Tyler A. Hassenfeldt[2]
[1]Pediatrics, Psychiatry, & Education, University of Pittsburgh, Pittsburgh, PA, USA
[2]Virginia Polytechnic Institute & State University, Blacksburg, VA, USA

Synonyms

Feeding disorder; Scavenging

Short Description or Definition

Pica is an eating disorder narrowly defined as the ingestion of nonfood items or nonnutritive items (e.g., clay, hair, paint chips, paperclips, coins) which has been present for at least 1 month. The word "pica" comes from the Latin word for the magpie bird (*Pica pica*) known for eating anything. Currently, pica is included as one of three subtypes under Feeding and Eating Disorders of Infancy and Early Childhood in DSM-IV-TR (APA, 2000). A broader definition of pica has been used in the literature to include the eating of food from inappropriate places (e.g., out of the trash can, off floor). While it is developmentally appropriate for children under the age of 24 months to mouth and potentially swallow nonedible objects, it is considered pathological when this behavior persists into older years (Baltrop, 1966; Stiegler, 2005). Individuals with intellectual disability (ID) and autism spectrum disorders (ASD) often present with comorbid pica that ranges from a mild, occasional behavior to life threatening. In light of the potential serious consequences, screening at minimal and further evaluation and treatment of pica as indicated should be considered in the care of individuals with ASD.

Categorization

Pica items or targets are strikingly diverse and include household products, small toy parts, organic materials, cosmetics, and art supplies. Table 1 lists a variety of pica subtypes that have been identified and specifically named, all ending in "-phagia." Other pica targets are not formally labeled (e.g., rubber gloves, coins, buttons, insects, pillow stuffing, candles, toiletries) but have been reported in individuals with ID and/or ASD (Stiegler, 2005).

Epidemiology

Pica has been found in a wide range of cultural groups across the world (Ali, 2001). However, we are unaware of any large-scale studies on the prevalence of pica in the general population. Pica is generally thought to often go unrecognized and underreported (Ali, 2001). Prevalence rates reported for pica specifically in individuals with ASD with ID have ranged from 6% to 25%, but samples have included primarily institutionalized samples (Ali, 2001; Stiegler, 2005). Pica is one of the more commonly found eating disorders in ASD, but future studies are needed to understand the prevalence of pica in ASD, particularly in individuals with ASD but without co-occurring ID.

Natural History, Prognostic Factors, and Outcomes

Pica has been reported throughout the world and, in fact, is an accepted practice in some cultures. Geophagia, the ingestion of dirt, clay, and soil,

Pica, Table 1 Subtypes of pica

Subtype	Target
Acuphagia	Sharp objects
Amylophagia	Laundry starch
Cautopyreiophagia	Burnt matches
Coprophagia	Human or animal feces
Foliophagia	Leaves, grass, acorns, pinecones
Geomelophagia	Raw potatoes
Geophagia	Dirt, clay, sand
Lignophagia	Wood, bark, twigs
Lithophagia	Rocks, gravel, pebbles
Pagophagia	Ice, freezer frost
Plumbophagia	Paint chips
Tobaccophagia	Cigarette butts
Trichophagia	Hair

has specifically been associated with pregnancy in some societies, including regions of Southern United States as well (Ali, 2001; Stiegler, 2005). Pica has also been observed in the presence of hunger, gastrointestinal distress, and micronutrient deficiencies such as iron and zinc (Young, 2010). Conversely, pica may result in micronutrient deficiencies (Ali, 2001). There has been limited conjecture that pica is associated with alteration in the dopamine system (Singh, Ellis, Crews, & Singh, 1994).

Gender differences of pica have not been reported in young children, but pica is rare in males *without* ID. Pica becomes more common in those individuals with more severe ID. ASD has been more frequently associated with pica than other developmental differences such as Down syndrome (Kinnell, 1985). Little is known about the long-term prognosis and outcome of pica in ASD. Although long term, improvement management in an institutionalized setting has been reported for individuals with ID (Williams, Kirkpatrick-Sanchez, Enzinna, & Dunn, 2009), pica has been noted to be resistant to treatment (Kern, Starosta, & Adelman, 2006).

Clinical Expression and Pathophysiology

Individuals with pica may be very specific about chosen pica targets (i.e., seek out only metal objects) or very indiscriminate (ingesting any nonfood items within their environment). Likewise, the pica behavior may seem to have a compulsive quality whereby individuals spend extraordinary time and effort in searching out pica targets. These individuals may engage in disruptive, aggressive behaviors when pica is thwarted or interrupted (Bogart, Piersel, & Gross, 1995). This driven nature of pica has led to speculation that pica may be an obsessive-compulsive disorder. In other individuals, the pica behavior may occur in a more random fashion whereby the opportunity presents itself (e.g., cigarette butts are left in an open container). In those with ASD who have high rates of sensory differences, there has been considerable speculation that pica may be a form of seeking sensory input.

Pica is seen in a wide range of children with ASD but is believed to continue into adult hood, at least in individuals with co-occurring severe ID. Individuals in institutional setting are generally believed to present with more pica than other populations. However, as already mentioned in a previous section, our knowledge of the course of pica in ASD specifically is limited by the lack of large-scale, rigorous studies.

Pica presents with a variety of subsequent health risks, including toxicity, obstructions, perforations, and even death (Bell & Stein, 1992; McLoughlin, 1988; Rapp, Dozier, & Carr, 2001). Sharp or bulky objects that have been ingested have the potential to cause perforations or blockages of the respiratory or gastrointestinal tracts. Persons who eat paint chips are at risk of lead poisoning. Parasites that live in dirt or clay can cause infections if eaten. Patients who have eaten an irregular amount of a nonfood substance risk malnutrition and the under- or overconsumption of calories. Dental health is also threatened with repeated chewing hard or abrasive items.

In addition to the health consequences of pica, there are adverse social consequences. This is particularly for individuals who engage in more "unclean" pica such as ingestion of feces, trash, and cigarette butts. Caregivers and peers may be likely to limit their interactions to avoid the unpleasantness associated with the pica behavior.

Evaluation and Differential Diagnosis

Screening and Diagnostic Evaluation

Screening for pica within the context of any evaluation for ASD is well warranted given the high rate of pica in individuals with ASD. This screening may simply be systematic interview questions directed toward parents and other caregivers as part of an evaluation for ASD. Screening questions for pica should also be included in intake assessments for individuals with ASD of all ages. That is, any educational, therapeutic, and other programs for individuals with ASD should screen for pica. If an individual is screened to be positive for pica, a more comprehensive assessment of pica should be pursued. This would first involve interviewing those involved in the care of the individual with ASD regarding observed pica behavior. When possible, an interview with the individual with ASD regarding pica practices should be pursued.

Medical and Nutritional Evaluation

A thorough medical history and evaluation should be conducted when pica is present. Medical testing to rule out the presence of parasites, rule our leading poisoning or other toxins, and to rule out nutritional deficits such as iron and zinc deficiencies should be considered. Additional nutritional testing may be justified when pica behavior is suspected of resulting in poor nutrition. Imaging studies may be warranted to determine the presence of ingested pica item(s). More extensive gastrointestinal work-ups may be necessary when further complications are suspected.

Behavioral Evaluation

A behavioral functional assessment is important in the treatment planning of pica, as it is important to distinguish what environmental factors may be maintaining or at least influencing the pica behavior. Functional assessments typically involve indirect methods such as starting with a focused interview of caretakers regarding situations where pica is observed and then not observed. The latter is just as important in treatment planning as determining when pica is most likely to occur. Functional analogue observations to specifically assess for pica would include safe replications of pica targets ("paint chips" made of cornstarch and water spread and dried on wax paper) along with the manipulation of common antecedent and consequence contingencies. Antecedents manipulated may be the presentation of a recent snack/meal or not, the presence of others (to determine whether there is a social component or not), the presence of toys or not (to determine whether pica is related to the impoverishment of environment), and the presence of appropriate food items (to determine whether pica is a substitution when food is not available). Consequence manipulation could include the attention of an adult's attention for engaging in pica behavior, the access to a preferred item/activity contingent on pica, or the ability to escape a situation contingent on pica. Previous, albeit limited, work has suggested that pica may be reinforced by automatic reinforcement (Kern et al., 2006; Piazza, Roane, Keeney, Boney, & Abt, 2002). That is, the behavior of engaging in pica is reinforcing in and of itself or stated in less behavioral terms as sensory pleasing to the individual. While conducting such functional analyses whereby antecedent and consequence variables are experimentally manipulated is widely recommended prior to designing behavioral treatments, the use of functional analysis in the evaluation of pica has a limited research base to date (Kern et al., 2006; Mace & McKnight, 1986; Piazza et al., 2002; Rapp et al., 2001). Nonetheless, a thorough behavioral assessment including functional analyses is accepted to be important in the development of empirically derived behavioral treatments that are least intrusive.

Additionally important for treatment planning is a preference assessment whereby reinforcers and punishers are empirically derived. Methods to determine possible reinforcers include indirect measures such as completion of a reinforcement inventory by a caregiver to direct measures (Hagopian, Long, & Rush, 2004). Direct measures have included observations of an individual approach to a stimulus when presented, duration of stimulus engagement, and the contingent presentation of stimuli to observe subsequent

changes in rate of a chosen behavior (Fisher, Piazza, Bowman, Hagopian, & Langon, 1994; Hagopian et al., 2004).

Treatment

The treatment of pica in ASD has a very limited empirical. As with other areas of the pica literature, there have been few, if any, large-scale treatment studies and the studies in the literature almost all combine individuals with ASD with those with ID and other developmental disabilities. Moreover, treatment studies have been nearly all either case reports or single subject studies with a small number of participants.

Pharmacological Treatment

Some very limited research has supported the use of medication, such as selective serotonin reuptake inhibitors (SSRIs) to treat pica (Stiegler, 2005). Anecdotal report has suggested positive outcomes in children whose pica was treated with stimulant medications (Barrett, 2008). At present, our knowledge base does not support the use of medication to target specifically pica.

Nutritional Treatments

Nutritional deficiencies have been linked to pica, especially iron and zinc. As discussed elsewhere in this chapter, there remains debate about whether nutritional deficiencies of these minerals may cause a person to engage in pica (eat iron- or zinc-containing substances), or whether that the ingestion of certain pica items results in subsequent mineral deficiencies. When iron and zinc are demonstrated to be deficit, supplementation is warranted, and some have suggested pica behaviors may abate, but there is lack of empirical support for this.

Behavioral Treatment

Behavioral approaches have been the most common for individuals with pica and ASD and ID. The specific behavioral intervention should be based on the functional assessment with respect to environmental variables maintaining the pica. Such an assessment is described in a previous section on the evaluation of pica. Behavioral treatment procedures for pica may be categorized as preventive or antecedent strategies, reinforcement consequences, punishment consequences, and specific teaching procedures of a new skill. More likely than not, treatment will require a treatment package to include several behavioral procedures.

Preventive and antecedent strategies have been used to limit access to potential pica items from the environment. This may include increased straightforward approaches such as regularly vacuuming, storing trash cans away from the child, and timely waste disposal. Environmental enrichment as a preventive approach has also been used as well as teaching appropriate discrimination of what to place in the mouth (Johnson, Hunt, & Siebert, 1994). Other prevent approaches have attempted to identify alternative, safe items which may be mouthed, chewed on in lieu of the pica item. Such an approach is appropriate when pica is suspected to be motivated by a need for sensory input, or in more behavioral terms, pica is automatically reinforced. Protective devices have also been used as a preventive approach. For example, arm splints and a facemask to prevent pica have been used. Such restrictive procedures should be used only in severe pica and as a temporary measure as a treatment program is being developed. Further, use of such procedures may be prohibited in some settings depending on local regulations.

In addition to prevention and antecedent strategies, reinforcement procedures have also been implemented to reduce pica behavior. These have included differential reinforcement procedures (differential reinforcement of other behaviors, lower rates of pica behavior, or an alternative behavior). Noncontingent reinforcement has also been used. Reinforcement procedures presume reinforcers have been identified as part of the evaluation process which may compete from the reinforcing value of engaging in the pica behavior itself.

While a least restrictive approach should be considered, the seriousness of pica may justify consideration of punishment procedures to suppress the pica behavior. The treatment literature on the use of punishment includes a disproportion number of individuals with severe and profound

ID who had potentially life-threatening pica. Punishment procedures have included timeout, contingent presentation of aversive stimuli, overcorrection, positive practice, and visual screening, as well as contingent placement of protective equipment or other physical restraint (Bell & Stein, 1992; McAdam, Sherman, Sheldon, & Napolitano, 2004). The consideration of the use of a punishment procedure should take into account the response of other approaches, the seriousness of the pica behaviors, and, again, local regulations regarding use of punishment procedures and consent requirements.

In addition to these behavioral procedures, teaching the individual to discriminate between edible and inedible items has been undertaken as a treatment approach to pica but in combination with a punisher (Bogart et al., 1995; Johnson et al., 1994). How the discrimination skill taught depends on the participant's level of development. The teaching of a replacement or alternative behavioral response behavior such as giving a pica to an adult and reinforcement for this has been described (Kern et al., 2006).

See Also

- Applied Behavior Analysis
- Autism
- Autistic Disorder
- Behavior Modification
- Eating Disorders
- Feeding Problems
- Functional Analysis
- Functional Behavior Assessment
- Medical Conditions Associated with Autism
- Obsessive-Compulsive Disorder (OCD)
- Operant Conditioning
- Overcorrection
- Reinforcement

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Pictorial Cues/Visual Supports (CR)

Vannesa T. Mueller
Speech-Language Pathology Program,
University of Texas at El Paso College of Health Science, El Paso, TX, USA

Definition

Pictorial cues or visual supports as used in language and cognitive therapy for individuals with autism are defined as any aid such as picture schedules, picture cards, symbols, communication boards, posters, models, visual scene displays, or videos that present information visually. As suggested in the previous list, visual supports can be very low- or no-tech such as in picture communication boards or can be used in high-tech communication devices such as visual scene displays. Compensating for difficulties with attention, organization, sequencing, and processing of verbal information can be facilitated with visual supports. The most commonly used visual supports will be described here. They are visual schedules, communication boards, the picture exchange communication system, and visual scene displays. Communication boards are discussed as another entry in this encyclopedia and so will not be discussed in detail here. Suffice it to say that communication boards are used to augment the spoken communication of individuals with ASDs.

Visual schedules or schedule systems (Mesibov, Browder, & Kirkland, 2002) or timetables (Bloomberg, 1996) are designed to make an individual's agenda explicit. They have been used with children with autism spectrum disorders (ASDs) to provide them with a sense of security and consistency. Between-activity visual schedules are those which allow the user to see the activities that will be completed during any length of time such as a therapy session or an entire day. Within-activity visual schedules show the steps necessary to complete a task and are designed to help an individual become more independent.

The picture exchange communication system (PECS) was developed by Bondy and Frost to aid in the functional communication of nonverbal children with ASDs. There is a large literature on this communication system, and so a brief description of it will be provided here. PECS is a multiphase system that begins with requesting. The child is first taught to exchange a picture symbol for an object that is motivating and rewarding. This occurs through hand-over-hand assistance from another adult. The second phase of PECS training requires the child to be persistent in his/her requesting. The communication partner and the picture symbol are moved so the child must seek out the picture and seek out the communication partner to request a desired item. In the third phase of PECS, the child is taught to discriminate between picture symbols. Phases four through six of PECS training involves helping the child combine symbols together to make sentences, respond to questions, and comment with the picture symbols. See Bondy and Frost (1994) for a more detailed description of PECS.

Visual scene displays are often whole pictures that represent an activity, place, or situation. They are useful for providing context for a communicative intention and aid in organization. For example, a scene of a park can be used for a child with autism. The picture can be either a real picture of the park the child frequents every afternoon, or a cartoon or line drawing of a generic park depending on the symbol

transparency needs of the child. Given the picture, the child can request the swings, slide, or merry-go-round or the child can comment on the other children playing on the playground equipment. Drager, Light, and Finke (2009) make the comment that visual scene displays are an interesting way to organize an augmentative and alternative communication system for individuals with ASDs because they allow for information to be presented as a whole and not in fragmented vocabulary items.

Historical Background

One of the earliest studies that involved the use of picture symbols with children with ASDs was conducted by Lancioni (1983). Two children were exposed to line drawings and were taught to interpret the line drawings and follow directions with them. Lancioni found that the children were successfully able to comprehend the symbols and accurately follow directions and that their ability to follow directions was generalized to other line drawings to which they had not previously been exposed. The use of picture symbols and visual supports for individuals with autism has grown to such an extent that at the time of this writing, when the words "picture symbol" and "autism" are fed into a search engine such as Google Scholar®, nearly 4,500 results appear just since the year 2005.

Rationale or Underlying Theory

Hermelin and O'Conner (1970) were the first to state that some children with autism process visuospatial information better than auditory information. Additionally, it has been found that the memory of children with autism is superior for visual information compared to auditory information (Prior & Chen, 1976). Finally, research on the attention of children with autism supports the notion that children with autism have difficulty selecting the most salient features of a stimulus (Frith & Baron-Cohen, 1987). Overall, individuals with autism have been shown to have more difficulty with verbal information compared to visual information (Hodgdon, 1995). Temple Grandin (1995) is an individual with autism. She states that she thinks in still pictures and in "videos" and that language-based information is difficult for her to process and retain. The use of other forms of augmentative communication for children with autism seems logical based on the strengths that children with autism possess. The use of sign language relieves the burden of having to process verbal information and builds on the strength of processing visuospatial information. The memory difficulties of children with autism can be alleviated by using picture communication symbols which do not require the child to rely on their own memories to create a message. If using picture symbols, children can attend to the symbols for as long as necessary to comprehend the information, alleviating the difficulties related to attention needed for verbal information transfer.

Although the use of picture symbols and visual supports are well supported by research, many laypersons fear that the use of these strategies will not allow oral speech to develop. The apprehension revolves around the idea that the individual with autism will use the visual supports as a crutch and will not need to use speech. In fact, the opposite has been shown to occur. Lloyd and Kangas (1994) and Romski and Sevcik (1996) agree that visual supports serve to lower the linguistic and cognitive demands of speech production and reduce the stress associated with speech, thereby facilitating speech development. Mirenda (2003) argues that the theory of automatic reinforcement is at play. When an individual with ASDs requests an item with a picture symbol, the communication partner verbally labels the item. The picture symbol and the verbal label occur so frequently together, and both are reinforced by the item; production of the verbal label and use of the symbol should increase.

Goals and Objectives

Like much of the field of AAC, the goal for the use of picture symbols and visual supports is

functional communication. Because speech production may not be possible for all individuals with ASDs, delaying the introduction to other forms of communication can be damaging to the language, cognitive, and emotional development of these individuals and may hinder their social development as well.

Treatment Participants

Any individual who is unable to communicate to the level expected for their age is a candidate for augmentative and alternative communication of any form (Beukelman & Mirenda, 2005). Therefore, because communication impairments are a hallmark of autism spectrum disorders (ASDs) (Mirenda, 2009), many individuals with ASDs are candidates for a total communication approach.

Treatment Procedures

Some of the picture systems mentioned have very specific treatment procedures (see the PECS description). Others are more specific to AAC, and treatment procedures that are appropriate for the application of AAC are appropriate for the application of picture symbols and visual supports. Using the participation model (Beukelman & Mirenda, 2005) as a guide, AAC interventions focus on allowing an individual with speech impairment to participate in their environment to the same extent as that of their peers. Beukelman and Mirenda (2005) also provide strategies and recommendations for implementing AAC for both nonsymbolic and symbolic beginning communicators. Nonsymbolic beginning communicators are those who use nonsymbolic communication such as gestures, facial expression, cries, or grunts. Symbolic beginning communicators use some form of symbolic communication such as words (spoken or written) or symbols with low- or high-tech communication devices. The authors state "opportunity for communication is at least as important to the success of a communication intervention as the availability of an appropriate system" (pg. 272). Additionally, the authors provide techniques related to shaping intentional communication, using scripted routines, providing natural consequences, and using structured instructional techniques such as the adapted strategic instruction model (A-SIM), structured practice, and conversational coaching.

Efficacy Information

A research synthesis was written by Wendt (2009) that discussed the application of picture symbols and visual supports for individuals with autism outside the domain of high-tech speech-generating devices. All of the studies included used a single-subject experimental design, and most of the studies focused on the ability of the individual with ASD to request objects or actions. A few studies focused on using visual supports to transition between activities, and one focused on recognition of orthographic symbols. The results of the review support the use of picture symbols for requesting. Children and adults were able to use picture symbols successfully to request a variety of objects and actions. Additionally, visual schedules were found to be helpful for individuals with ASDs in transitioning from one activity to another independently without the anxiety associated with inconsistent routines and without the need for constant prompting from another person.

Outcome Measurement

Because the goal of AAC use is functional communication, the outcome measurement should be the same. Functional communication will be defined differently based on the cognitive skills of the individual and the type of AAC system that is in place.

Qualifications of Treatment Providers

AAC (augmentative and alternative communication) interventions are most typically introduced

by a speech-language pathologist. Unfortunately, many speech-language pathologists do not report having adequate training or education in the field of AAC (King, 1998; Marvin, Montano, Fusco & Gould, 2003; Simpson, Beukelman, & Bird, 1999), and a survey of education programs for speech-language pathologists has uncovered a need for better education in this area (Ratcliff, Koul, & Lloyd, 2008). Although this is the case, speech-language pathologists are the best equipped of all professionals who work with individuals with autism to provide intervention that includes AAC. A listing of speech-language pathologists who are certified by the American Speech-Language-Hearing Association can be found on their website. A few short questions posed to the speech-language pathologist can reveal whether they are comfortable with the area of AAC.

See Also

- ▶ Alternative Communication
- ▶ Assistive Devices
- ▶ Communication Board
- ▶ Low-Technology Device
- ▶ Total Communication (TC) Approach

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Picture Arrangement

Cate Kraper and Timothy Soto
Clinical Psychology, University of Massachusetts Boston, Boston, MA, USA

Definition

Picture Arrangement is a subtest on both the Wechsler Intelligence Scale for Children-3rd edition (WISC-III; Wechsler, 1991) and the Wechsler Adult Intelligence Scale-3rd edition (WAIS-III; Wechsler, 1997). This subtest was dropped from the most recent versions of both the child and adult versions of the Wechsler tests (WISC-IV and WAIS-IV). In this subtest, individuals are presented with a series of cards in an incorrect order that must be placed in the correct order to tell a story that makes sense. The stories are similar to short comic strips, and placing them in order relies on the individual's ability to recognize the cause and effect relationship of events depicted in the cards. This task gives information about an individual's reasoning abilities, and performance is related to the ability to understand precursors and consequences of events. The pictures on the cards involve human characters and interactions, so to some degree the test draws on the ability to understand antecedents and consequences of social interactions. Because of this, there has been a long-standing assumption that performance on Picture Arrangement is associated with social competence, especially given that performance on this subtest by individuals with autism is relatively weak compared to other subtests on the Wechsler tests (Lincoln, Courchesne, Kilman, Elmasian, & Allen, 1988). However, more recent evidence has suggested that performance does not in fact predict social understanding or competence (Campbell & McCord, 1999; Lipsitz, Dworkin, & Erlenmeyer-Kimling, 1993), and performance may instead be more related to general intelligence. Low scores may be related to difficulties with visual organization and visual acuity, or in anticipating events and their consequences; inattention to details and anxiety might also interfere with performance.

See Also

► Wechsler Adult Intelligence Scale
► Wechsler Intelligence Scale for Children

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Picture Board

► Communication Board

Picture Exchange Communication System

Eugenia Corbett[1] and Patricia Prelock[2]
[1]Franklin County Home Health, St. Albans, VT, USA
[2]Communication Sciences & Disorders, Dean's Office, College of Nursing & Health Sciences, University of Vermont, Burlington, VT, USA

Definition

The Picture Exchange Communication System (PECS) is an aided picture-based augmentative intervention used to teach functional communication within a social context (Charlop-Christy, Carpenter, Le, LeBlanc, & Kellet, 2002; Frost & Bondy, 2002). It requires an individual to spontaneously select a picture representing a desired item and exchanging that picture with a communication partner to retrieve the desired item. It is one of several interventions used to augment the communication of individuals with no or limited functional communication, particularly those with autism spectrum disorders (ASD).

Historical Background

Lori Frost and Andrew Bondy originally developed PECS at the Delaware Autism Institute for children with ASD and other socio-communicative disorders who had limited or no functional communication. PECS was designed to address some of the problems associated with more traditional language training programs that require prerequisite skills such as motor and verbal imitation, visual attention, pointing, and initiation. It was also developed to circumvent the frequent difficulty children with ASD have with prompt dependency and obtaining a listener's attention (Bondy & Frost, 1994, 1998; Frost & Bondy, 1994). The first manual for implementing PECS was published in 1994. In 2002, Frost and Bondy updated the PECS by broadening their view on the importance of establishing a foundation for communication training by systematically structuring the learning environment, redefining their intervention as the Pyramid Approach to Education, and emphasizing "functional activities and communication, powerful reinforcers and behavior intervention plans" (Frost & Bondy, 2002, p. vii).

Rationale or Underlying Theory

PECS is designed to address the failure to initiate communication, a common deficit area for those with autism, which has implications for long-term outcomes related to the development of functional communication (National Research Council, 2001). Further, as individuals with ASD often lack the motivation and the social skills (Ogletree, Oren, & Fischer, 2007) to communicate effectively in social contexts (e.g., failing to orient or attend to others, difficulty displaying affection and emotions in social contexts, and impairment in gesturing and pointing), a system that supports the development of social communication is critical. PECS offers a systematic approach to teach individuals to use functional communication skills to facilitate an exchange with a communicative partner. Bondy and Frost (1998) believe that an effective communication training system should use meaningful reinforcers through the application of request situations rather than labeling situations, emphasize spontaneous communication, avoid prompt dependency, and not require extensive training prior to the initiation of the system.

The underlying theoretical framework for PECS is grounded in the principles of behaviorism (Skinner, 1953) and applied behavioral analysis (Baer, Wolf, & Risley, 1968), suggesting that the environment controls the learning of verbal and nonverbal communication skills and techniques such as modeling, prompting, and shaping can be used to facilitate that learning. PECS also capitalizes on the belief that many individuals with ASD are considered visual learners and a communication system that can effectively and efficiently incorporate visual and graphic symbols is likely to be more successful than those without a visual emphasis (Mirenda, 2001;

National Research Council, 2001). In addition, PECS uses a direct reinforcement system to motivate its communicators. That is, communicators with limited expressive language skills are taught to initiate nonverbal communicate to achieve their desired outcomes. PECS users learn that they can exchange a picture or icon for their actual desired item or activity. Thus, receiving what they requested rewards communicators.

Goals and Objectives

Bondy and Frost emphasize the importance of establishing educational objectives and activities that are functional and can be taught and utilized at school, home, and in the community. Intervention goals in the PEC system serve two broad communication functions, more directive communication attempts that serve as requests or commands, and social communication attempts that include commenting, describing, and naming. Goals are established for each of the six phases of intervention with current levels of performance and the criteria for achieving each objective defined.

Treatment Participants

PECS has been utilized to support the communication of a variety of individuals. Originally, it was designed for young children with ASD including autistic disorder, pervasive developmental disorder-not otherwise specified, Rett's disorder, and childhood disintegrative disorder (Bondy & Frost, 2001; Ganz & Simpson, 2004), but it has been successfully used with older children and adolescents who have limited expressive language or lack a functional communication system. Similarly, PECS has been applied to augment the communication of individuals with a range of language and developmental levels beyond ASD.

Although a formal assessment of who might be the most appropriate candidates for PECS is not available, the Pyramid Educational Consultants (http://www.pecs.com/faq/entry/17) pose several questions for consideration when identifying possible candidates. These include whether or not a person has a functional communication system, the extent to which their communication attempts are understood, how effective their communication system is at addressing their wants and needs, and whether their current system facilitates spontaneous communication and the ability to respond to a variety of questions.

Treatment Procedures

PECS has some advantages over other communication interventions in that communicators are not required to exhibit prerequisite skills such as attention and eye contact nor are they required to demonstrate comprehension of the pictures or icons used prior to initiating the intervention. PECS focuses on developing a number of key receptive and expressive language skills (Frost & Bondy, 2002). Receptively, PECS targets the ability to respond to directions, follow visual cues, and follow a direction to wait. Expressively, PECS emphasizes requesting help, a break or desired item or activities, and rejecting or affirming offers of items or activities. Instructors determine which skills the communicator needs and then plan to address these within the six phases of PECS.

Prior to implementation of the six intervention phases, a reinforcer assessment is completed with the individual for whom the intervention is being used to determine what items are highly preferred, preferred, and nonpreferred. Individualized reinforcers as well as the corresponding pictures and/or icons that match the communicators' desired items are determined by the communicators' interests, needs, and wants. Input is gathered from parents or caregivers and probing the individual's preferences from 5 to 8 selected items (Frost & Bondy, 1994).

Following the reinforcer assessment, *Phase I: Teaching the physically assisted exchange* is initiated. This phase requires two trainers: one person who serves as the communication partner and receives the picture, and one who provides, at least initially, hand-over-hand assistance.

The goal of Phase I is to have the communicator spontaneously pick up a picture of a highly preferred item, reach toward the trainer, and release the picture into the trainer's open hand (Frost & Bondy, 1994).

In *Phase II: Expanding Spontaneity*, the distance between the communicator and the communication board and the communicator and the trainer is increased. Spontaneity is expanded to increase communicative persistence so that the individual goes to his/her communication board, removes a picture, finds the trainer, and releases the picture into the trainer's hand (Bondy & Frost, 1998; Frost & Bondy, 1994).

Phase III: Simultaneous Discrimination of Pictures teaches the communicator to discriminate between pictures. The communicator requests a desired item by going to his/her communication board, selects the picture representing the desired item from an array, moves to the communication partner, and releases the picture into the partner's hand (Frost & Bondy, 1994).

Phase IV: Building Sentence Structure teaches the communicator to request using the carrier phrase, "I want." The individual selects a desired picture and places it on a sentence strip next to a picture depicting "I want ___" to complete the phrase. The individual then gives the entire sentence strip to the communication partner.

In *Phase V: Responding to "What do you want?"* the communicator is taught to respond to this question using delayed prompting. Throughout the communicator's daily activities, he/she is expected to spontaneously request desired items and answer the "What do you want?" question.

The final phase, *Phase VI: Commenting in Response to Questions*, requires the communicator to respond to different questions (e.g., "What do see?" "What do you have?") using carrier phrases (e.g., "I see ___." "I have ____.") to teach communicative functions like labeling or naming. The communicator is taught to respond to the communication partner's questions related to a particular referent such as pulling a car out of a bag and asking, "What do you see?" with the expectation that the communicator will select the correct picture for the item and create a sentence strip that says "I see car."

Beyond Phase VI, communicators are taught a variety of language concepts (e.g., location, verb concepts, attributes) using the basic PECS principles. A variety of teaching procedures that fall under the umbrella of applied behavior analysis are used to facilitate the success of the communicator during the training phases. These include the use of backward chaining, incidental training, shaping, discrete trials, delayed prompting, and discrimination training (Bondy & Frost, 1994).

Efficacy Information

Over the last 15 years, several studies have investigated the effectiveness of PECS as a communication intervention for children with ASD. PECS has been investigated in small groups and single subject designs including both efficacy (those occurring in controlled settings like research labs and clinics) and effectiveness (those occurring in natural settings like home and school) studies (Prelock, Paul, & Allen, 2011). Research has focused primarily on children with ASD 18 months to 12 years of age with limited investigation of older children, adolescents, and adults. Some comparisons of PECS to other interventions (Beck, Stoner, Bock, & Parton, 2008; Tincani, 2004; Yoder & Stone, 2006) exist, although this is an area of research requiring further examination to determine what outcomes might best be facilitated by PECS versus other interventions.

A number of functional communication outcomes have been reported following PECS training ranging from speech facilitation (Bondy & Frost, 1994, 1998; Ganz, Simpson, & Corbin-Newsome, 2008) and increased initiations (Carr & Felce, 2007) to gains in joint attention, eye contact, and toy play with a reduction of problem behaviors (Charlop-Christy et al., 2002). In addition, results have revealed increases in vocabulary (Anderson, Moore, & Bourne, 2007; Magiati & Howlin, 2003; Yoder & Stone, 2006)

and mean length of utterance (Charlop-Christy et al., 2002; Ganz & Simpson, 2004). Maintenance of speech gains and generalized use of trained and untrained functions across settings have also been documented (Charlop-Christy et al., 2002; Kravitz, Kamps, Kemmerer, & Potucek, 2002; Schwartz, Garfinkle, & Bauer, 1998; Yokoyama, Naoi, & Yamamoto, 2006).

PECS appears to be an appropriate strategy for supporting young children at the early stages of communication (Prelock et al., 2011). More research, however, is needed to identify the profiles of those children most likely to benefit from PECS versus other intervention methods.

Outcome Measurement

No specific tools are used to measure treatment outcomes, although consistent with the principles of applied behavior analysis, PECS incorporates a data-based system to measure progress across all phases of the program. An 80% or higher correct response rate for a minimum of 3 days is required for a communicator to move across each phase of PECS (Frost & Bondy, 1994).

Practitioners and researchers have been interested in the development of spoken language following the implementation of PECS. Frost and Bondy (1994) reported that children learning PECS began speaking. Ganz and Simpson (2004) confirmed that spoken language sometimes follows training in PECS. Interest also exists in the impact of PECS on reducing behavior problems and aberrant responses (Charlop-Christy et al., 2002; Ogletree et al., 2007).

Qualifications of Treatment Providers

Speech-language pathologists, teachers, families, and others can use PECS in a variety of settings as it does not require complex or expensive technology or equipment, materials are readily available, training is accessible, and the intervention is manualized.

Pyramid Educational Consultants offer PECS training globally (www.pecs.com/faq/entry/17/). Providers seeking implementation certification status must provide proof of attendance at a basic PECS workshop and must demonstrate competency in implementing the six phases of PECS, error correction procedures, implementation during functional activities, writing PECS lessons and summaries, and data collection. Those receiving a *PECS Implementer Certificate* can renew their certificate every 3 years. Pyramid Educational Consultants has explicit rules and guidelines for those who complete each level of PECS training. They also provide training for supervisors. This is an advanced training for individuals who are skilled in applying the Pyramid Approach to PECS implementation in the worksite and with those who have completed the basic PECS training.

See Also

- ▶ Alternative Communication
- ▶ Applied Behavior Analysis
- ▶ Communicative Functions
- ▶ Initiation of Communication
- ▶ Pictorial Cues/Visual Supports (CR)
- ▶ Picture Arrangement
- ▶ Visual Supports

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Picture Schedule

► Visual Schedule

Picture Thinking

► Visual Thinking

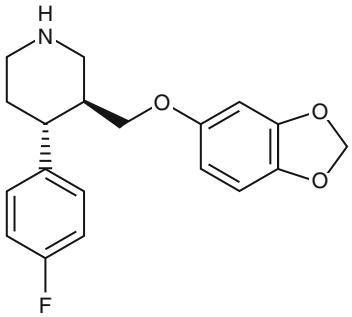
Pimozide

Kate S. Perri[1], Marcel Moran[2], Kimberly Stigler[3] and Christopher McDougle[4]
[1]Christian Sarkine Autism Treatment Center, Riley Hospital for Children, Indianapolis, IN, USA
[2]Indiana University School of Medicine, Indianapolis, IN, USA
[3]Christian Sarkine Autism Treatment Center, James Whitcomb Riley Hospital for Children, Indianapolis, IN, USA
[4]Lurie Center for Autism/Harvard Medical School, Lexington, MA, USA

Synonyms

1-[1-[4,4-bis(p-fluorophenyl)butyl]-4-piperidyl]-2-benzimidazolinone; Orap

Definition



Pimozide is an antipsychotic in the diphenylbutylpiperidine class with the chemical formula $C_{28}H_{29}F_2N_3O$. This drug was initially FDA-approved in 1984 for the treatment of severe tics associated with Tourette syndrome. It is used outside of the United States for schizophrenia and has also been found to be effective in the treatment of monosymptomatic hypochondriacal psychosis, body dysmorphic disorder, metastatic melanoma, trichotillomania, and trigeminal and postherpetic neuralgia. Adverse effects include extrapyramidal reactions, akathisia, dystonia, tardive dyskinesia, neuroleptic malignant syndrome, menstrual irregularities, and galactorrhea. The drug has also been reported to have adverse cardiac effects. Unexpected deaths have been reported in patients using high doses of this drug.

See Also

► Antipsychotics: Drugs

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Pincer Grasp

Tina R. Goldsmith
Center for Development and Disability, University of New Mexico, Albuquerque, NM, USA

Definition

When a child employs a pincer grasp, the tips of the thumb and index finger are used in opposition to pick up and manipulate small objects. The ability to perform this task is a milestone of fine motor development that typically emerges before a child's first birthday. Prior to the emergence of this skill, infants grasp objects in more rudimentary ways. Ordinarily, by 6–7 months, objects are raked into the palm with the fingers. By 8–9 months, the thumb and radial fingers are used to grasp and pick up small objects. Then, by 10–12 months, the fine pincer grasp appears. It can be tested by allowing a child to pick up a small object (e.g., a piece of breakfast cereal) from a flat surface. Once this skill is added to a child's fine motor repertoire, their ability to explore their world through object manipulation is greatly increased.

See Also

► Fine Motor Development
► Motor Control

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Pivotal Response Teaching®

► Pivotal Response Training

Pivotal Response Training

Mi Na Park
Department of Counseling, Clinical, and School Psychology, University of California, Santa Barbara, Santa Barbara, CA, USA

Synonyms

Naturalistic behavioral intervention; Natural language paradigm; Pivotal Response Teaching®; Pivotal Response Treatment®; PRT®

Definition

Pivotal response training® (PRT®) is an individualized, comprehensive treatment model that uses the child's motivation to present learning opportunities within their natural environment. It was developed by Lynn and Robert Koegel and initially called the natural language paradigm (Koegel, O'Dell, & Koegel, 1987). Grounded in applied behavior analysis and developmental approaches, PRT® targets pivotal areas such as motivation, responsivity to multiple cues, self-management, and self-initiations. Focusing on these pivotal areas results in collateral gains in untargeted areas and generalized sustained improvement in language, behavior, and social outcomes. Its comprehensive approach encourages consistent and coordinated programming across the child's contexts, with particular focus on parent education. Parents play an integral role in the habilitation process and receive training in PRT® using a collaborative, ecocultural approach. Through this partnership-based model, parents identify clinically meaningful goals and intervention strategies that can be easily incorporated into their already existing daily routines. The aim of PRT® is to improve the quality of life for children with autism spectrum disorders by creating opportunities to lead meaningful lives in fully inclusive settings.

See Also

► Naturalistic Interventions
► Natural Language Paradigm

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Pivotal Response Treatment®

► Pivotal Response Training

PL94-142

► Education for All Handicapped Children Act of 1975 (PL94-14L)

Placebo

Fred R. Volkmar
Director – Child Study Center, Irving B. Harris Professor of Child Psychiatry, Pediatrics and Psychology, School of Medicine, Yale University, New Haven, CT, USA

Synonyms

Placebo effect; Placebo response

Definition

A simulated intervention (often a drug but potentially other interventions) used as a control/comparison in research studies. As suggested in the title of a book on the subject (Shapiro & Shapiro, 2000), the effects of such treatment can be powerful (what is termed to placebo response or effect). In drug studies, for example, the use of a placebo (inert agent that is packaged so as to be indistinguishable from the drug being studied) control provides one of the most stringent tests in demonstrating drug efficacy.

As Volkmar and Wiesner (2009) note that the nature of the placebo response in studies involving children with autism reflects several factors: high levels of attention from parents, teachers, and clinicians; provision of high-quality care during a study; variation in symptoms over time; and the effects of expecting a change with a new treatment (see also Volkmar, 2001). The effects of placebo treatments can be quite strong, as demonstrated in studies of secretin which did not significantly outperform secretin (Sandler & Bodfish 2000); on the other hand, studies of agents like risperidone (McCracken et al., 2002), the active drug, proved significantly better than placebo even after only a few weeks of administration.

See Also

- ▶ Risperidone
- ▶ Secretin

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Placebo Effect

- ▶ Placebo

Placebo Response

- ▶ Placebo

Placement-Pending Requirement

- ▶ Stay-Put Requirement

Placenta

Harvey J. Kliman
Reproductive and Placental Research Unit, Department of Obstetrics, Gynecology and Reproductive Sciences, Yale University School of Medicine, New Haven, CT, USA

Definition

If we could noninvasively analyze the detailed neuroanatomy of all newborns at a cellular, synapse by synapse level, we might be able to

identify those children who will go on to have an autistic spectrum disorder (ASD). As that is unlikely to be possible anytime soon, doctors seek surrogates that can make the same diagnoses. Luckily, the placenta, an organ that is often routinely discarded at birth, may be able to identify those babies who will exhibit overt signs of autism months or years later.

The human placenta is not only an integral part of the fetus during all of pregnancy, but it also shares in the vast majority of cases the exact genetic makeup of the fetus. As such, it offers the potential to reveal abnormal morphologic patterns that may be at the basis of ASD and other genetic and developmental abnormalities.

Historical Background

Formation of the Placenta

Humans start off as a symmetrical ball of cells. Even as our first few dozen cells begin to separate into an inner cell mass (which will become the embryo, fetus, and eventually baby) and the trophoblasts (which will become the placenta), genes are regulating the creation of the developmental axes that will form the basis of the entire organism (Kliman, 1999). Defects in the genes that regulate these processes lead to a wide range of embryonic, fetal, and neonatal defects from minor cosmetic abnormalities to disasters that terminate pregnancy within a few days to weeks after fertilization.

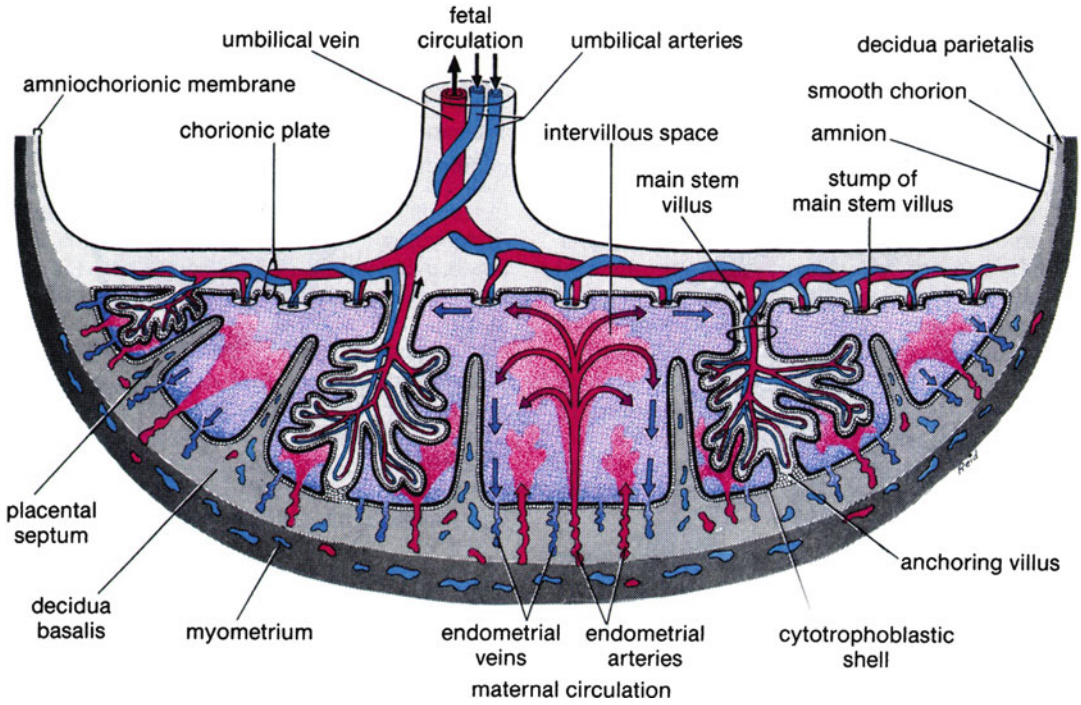
By 21 days after fertilization, the trophoblasts have begun to sort themselves into what will become the treelike structures that make up the placenta: the chorionic trees, branches, and villi (Fig. 1). The terminal villi (from the Latin for shaggy hair) are fingerlike structures that are covered with a double cell layer. This trophoblast bilayer is made up of an inner cytotrophoblast layer made of single nucleated cells and an outer syncytiotrophoblast layer made of giant multinucleated sheets (Fig. 2). Starting with purified cytotrophoblasts, we demonstrated using in vitro time lapse cinematography that cytotrophoblasts fuse to form syncytiotrophoblast (Kliman, Nestler, Sermasi, Sanger, & Strauss, 1986) (Fig. 3), an observation that has been confirmed in situ (Huppertz, Tews, & Kaufmann, 2001). The critical conclusion from these studies is that only the cytotrophoblasts proliferate, making the growth of the syncytiotrophoblast layer completely dependent on the absorption of fusing cytotrophoblasts (Fig. 4).

Current Knowledge

Trophoblast Inclusions

The relative rates of cytotrophoblast proliferation and incorporation into the outer syncytiotrophoblast layer appear to determine the morphology of the fingerlike chorionic villi (Huppertz et al., 2001; Kliman & Segel, 2003; Rejniak, Kliman, & Fauci, 2004). In the normal placenta, new villus branches are formed by outward bending bulges of the trophoblast bilayer (Fig. 5). However, when these critical processes go awry, the bilayer can inappropriately bulge inward into the villi, creating invaginations (Fig. 6) and trophoblast inclusions (Fig. 7) that can be readily detected upon histological examination of sectioned placental tissue.

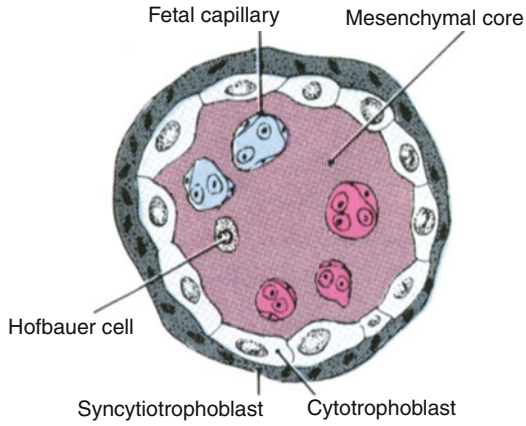
The basis of trophoblast invaginations and inclusions, therefore, appears to be an imbalance between the rate of cytotrophoblast proliferation and fusion (Rejniak et al., 2004). This could be the result of either an increased rate of proliferation – due to either endogenous genetic factors within these cells or exogenous factors such as increased exposure to paracrine or endocrine growth factors – or the result of a decreased rate of fusion – due to decreased production of the factors that facilitate cell fusion. Endogenous cell proliferation rates may be affected by genes that regulate the mitotic cycle, such as the cyclins (Gillett & Barnes, 1998). Equally potent are hormones that regulate cellular proliferation, such as growth hormone and insulin. Abnormalities of cytotrophoblast fusion have been shown in the placentas of Down syndrome (trisomy 21) children, showing a direct relationship between this particular genetic disorder and placental morphogenesis (Malassine, Frendo, & Evain-Brion, 2010).



Placenta, Fig. 1 *Diagram of the human placenta.* The placenta, which is part of the fetus, attaches to the maternal decidua via the anchoring villi. The maternal blood is injected into the intervillous space where it circulates around the chorionic villi and then returns to the maternal circulation via the endometrial veins. The fetus pumps its blood into the placenta via the umbilical arteries, which branch in the chorionic plate and eventually dive down to form the villus trees. The fetal circulation terminates in the fingerlike chorionic villi, which are covered by a layer of trophoblast cells (see Fig. 2). (From Moore KL, The Developing Human, 4th edition, WB Saunders, 1988, used with permission)

Understanding how trophoblast invaginations and inclusions are formed helps to identify them in placental tissues and leads to criteria for diagnosing these dysmorphic features. In almost all cases of invagination, there is an increased number of cytotrophoblasts at the point of infolding compared to the density of cytotrophoblasts away from the invagination (Fig. 8). Likewise, careful examination of a trophoblast inclusion reveals a central region of syncytiotrophoblasts, surrounded by cytotrophoblasts (Fig. 8). Like an epidermal inclusion cyst, which continues to get larger and larger over time, the cytotrophoblasts continue to proliferate and fuse with the adjacent syncytiotrophoblasts, which in some cases leads to very large trophoblast inclusions (see Fig. 7d). Adherence to the criteria of identifying increased numbers of cytotrophoblasts along the invagination and around the syncytiotrophoblast core of an inclusion helps to distinguish trophoblast invaginations and inclusions from tangential sections of curved chorionic villus surfaces.

Although trophoblast inclusions were first described as a marker of triploid gestations (a complete extra one set of chromosomes) (Szulman, Philippe, Boue, & Boue, 1981), it is now appreciated that the presence of trophoblast inclusions in placentas is associated with a long list of genetically abnormal gestations, including tetraploidy (a complete extra two sets of chromosomes), trisomies (an extra individual chromosome, such as trisomy 21 or Down syndrome, trisomy 18, and trisomy 13), Turner's syndrome (female with one X chromosome missing), and even genetic diseases without obvious chromosome abnormalities (Honore, Dill, & Poland, 1976; Novak et al., 1988; Silvestre, Cusi, Borras, & Antich, 1996; Szulman, 1984; van Lijnschoten,



Placenta, Fig. 2 *Diagrammatic cross section of first-trimester chorionic villus*. The villus core of villi contains fetal capillaries embedded in a loose matrix which contains fibroblasts and macrophages (also called Hofbauer cells). In the first trimester, a villus cross section reveals two distinct trophoblast layers, the outer syncytiotrophoblast layer which is in direct contact with maternal blood and the inner cytotrophoblast layer, the stem cell of the placenta and the source of new trophoblasts. (Modified from Moore KL, The Developing Human, 4th edition, WB Saunders, 1988, used with permission)

Arends, De La Fuente, Schouten, & Geraedts, 1993). Thus, many different genetic defects manifest themselves in the placenta as trophoblast inclusions. Since cytotrophoblast proliferation and absorption is no doubt regulated by many genes, it appears that abnormalities in any part of these multigene processes may result in these villus dysmorphic features.

Frequency of Trophoblast Inclusions

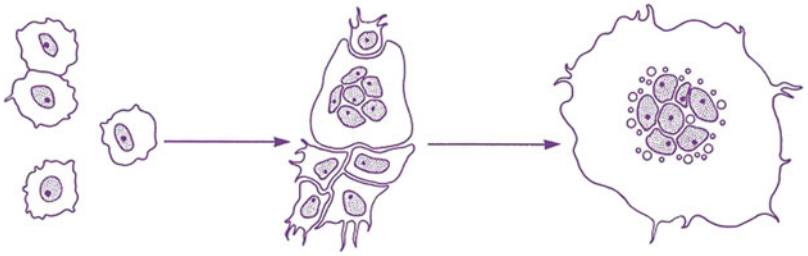
Fewer than 3% of placentas from uncomplicated, normal gestations manifest trophoblast inclusions. But 70% of placentas of fetuses with known chromosomal abnormalities exhibit inclusions (Kliman et al., 2003). Since the presence of a normal karyotype does not exclude the possibility of a genetic defect (e.g., cystic fibrosis, Tay-Sachs, sickle cell disease), it should not be surprising that trophoblast inclusions are also seen in cases with a normal karyotype. The most common example of the later situation is a spontaneous pregnancy loss where the karyotype is normal, but clearly, there is something abnormal about the gestation. The genetic basis of such losses is reinforced by the finding of both a high recurrence risk for these families and the fact that the losses almost always occur at the same gestational age for each particular family, suggesting a specific programming error.

The more severe the genetic abnormality, or the earlier the pregnancy loss, the more inclusions are found (Fig. 9). This is consistent with studies that have concluded that over 90% of first-trimester losses are secondary to genetic causes (Zhang et al., 2009). As pregnancies progress from the first to the third trimester, the likelihood of a genetic basis for a pregnancy loss decreases but does not go to zero even at term. Not surprisingly, the number of trophoblast inclusions seen in cases that reach term are fewer than those that terminate early in pregnancy. This is most likely related to the severity of the genetic abnormality, with the most severe terminating before 13 weeks of gestation.

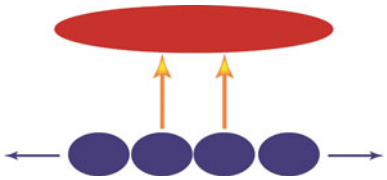
The only documented nongenetic cause for trophoblast inclusions appears to be gestational diabetes. In such cases, it is believed that increased glucose and insulin levels lead to increased cytotrophoblast proliferation, which as described above, would lead to invagination of the trophoblast bilayer. This is consistent with the observation that cultured cytotrophoblasts grow better in high glucose media compared to normal media (Kliman et al., 1986). It is also of interest that diabetics have a much higher fetal anomaly rate (Correa et al., 2008), suggesting that the high glucose insulin environment leads not only to abnormalities in the placenta but also in the fetus. This has been confirmed in rat gestations where it has been shown that high glucose levels alone can lead to both deformed fetuses and pregnancy terminations (Reece, Pinter, Homko, Wu, & Naftolin, 1994).

Trophoblast Inclusions and Autism

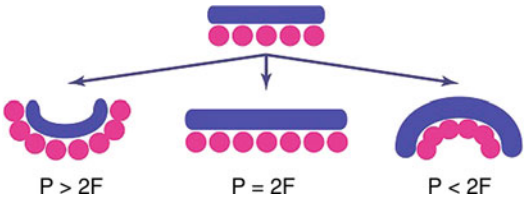
It was in the context of trophoblast inclusions as a general marker of genetic and developmental abnormalities that the association of trophoblast inclusions and autism was first suggested. The linkage was first observed anecdotally in two cases of Asperger's syndrome, which was then followed by a retrospective study. Trophoblast



Placenta, Fig. 3 *In vitro conversion of cytotrophoblasts into syncytiotrophoblasts*. Individual cytotrophoblasts (*left*) migrate like amoeba, eventually making contact with each other. Once in contact, the cytotrophoblasts form aggregates (*middle*), and in time, the cells fuse to form syncytiotrophoblasts. Eventually, all the cytotrophoblasts have merged and fused to make a large syncytiotrophoblast (*right*). (From Kliman HJ, Nestler JE, Sermasi E, Sanger JM, and Strauss JF III. (1986) Purification, characterization and in vitro differentiation of cytotrophoblasts from human term placentae. Endocrinology 118: 1567–1582, used with permission. *Copyright 1986, The Endocrine Society*)



Placenta, Fig. 4 *Cytotrophoblast proliferation and fusion*. Cytotrophoblasts (*blue*) either proliferate to increase the number of trophoblastic stem cells (*blue arrows*) or occasionally fuse upward (*gold arrows*) into the multinucleated syncytiotrophoblast layer (*red*). The balance of these two processes – proliferation and fusion – determines the overall morphology of the placenta's chorionic villi (see also Fig. 5)



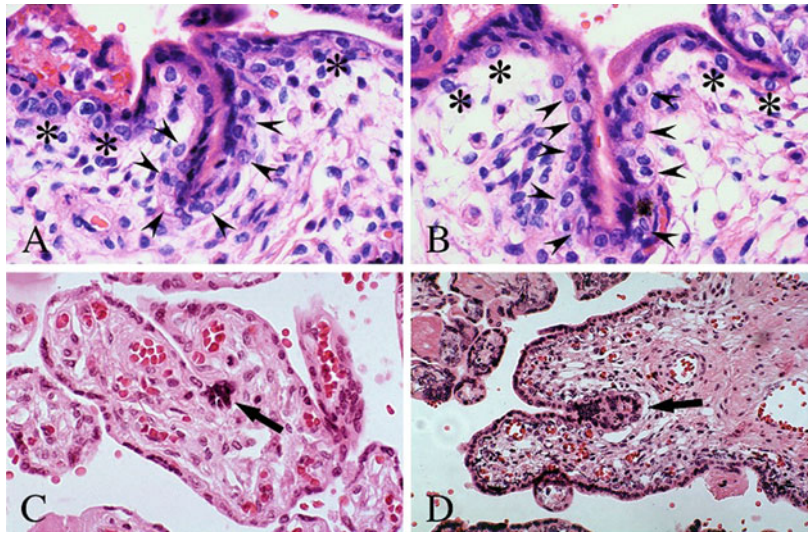
Placenta, Fig. 5 *Proliferation fusion model*. A model illustrating the different ratios of proliferation (*P*) and fusion (*F*). Cytotrophoblasts (*pink circles*) proliferate and intermittently fuse into the upper syncytiotrophoblast layer (*blue bars*). Stability (relative flatness) of the bilayer is maintained at, or near, an ideal ratio: P = 2F. Normal outward budding (evagination) is observed from the ratio: P < 2F, while an abnormal trophoblast inclusion (invagination) results from the ratio: P > 2F. (Kliman HJ, Segel L. (2003) The placenta may predict the baby. J Ther Biol, 225: 143–145, used with permission)

inclusions were found in significantly more cases of ASD than would be predicted from the normal population (Anderson, Jacobs-Stannard, Chawarska, Volkmar, & Kliman, 2007).

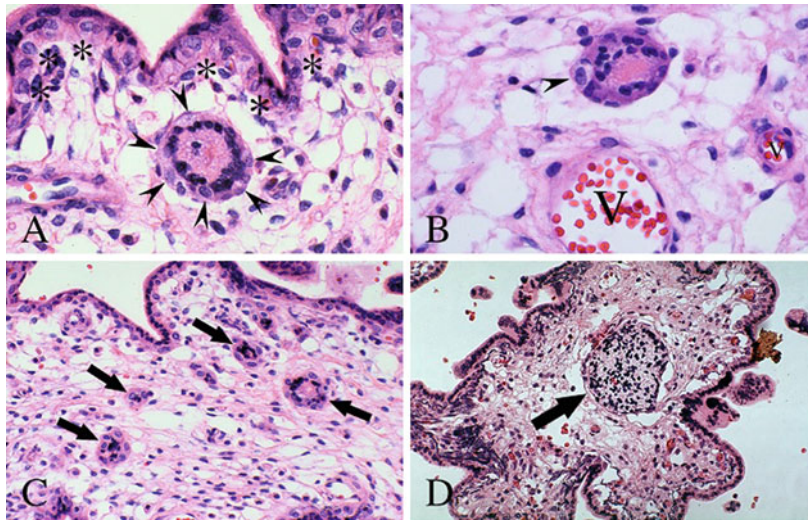
This result fits into the consensus view that ASD is largely genetically based. It also suggests that this seemingly polygenetic, heterogeneous condition may ultimately be caused by subtle abnormalities in common morphogenetic processes, such as bilayer folding.

A Problem of Folding

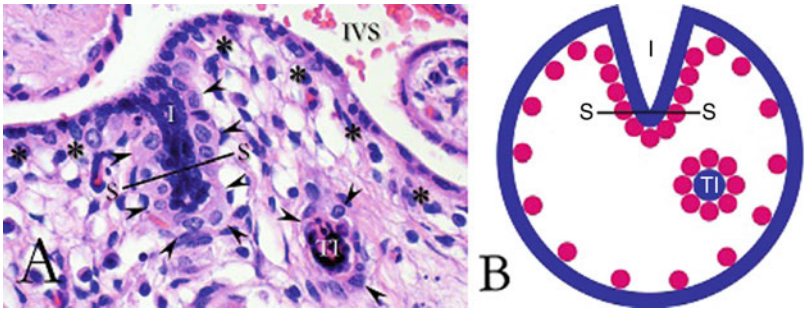
There are only a few developmental processes in the embryology tool box. These include cell proliferation, cell death, cell migration, cell hypertrophy, differentiation, fusion, and cellular dissociation. With these tools, all the various organs and body parts are made. One of the common problems in development is how to increase surface area. There are two basic solutions to this problem: increased branching or increased folding. In both cases, these are most often achieved by differential growth of layers of cells, which due to increased tension being built up in one layer or another, results in bending. This is exactly how the placenta forms new buds and villi to make the villus tree. It is also how the heart forms, the bronchi branch in the lung, the kidney tubules form, the gut surface area



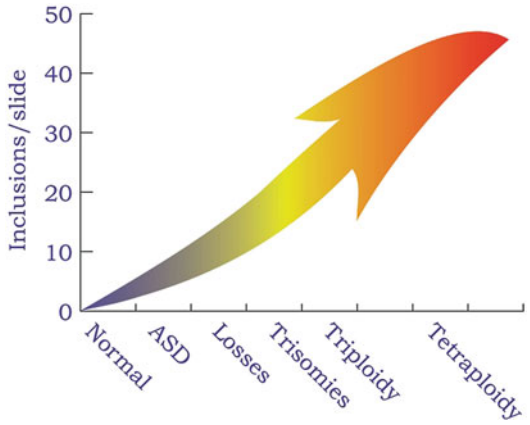
Placenta, Fig. 6 *Trophoblast invaginations.* (**a**, **b**) Trophoblast invaginations forming cleft-like structures. Note the many cytotrophoblasts lining the invaginations (*arrowheads*) and the fewer cytotrophoblasts underlying the normal bilayers (*). (**c**) Invagination ending in an area of increased syncytiotrophoblasts (*arrow*). Even though the bilayer is invaginated, syncytiotrophoblasts still form. (**d**) Bulb-like prominence of syncytiotrophoblasts at base of an invagination (*arrow*). (Kliman HJ, Segel L. (2003) The placenta may predict the baby. J Ther Biol, 225: 143–145, used with permission)



Placenta, Fig. 7 *Trophoblast inclusions.* (**a**) Trophoblast inclusion within the villous core. Note how the cytotrophoblasts of the bilayer (*arrowheads*) and the cytotrophoblasts of the inclusion (*) both are adjacent to the villous core. (**b**) Trophoblast inclusion with a prominent syncytiotrophoblast layer and a lone cytotrophoblast (*arrowhead*). Fetal vessels (*V*). (**c**) Chorionic villous with four prominent trophoblast inclusions (*arrows*). (**d**) Trophoblast inclusion with very expanded syncytiotrophoblast component (*arrow*). (Kliman HJ, Segel L. (2003) The placenta may predict the baby. J Ther Biol, 225: 143–145, used with permission)



Placenta, Fig. 8 *Formation of trophoblast invaginations and inclusions*. (**a**) Histologic section of a placental villus which exhibits both a trophoblast invagination (*I*) and inclusion (*TI*). Note the increased numbers of cytotrophoblasts (*arrow heads*) beneath the syncytiotrophoblast layer in the region of the invagination and their paucity away from the invagination (*). When an invagination is sectioned perpendicular to its long axis (*S-S*), it appears as an inclusion (*TI*), with dark syncytiotrophoblast nuclei in its center surrounded by cytotrophoblasts (*arrow heads*). *IVS* Intervillus space. (**b**) Diagram of a villus cross section showing the outer syncytiotrophoblast layer (*blue*) and inner cytotrophoblast layer (*pink cells*) with a trophoblast invagination (*I*) and inclusion (*TI*) illustrating the relevant morphology and disposition of cytotrophoblasts in the region of the invagination. (From Anderson GM, Jacobs-Stannard A, Chawarska K, Volkmar FR, Kliman HJ. (2007) Placental Trophoblast Inclusions in Autism Spectrum Disorder, Biological Psychiatry, 61:487–491, used with permission)



Placenta, Fig. 9 *Trophoblast inclusions as a function of genetic abnormality severity*. Normal placentas rarely exhibit trophoblast inclusions. As the degree of genetic abnormality increases, the more trophoblast inclusions can be identified per unit area of placenta examined. The earlier the pregnancy loss, the more frequent the inclusions. Many pregnancy losses reveal normal karyotypes; however, a significant number of trophoblast inclusions can be seen in many of these cases. The trisomies (e.g., trisomy 21, 13, 18) may or may not lead to an early pregnancy loss, depending on which chromosome is affected. In very abnormal gestations, such as triploidy and tetraploidy, as many as 50 or more inclusions per slide can be seen. ASD, a subtle condition that does not lead to pregnancy loss, usually exhibits only 1–3 trophoblast inclusions per placenta slide examined

increases, and most dramatically how the brain, especially the human brain, fits into the skull.

Since the upper limit of human skull diameter is directly related to the size of the female pelvis, increases in brain surface area could only be achieved by folding. And the human brain is one of the most folded brains in the animal kingdom (Hilgetag & Barbas, 2006). Behind this folded structure are the cellular processes that lead to differential growth in the many neural layers that make up the brain. Could the developmental abnormalities that lead to abnormal folding and trophoblast inclusions in the placenta also be at work in the brains of ASD children?

Researchers have demonstrated significantly abnormal brain folding in children on the autism spectrum using surface mapping and magnetic resonance imaging (MRI) (Awate, Win, Yushkevich, Schultz, & Gee, 2008; Kates, Ikuta, & Burnette, 2009; Nordahl et al., 2007). These abnormalities may in part explain the observation of increased head size in ASD children (Awate et al., 2008; McCaffery & Deutsch, 2005). Basically, with less folding, the brain tissue has no other option but to expand the skull to make up for the less compact nature

of the neural tissue. Translating this gross macroscopic observation to cellular processes and ultimately to abnormal behaviors is much harder. However, neuropathologists have described abnormalities in ASD children at the tissue level of the brain that may be associated with these macroscopic changes (Bauman & Kemper, 2003, 2005; Kemper & Bauman, 1998; Whitney, Kemper, Rosene, Bauman, & Blatt, 2009).

Future Directions

If one of the basic pathologies in ASD is related to problems in tissue folding, then we should see evidence for this in any tissue where folding is a critical part of the anatomy or function of that tissue. Some organs may be impervious to low frequencies of misfolding, such as the liver, which does not have a critical requirement for multilayer cellular organization. Other organs, such as the gut, may not function as well if its folded structure is disrupted. If commonalities can be ascertained in cases of ASD, then candidate genes could be sought that control and regulate these processes. Further, in the future, one might anticipate that genetic or medical interventions might be forthcoming that can ameliorate the abnormalities that may exist in ASD children. In the meantime, knowing that trophoblast inclusions are related to ASD could lead to early identification and intervention before overt symptoms arise.

See Also

► Developmental Change

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PL-ADOS

► Prelinguistic Autism Diagnostic Observation Schedule

Planning and Placement Team (PPT)

► Interdisciplinary Team

Plasticity, Neural

Joshua Trachtenberg and Peyman Golshani
David Geffen School of Medicine at UCLA, Los Angeles, CA, USA

Synonyms

Cortical remapping; Cortical rewiring; Neural reorganization

Structure

Autism spectrum disorders are characterized by profound impairments in language acquisition and social interaction that are often comorbid with repetitive behaviors and sensory and motor abnormalities. Communicative and social skills emerge in early childhood and grow exponentially in complexity. The establishment of appropriate neural circuitry in the cerebral cortex subserving language acquisition, social interaction, and indeed, all aspects of cortical function, including vision and motor control, relies on the proper execution of genetic programs that regulate neural proliferation, migration, differentiation, axon guidance, and recognition of synaptic targets. A characteristic conserved between these disparate systems is that this circuitry is ineffective at birth. Sensory experience within specified sensitive or so-called "critical" periods during development sculpts the fine structure and function of cortical circuitry. However, the timing and influence of these critical periods varies dramatically among the functional domains of the cerebral cortex. This entry examines recent advances in our understanding of how autism-candidate genes regulate neural growth, synaptic plasticity, and the closure of critical periods.

Anatomical Plasticity of Neural Structure

The establishment of precise neural circuitry in the cortex hinges on five major events. First, neurons must be born in correct numbers. Second, these neurons must migrate to appropriate

locations to establish the basic lamination of the cortex. Third, these neurons must grow specialized processes – dendrites that integrate information coming into the neuron and axons that provide the information output to other neurons in the cortical network. Fourth, axons must identify appropriate target dendrites and establish synapses. Fifth, these newly formed synapses are stabilized or eliminated by neural activity largely driven by sensory experience. In the cortex this last step of experience-dependent changes in the number and strength of synapses peaks during critical periods. In this entry, we examine recent work on synaptic and circuit plasticity in mice with genetic mutations in genes associated with autism.

Function

Critical Periods of Experience-Dependent Plasticity in the Developing Human Brain

Critical periods are present in all areas of cortex examined from the evolutionarily earliest primary sensory cortices to the phylogenetically more recent frontal cortices. Perhaps the most well known examples are critical periods in sight and language. Poor vision during childhood results in a permanent reduction in high acuity vision – a condition known as amblyopia. In children born with congenital cataracts, for example, restoration of optical clarity through the lens will restore sight if the surgery is completed before about age 5. The older the age at treatment the worse the final outcome (Holmes et al., 2011). If corrective surgery is delayed past puberty the patient will remain effectively blind to that eye, despite the restoration of normal optical clarity through the eye and otherwise normal signal transduction in the retina. This permanent loss of sight results from the development and ultimate crystallization of cortical circuitry exposed to poor vision. Vision, therefore, profoundly shapes cortical circuitry, effectively establishing our sense of sight by its actions on cortical connectivity, but only during a limited period of adolescence. Cataracts that form in adults do not induce permanent deficits in sight once removed. Similarly, language acquisition is entirely dependent on exposure to language and its actions on cortical wiring. Socially isolated children fail to acquire normal language if initial exposure occurs past puberty (Fromkin, Krashen, Curtin, Rigler & Rigler, 1974). A second language learned after puberty is heavily accented with improper intonation, whereas fluency of speech and comprehension are readily attained if the second language is learned before 7 years of age (Johnson & Newport, 1991). The critical period for learning social interactions, which is heavily dependent on frontal cortical circuitry, is not well defined, but in humans it can be argued that it extends throughout life.

Typical Development of Human Frontal and Temporal Cortex

The closure of cortical critical periods is tied to cessation of neural growth, the strengthening of cortical inhibition (Hensch, 2005), and the establishment of axonal myelination (McGee, Yang, Fischer, Daw & Strittmatter, 2005). In frontal cortex, the region most severely affected in autism and the region of the brain that regulates executive function, neurons are remarkably immature at birth. Dendrites of frontal cortical pyramidal neurons are very rudimentary, extending to perhaps 3% of their ultimate adult size (Huttenlocher, 1990). Dendritic growth proceeds slowly, reaching 35% of adult size by 6 months of age, 50% of final size by 2 years of age, and are adult-like by 7–10 years of age (Huttenlocher, 1990). The slow, progressive growth of dendrites and concomitant increase in neuropil are reflected in functional brain imaging studies demonstrating a progressive thickening of frontal gray matter that peaks at about age 12 (Giedd et al., 1999). Notably, the language areas of frontal and temporal cortex, another region that is thought to malfunction in autistic patients, continue to thicken well past puberty (Sowell et al., 2004). The prolonged development of these cortical areas may reflect their phylogenetically recent emergence in the forebrain (Hill & Walsh, 2005). Relative to phylogenetically older sensory cortices, frontal cortex has experienced a tremendous expansion from basal shrew-like

mammals through primates and ultimately humans. Paralleling this expansion is the emergence of complex social structure and language – both of which require decades of learning to master.

The establishment of synapses on growing dendrites and their subsequent refinement by experience also occurs at a slower pace in frontal cortex than in sensory cortices. Whereas synaptic density peaks at 3 months of age in primary auditory and visual cortices, it peaks at 3.5 years of age in frontal cortex. It is widely held that experience sculpts cortical circuitry largely by stabilizing some synapses while eliminating others. This process of synaptic elimination is complete by 12 years of age in primary sensory cortices, but is more gradual in frontal cortex, continuing throughout mid-adolescence (Huttenlocher & Dabholkar, 1997). Myelination of subcortical white matter is perhaps most prolonged, continuing into the second decade of life (Giedd et al., 1999; Klingberg, Vaidya, Gabrieli, Moseley & Hedehus, 1999).

The slow, progressive growth and refinement of this cortical circuitry enables sensory experience to profoundly impact the final structure and function of frontal and temporal cortices. As discussed below, these processes are accelerated in autism, forcing a premature closure of critical periods for language and social learning.

Pathophysiology

Development of Frontal and Temporal Cortex in Autism

There are no postmortem studies of neural anatomy in autistic children ages 2–4, the typical age of diagnosis. Thus, we do not know how the fine structure of neurons and refinements in synapse number and connectivity are impacted by autism. However, a growing number of brain imaging studies indicate that gray matter in frontal and temporal cortices grows precociously in the autistic brain. At the earliest ages measured, 2.5 years of age, the thickness of frontal and temporal gray matter is already 6% and 9% greater, respectively, than typical, and this accelerated growth continues through at least 5 years of age (Schumann et al., 2010). Despite this early overgrowth, there is some evidence that it is short lived – frontal and temporal gray matter increase by only 1% between ages 6 and 8 in autistic children during which time the normally developing brain experiences increases of 17–20% (Carper, Moses, Tigue & Courchesne, 2002). Thus, frontal and temporal gray matter thickness increases rapidly in the autistic brain, reaching adult thickness a decade or more ahead of normal pace. The precocious overgrowth of the autistic brain is perhaps most apparent when noting that the average brain weight in 3–5-year-old autistic children is equivalent to that of normal adults (Courchesne, Muller & Saitoh, 1999). The normally slow growth of cortical gray matter parallels the emergence and slow acquisition of language and social skills. The premature cessation of cortical growth in autism would almost certainly impair their refinement.

Synaptic density measurements support a view of premature closure of critical periods. The density of dendritic spines – the postsynaptic specializations of dendrites that receive excitatory inputs – is increased in autism (Hutsler & Zhang, 2010; van Spronsen & Hoogenraad, 2010), suggesting an absence of the normal pruning processes necessary for the refinement of circuit function.

How the signaling pathways that drive autism impact the structure and function of individual neurons and their synapses can only be achieved by studying mouse models of autism. We discuss recent advances in this line of investigation below.

Synaptic Plasticity in Mice Carrying Mutations in Autism-Candidate Genes

The maturation of appropriate cortical connectivity and function depends on long-term changes in synaptic strength. These changes include enhancements in synaptic strength (long-term potentiation; LTP) and reductions in synaptic strength (long-term depression; LTD), as well as the formation of new synapses and the retraction of others. It is conceivable that abnormal synaptic plasticity could contribute to deficits in circuit refinement

and behavioral inflexibility seen in autistic patients. To discover whether alterations in synaptic plasticity play a role in the cognitive and behavioral deficits suffered by patients with autism, studies of cortical and hippocampal LTP and LTD have been performed in a number of mouse models with deletions of autism-related genes; these studies are summarized in Table 1. Additionally, recent advances in nonlinear microscopy permit longitudinal imaging studies of synaptic structure in vivo in mouse models of autism.

Altered Synaptic Strengthening

Mice engineered to have the R451C neuroligin-3 mutation found in a small number of patients with autism, have social behavioral deficits and enhanced learning (Tabuchi et al., 2007; Etherton et al., 2011). They have enhanced inhibitory transmission in the cortex, and enhanced excitatory transmission in the hippocampus (Etherton et al.). In addition, they show enhanced hippocampal LTP, likely because of an upregulation of the NMDA receptor NR2B subunit (Etherton et al.).

Mice with Shank3 C-terminus truncation mimicking the human autism-related mutation have loss of Shank3 at synapses. These mice have social behavioral deficits, loss of NMDA receptors at synapses, and loss of NMDAR dependent LTP (Bangash et al., 2011).

Deletion of CACNA1C, encoding a calcium channel mutated in Timothy Syndrome, an autistic spectrum syndrome, results in deficient Schaffer Collateral Late-LTP in the hippocampus (Moosmang et al., 2005). Deletion of MECP2, encoding a chromatin binding protein mutated in Rett Syndrome, another autism spectrum disorder, also results in deficient hippocampal (and cortical) LTP (Moretti et al., 2006; Weng, McLeod, Bailey & Cobb, 2011). Coversely, loss of activity induced phosphorylation of MECP2 results in enhanced binding of MECP2 to target promoters, results in enhanced hippocampal LTP, and enhanced learning in hippocampal-dependent tasks (Li, Zhong, Chau, Williams & Chang, 2011). Deletion of FMR1, the gene implicated in Fragile X syndrome, results in decreased LTP in the visual cortex (Wilson & Cox, 2007), and loss of spike-timing dependent LTP in the prefrontal cortex (Meredith, Holmgren, Weidum, Burnashev & Mansvelder, 2007), but enhanced heterosynaptic LTP in the hippocampus (Connor, Hoeffer, Klann & Nguyen, 2011). Conversely, mice with deletions in TSC2, a gene mutated in the autism-related syndrome, tuberous sclerosis, show abnormal induction of late-LTP by stimuli that only induce early-LTP in control mice (Ehninger et al., 2008).

Altered Synaptic Weakening

MECP2 knockout mice (Moretti et al., 2006), as well as mice with conditional deletion of PTEN, a regulator of the mTOR pathway that is mutated in a significant cohort of patients with autism and extreme macrocephaly, show impaired hippocampal LTD (Jurado et al., 2010). PTEN conditional knockout mice show dramatic social behavioral deficits as well as seizures. Mice with deletions of UBE3a, an E3 ubiquitin ligase, implicated in the autism-related Angelman syndrome show impaired LTD in visual cortex (Yashiro et al., 2009). Consistent with a role of LTD in experience-dependent plasticity in the cortex, these mice show impaired ocular dominance plasticity when challenged with monocular deprivation (Yashiro et al.). In contrast to the above models, mice with deletions of FMR1, the gene implicated in Fragile X syndrome as well as Shank3 mutant mice have *increased* mGluR-dependent LTD in the hippocampus (Huber, Gallagher, Warren & Bear, 2002; Hou et al., 2006). FMR1 mice also show abnormal visual cortical plasticity (Dolen et al., 2007) and both FMR1 and Shank3 mice show impairments on a number of spatial and social behaviors (Bangash et al., 2011; Krueger, Osterweil, Chen, Tye & Bear, 2011).

Deficits in Synapse Number

Changes in the total number of synapses made onto single neurons can profoundly impact the firing properties of these cells and alter network function. In cultured neurons, loss of TSC1 or TSC2 decreases the density of dendritic spines, the morphological correlates of synaptic contacts. Decreases in cortical spine density are also observed following loss of UBE3a

Plasticity, Neural, Table 1 Autism related genes and neural plasticity

Gene	Protein function	Syndrome	Synaptic plasticity/ function	Learning deficits	Molecular features
CACNA1C	Calcium channel	Timothy syndrome	Impaired Schaffer collateral late LTP	Impaired hippocampal spatial memory	
CNTNAP2	Cell adhesion molecule	Autism/ epilepsy/MR	–	Differential expression in bird song learning nuclei	Clusters potassium channels
CYFIP1	Synaptic translation regulation	Autism	–	–	Binds and regulates FMR1
DISC1		Autism/ Schizophrenia	Impaired hippocampal short term plasticity; short dendrites; decreased spine density	Abnormal spatial working memory	Controls Rac1 activation by NMDA receptors
FMR1	Activity-dependent synaptic translation regulation	Fragile X syndrome	Increased mGluR dependent LTD; impaired LTP in the prefrontal and visual cortex. Decreased spine stability; reduced experience-dependent changes in spine stability	Impaired hippocampal spatial memory. Altered ocular dominance plasticity	
NGLUT3	Glucose transporter	Autism		Abnormal spatial and working memory Cognitive inflexibility	
Neuroligin3	Synaptic adhesion molecule	Autism/MR	Increased cortical inhibition; Increased hippocampal excitation. Increased hippocampal LTP	Improved spatial memory Social Social behavior deficit	
MECP2	Transcriptional regulator	Rett Syndrome	Impaired cortical and hippocampal LTP. Impaired hippocampal LTD	Impaired Hippocampus-dependent spatial memory, contextual fear memory, and social behavior	Binds methylated cytosine to regulate activity dependent transcription
PTEN	Cell/dendritic growth regulator	Autism/MR; Cowden syndrome; or Bannayan-Riley-Ruvalcaba syndrome	Impaired hippocampal LTD; increased dendritic growth, decreased spine stability; increased spine density	Social behavior deficits	Inhibits activation of mTOR pathway
TSC1	Cell growth	Tuberous sclerosis	decreased spine density; increased AMPAR currents	Impaired hippocampal spatial memory	Inhibits activation of mTOR pathway
TSC2	Cell growth	Tuberous sclerosis	Abnormal induction of hippocampal Late-LTP; decreased spine density	Impaired hippocampal learning behavior	Inhibits activation of mTOR pathway
UBE3a	Proteosomal regulator	Autism; Angelman syndrome	Impaired visual cortical LTD; decreased spine density	Impaired ocular dominance plasticity	E3 ubiquitin ligase
Shank3	Synaptic adhesion molecule	Autism	Impaired hippocampal NMDAR LTP, LTD. Enhanced mGluR dependent LTD	Social behavioral deficits	

(Dindot, Antalffy, Bhattacharjee & Beaudet, 2008; Sato & Stryker, 2010) or DISC1 point mutation (Lee et al., 2011) in vivo. Notably, spine density is not affected by mutations of MET, a receptor upstream of the AKT signaling pathway. Taken together these observations suggest that either the normal establishment of spines is impaired or that their subsequent stabilization is compromised. Recent in vivo longitudinal imaging studies, presented below, support the latter view.

Deficits in Synaptic Stability

In addition to impairments in synaptic strength, a growing body of research implicates deficits in the physical growth and elimination of synapses in autism. Recent advances in nonlinear microscopy have enabled investigations of synaptic stability in wild-type and mutant mice. Using 2-photon excitation, the fine structure of individual neurons, their dendrites, and the spines emerging from these dendrites can be visualized in vivo. Dendritic spines are the postsynaptic element of excitatory synapses, and thus each spine represents a single synapse. Because this approach does not damage the imaged cortex, these same neurons, dendrites, and dendritic spines can be reimaged daily or weekly and the fates of individual spines followed for months. This approach has been used to longitudinally image dendrites and dendritic spines in mice with mutations in Pten and FMR1. In both mutants, the lifetimes of spines are reduced, indicating that cortical connectivity is far more kinetic and thus less stable. Notably, spine stability was less sensitive to changes in experience in FMR1 mutant mice. These observations suggest that the refinement of synaptic connections that is the hallmark of the critical period cortex is driven more by intrinsic activity patterns than by sensory experience.

Conclusion

Changes in neural structure, synaptic strength, and synaptic density occur throughout life but are most pronounced after the onset of sensory experience. Observations from mice harboring mutations of autism-candidate genes indicate that synapse number and stability are reduced and changes in their strength and stability are less sensitive to the pattern of neural activity. Impairments in use-dependent synaptic plasticity would severely impact the final structure and function of neural circuitry in all areas of the brain, but particularly so in cortex. Recent evidence showing that autism-like behaviors can be induced by altering the balance of excitation and inhibition in cortex in adult mice or by manipulating autism-candidate genes in adult mice supports a view of the disease in which postnatal plasticity, rather than initial patterning, is a prime driver of abnormal social behavior in autistic individuals.

See Also

- ▶ Synaptic Pruning
- ▶ Synaptogenesis

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Play

Katherine S. Wallace and Sally J. Rogers
Department of Psychiatry and Behavioral Sciences, UC Davis M.I.N.D. Institute, Sacramento, CA, USA

Synonyms

Exploratory play; Functional play; Games with rules; Parallel play; Pretend play; Sensorimotor play; Social

Definition

Play is a difficult phenomenon to define. Many theorists have attempted to develop strict definitions of play, but it is an occurrence which eludes simple definition (Pelligrini, 2009). Because play differs so dramatically across individuals, contexts, and cultures, there currently exist lists of characteristics often indicative of play situations, rather than a strict definition itself. For example, play may be distinguished in terms of functional dimensions, in that it often does not have a functional or goal-directed consequence (e.g., play fighting does not hurt others), and it is often more oriented toward means than ends. In addition, play may be distinguished in causal dimensions, in that play will frequently be interrupted by more pressing, functional concerns, players exhibit relaxed motivation (i.e. play is voluntary), and play is often characteristic of juveniles (i.e. children play more frequently than adults). Because there is not a universally-accepted definition of play, researchers apply different descriptions of play characteristics to identify play in different contexts. Nevertheless, such characteristics converge toward a definition of a complex phenomenon.

Historical Background

Two developmentalists have had extraordinary influence in defining play and its development. Parten (1932) focused on social participation within play, and Piaget (1952) focused on the development of object play as a reflection of developing cognitive processes. Prior to the 1930s, only "scattered individual attempts" (Parten, 1932, p. 246) had been made to study children's social behavior more generally and play more specifically. Mildred Parten, at the University of Minnesota, recognized the need for systematic study of child group behavior. She pioneered the longitudinal observational study of children's social behavior within the nursery school of the Institute of Child Welfare at the University of Minnesota. Results from this study formed the basis of categorization of types of children's play.

Parten (1932) observed 42 children across 8 months' time. Although children's IQ ranged from 81 to 145, the mean IQ indicated above-average mental ability, and a high percentage of children had fathers with professional careers. Generalization of research results drawn from such studies, as well as considerations of cross-cultural studies of play, is discussed below. After several weeks of careful observation, Parten (1932) developed a scale of social participation within play. The following stages represent increasingly socialized forms of play:

1. Unoccupied behavior: The child does not seem to be playing but instead occupies him/herself with watching anything that happens to be of momentary interest. When nothing external interests him/her; he/she plays with his/her own body, gets on and off chairs, stands or sits unoccupied, or follows the teacher.
2. Onlooker: The child observes a group of children playing but does not overtly enter into the play activity. The child may, however, talk to the children whom he/she is observing, ask questions, or give suggestions.
3. Solitary independent play: The child plays alone and independently with toys different from those used by nearby children. He/she makes no effort to get close to other children or to reference what others are doing.
4. Parallel activity: The child plays beside, rather than with, other children. The activity that he chooses naturally brings him/her close to other children, but he/she plays independently. Toys used are similar to those used by others around him/her, but he/she plays with them as he/she desires and does not try to influence the activity of the other children.
5. Associative play: The child plays with other children. In this group play, there is an overt recognition by the group members of their common activity, interests, and personal associations. Although all group members engage in similar or identical activity, there is no division of labor and no organization of the activity around any material goal or product.
6. Cooperative or organized supplementary play: The child plays in a group that is organized for the purpose of making some material product, attaining some competitive goal, dramatizing situations of adult or group life, or playing formal games. This represents the most highly organized group activity and is marked by elements of division of labor, group censorship, centralization of control in the hands of one or two members, and the subordination of individual desire to that of the group.

Parten's observational study involved 2–4-year-olds, and she found a clear progression through stages of play as children aged. The younger children either played alone or in parallel groups, while the older children played in the more highly organized groups. Parten's play categories are still respected and widely used as a meaningful framework within which to examine children's increasing maturity of play.

Piaget provided the first detailed theory of play development from a cognitive perspective. Although many writers prior to Piaget theorized that play was important to children's development, Piaget elaborated upon play's significance in terms of cognitive development and defined three types of play. Like Parten (1932), Piaget (1952) theorized that these categories of play were organized into stages which children move through as they develop. According to Piaget (1952), children move through three primary ordered stages during their first four years of life. His theory, like that of Parten (1932) two decades prior, has remained highly influential. Piaget suggested that children's play moves from motor actions to underlying cognitive representation over time. Piaget (1952) outlined the following three stages:

1. Practice play: Characteristic of children from approximately 2 months to 2 years of age. During this stage, children are not yet motivated or influenced by convention, symbols, pretending, or rules. Instead, they utilize sensorimotor activities to gain pleasure – mastery motivation – based on agency, via moving their bodies or objects and repeating learned actions. Infants in this stage develop the ability to combine different sensorimotor action schemes in their practice play, begin to define objects by their use, and perform ritualistic action patterns in which typical actions with conventional objects are performed. However, the play in this stage is limited in that infants will not apply these actions to new objects or display an awareness of make-believe.
2. Symbolic play: Characteristic of children from approximately 2 to 4 years of age. During this stage, children make the transition from sensorimotor schemes to mental operations or representations. Piaget (1952) detailed eight ordinal levels of symbolic play, leading from the earliest forms involving the use of

familiar actions on novel objects (e.g., putting a box on the foot and saying it is a shoe) to the reproduction of scenes from reality, corrected to "fix" certain outcomes (e.g., after a recent trip to the doctor, the child might pretend that that doctor did not give him/her a shot, but instead gave him/her a lollipop).

3. Games with rules: Characteristic of children from approximately 4 to 7 years of age. During this stage, children become interested in social games involving rules, structure, and social interaction. Over time, the types of rules, as well as the reasons for following them change. Children at first follow rules centered on the sensorimotor aspects of play which provide structure and repetition. Later, rules become focused on the social aspects of play and are connected to group acceptance. Finally, competitive games and games with codes of rules become more frequently played.

The theories described above can easily be combined to imagine a typical child's progression through play development both in social interaction and cognition. A 2-year-old child might, for example, engage in parallel play while projecting symbolic schemes onto new objects, while a 4-year-old child might engage in cooperative supplemental play while exploring anticipatory combinations. For all the research on play that has occurred since Parten (1932) and Piaget (1952), their research and theories continue to influence current play research.

Current Knowledge

Play, in its various forms and stages, affects children's development widely (Bjorklund, 1997). Many theorists argue, in fact, that it is primarily through play that children's cognition develops (Dansky, 1980; Piaget, 1952). Play can be viewed from an evolutionary perspective as a mechanism by which children master skills that will be important for their survival and development to maturity (Bruner, 1972). According to Bjorklund (1997), the play exhibited by children has an adaptive role in both evolution and human development. He argues that the play exhibited by children in humans' protracted period of immaturity is a necessary component of development and leads to successful learning by children of the complexity and diversity of contemporary human community. Play is a forum through which children develop skills and knowledge related to motor skills, culturally acceptable social behaviors (Bruner, 1972), spatial and classification skills (Connolly & Doyle, 1984), language fluency, abstract thought and intelligence (Weininger, 1978), and innovative problem-solving (Smith & Dutton, 1979).

Many categories of play cited today correspond to the stages of play development outlined by Parten (1932) and Piaget (1952). Categories of play include:

- Sensorimotor or exploratory play: This is also known as practice play and corresponds to the first stage of Piaget's (1952) theory outlining development of play. In sensorimotor play, children manipulate objects as a means for practice and mastery of action schemas. Sensorimotor play involves repetition of behaviors, routines, and subroutines that have been mastered. Examples include infants' rhythmic motor behaviors, such as repetitive kicking or shaking of an object (Pelligrini, 2009; Rogers, Cook, & Meryl, 2005).
- Functional play: Functional play is categorized in one of two ways. According to some researchers, functional play is a synonym for the sensorimotor or practice play described above (Pelligrini, 2009). For others, it is a separate category of play involving the child combining objects and forming play acts in ways that reflect social conventions. In this category of play, children use objects in the ways that they are typically used. Examples include a child eating and drinking from play dishes and placing a toy cup on a saucer (Rogers et al., 2005).
- Pretend play: Also called symbolic play, fantasy play, or make-believe play, this corresponds to the second stage of Piaget's (1952) theory outlining the development of play. Pretend play is a primarily assimilative behavior where in the child takes a behavior out of its functional context or recombines everyday behavioral sequences in novel orders

(Pelligrini, 2009). In pretend play, absent elements are often represented through objects, gestures, and language. It grows out of the child's developing ability for mental representation and provides a means for practicing and gaining understanding of the events of the social world (Rogers et al., 2005). Examples include a child utilizing a stick in place of a spoon to stir pretend liquid in a cup or pretending that one is a train conductor.

- Games with rules: This type of play corresponds to the third stage of Piaget's (1952) theory outlining the development of play. In this type of play, games are primarily accommodative and governed by a priori rules. Although there is some negotiation in the rules of children's games, these rules are generally not flexible (Pelligrini, 2009). Examples include baseball and board games.
- Parallel play: This type of play corresponds to the fourth stage of Parten's (1932) theory outlining the development of play. In this type of play, the child plays beside, rather than with, other children. Although the child uses similar toys as those around him, he/she plays with them independently and as he/she desires, and he/she makes no effort to influence the play of others. Examples include playing with dump trucks in a sandbox or playing with toy boats in a water table, next to other children playing similar games.
- Social play: This type of play corresponds to the fifth and sixth stages of Parten's (1932) theory outlining the development of play (associative play and cooperative play). Here, the child plays with other children. As evidenced by the multiple corresponding stages, there is a continuum of social play. As in cooperative play, the group of playing children may organize itself in order to make some material product, attain some competitive goal, dramatize situations of adult or group life, or play formal games. As in associative play, the children may merely play with one another, with an overt recognition by the members of their common activity, interests, and personal associations but without division of labor or organization.
- Exploratory play: It has been argued that exploration is a separate activity than play. Some researchers argue that exploratory behaviors occur prior to play behaviors in the first few months of life. They note that exploration is performed in a deliberate manner, often in novel contexts, in order to gather information, while play is exhibited in familiar contexts with positive affect in order to practice (Pelligrini, 2009). Other researchers, however, view exploration as a type of play and hypothesize that children learn cause and effect relationships through such play (Schultz & Bonawitz, 2007). Piaget himself argued that children construct knowledge via active exploration (Piaget, 1930), and exploratory play is believed to accomplish such knowledge attainment. Examples of exploratory play include mouthing objects and dropping objects to observe what happens.

Cultural Influences on Play

Roopnarine, Johnson, and Hooper (1994) describe cultural-ecological models of behavior and stress the importance of applying such models to research of play. According to a cultural-ecological model, there are three interacting layers of environmental influence on play: (1) physical and social aspects of children's immediate settings; (2) historical influences that affect the way adults and children conceptualize play; and (3) cultural and ideological beliefs regarding the meaning of play. A wide range of variables contribute to the development, significance, and value of play and are highly influenced by ecological context at many levels. Play is an expression of a particular culture and an important context for transmission of that culture (Schwartzman, 1978). Although some research has been conducted on the cross-cultural development of play, the majority of taxonomies of play forms, as well as discussions of the significance and value of play, have been based on studies of Western children and have made global assumptions. In order to achieve a more comprehensive, coherent, and integrated knowledge base of play, it is necessary to expand these cross-cultural considerations in future play research (Roopnarine et al., 1994).

Play in Autism

Many studies have repeatedly isolated symbolic play deficits as a core feature of autism. In 1975, for example, Ricks and Wing reviewed what was known about autism up to that point and concluded that a central deficit within children diagnosed with autism is the inability to understand symbols. This inability affected, among other areas, the symbolic play skills of children with autism. Expanding on that paper, Wing, Gould, Yeates, and Brierley (1977) published the first major research paper on symbolic play in autism. They confirmed that in children with autism, there is a lack of spontaneous symbolic play, and that for those who did demonstrate some amount of symbolic play, the play acts were repetitive and stereotypic. Children with autism do not perform symbolic play acts as frequently as other children, and when they do perform these play acts, the play lacks variety.

Additional research has replicated these original findings and strengthened the viewpoint that children with autism engage in fewer and poorer quality symbolic play acts (Hammes & Langdell, 1981; Riguet, Taylor, Benaroya, & Klein, 1981). Sigman and colleagues (Mundy, Sigman, Ungerer, & Sherman, 1986; Sigman & Ungerer, 1984) replicated these findings but also found that nonsymbolic play was affected in children with autism.

Although Sigman and colleagues (Mundy et al., 1986; Sigman & Ungerer, 1984) found that children with autism exhibit a paucity of functional and sensorimotor play skills in addition to exhibiting a lack of symbolic play skills, evidence on this has been mixed. While Baron-Cohen (1987) and Sigman and Ruskin (1999) found no deficits in functional play skills in children with autism, the majority of studies have found differences in functional and sensorimotor play skills in children with autism as compared to matched comparison groups. For example, Sigman and Ungerer (1984) reported that in spontaneous play conditions, young children with autism produced fewer functional play acts, fewer different functional play acts, and fewer sequences than intellectually disabled children in their comparison group. In addition, Williams, Reddy, and Costall (2001) found deficits in both functional and sensorimotor play in children with autism. These children exhibited lower rates of both types of play acts and performed more immature than mature play acts. The research across the symbolic, functional, and sensorimotor play skills in children with autism demonstrates similar patterns of findings: children with autism exhibit fewer play acts, more repetition, less novelty, and less diversity of play schemas.

Interventions have been demonstrated to improve the play skills of children with autism. Direct teaching and naturalistic teaching approaches have demonstrated significant effects on children's play (Kasari, Freeman, & Paparella, 2006, 2008, Kasari, Paparella, Freeman, & Jahromi, 2008; Reddy, Files-Hall, & Schaefer, 2005; Rogers, 2005), addressing both functional and symbolic play deficits. Targeting play for interventions serves to increase children's play as a learning tool and also provides older children with appropriate recreational activities.

Future Directions

Future needs related to autism play research fall under two primary areas: brain behavior correlates and effects of play skills on later development. Neuroscience has not yet been incorporated into models or studies of play (Rogers et al., 2005). Play is a cognitive activity as well as a motor and social-emotional activity. Observers can distinguish between adaptive acts and play acts in children's behavior, with the assumption that some differing neural processes are involved, even when the overt act is the same. It will be helpful for researchers to begin to consider the neural systems underlying play and the neuropsychology of play. Play is considered an important therapeutic medium for a number of childhood disorders (Reddy et al., 2005). Most childhood interventions for autism spectrum disorder target play skills, without much knowledge about the relationships between childhood play skills and their effects on later development. Longitudinal research in this area is sorely needed. Expanding the multilevel accounts of play should assist future researchers to understand the change process facilitated by play, both developmentally and therapeutically.

See Also

► Symbolic Play

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Play Intervention

Brooke Ingersoll and Katherine Walton
Department of Psychology, Michigan State University, East Lansing, MI, USA

Definition

Play intervention is a term used to describe psychosocial interventions designed to improve play skills in children with ASD. The term has also been used to describe interventions that take

place within a play setting, but focus instead on increasing social or language skills. This entry will focus on intervention developed specifically to target play skills in children with ASD.

Play is a broad term that describes a variety of skills, including object-oriented play, pretense, and play with peers. Children with ASD have significant deficits in all of these areas, and a lack of varied, spontaneous make-believe play or social imitative play is a hallmark feature of the disorder (American Psychiatric Association [APA], 2000). Thus, a variety of intervention strategies have been developed to target play skills in children with ASD, including discrete trial training (DTT), naturalistic behavioral interventions, integrated play groups, video modeling, differential reinforcement of appropriate behavior (DRA), self-management, and play scripts (see Stahmer, Ingersoll, & Carter, 2003 for review).

The term "play intervention" is most commonly used to describe a group of naturalistic intervention techniques that take place in a play setting, and may or may not involve typically developing peers. As such, this entry is focused on play intervention of this type. Within a play setting, the intervention provider uses a number of techniques to engage the child with the materials and with the provider (e.g., following along with the child's focus of interest, acting excited and animated about the child's play). With the child engaged in the interaction, the intervention provider then provides models and prompts (either verbal or physical) to encourage the child to complete more complex or advanced play actions than he is currently using. When the child responds by completing the prompted play actions, the intervention provider typically praises the child verbally and rewards the child by allowing him continued access to the toys.

Historical Background

Limited and perseverative play has been described as a difficulty for children with autism since Kanner's first description of the syndrome in 1943. More systematic research as early as 1964 indicates that, compared to typically developing or intellectually disabled children, children with autism show more stereotyped play, less diversity of play, and less symbolic play (Wulff, 1985). When autism first appeared in the third edition of the Diagnostic and Statistical Manual of Mental Disorders in 1980, difficulty with imaginative play and social play were included as symptoms of the disorder. The first treatment to specifically target play skills in children with autism and other developmental delays was discrete trial training. However, given concerns about generalization of skills and appropriateness of such structured programs for young children, most play interventions now take place in a more naturalistic setting. Pivotal response training (PRT), a naturalistic behavioral intervention originally designed to teach language to children with autism, was the first intervention of its type to be successfully adapted to teach symbolic play skills to children with autism (Stahmer, 1995). Since this time, a number of other naturalistic behavioral interventions have been used to teach play as well.

Rationale or Underlying Theory

The play deficits (particularly regarding symbolic play) seen in children with autism have been theoretically linked to difficulties with symbol formation more generally. Other skills that rely heavily on symbol formation are language and abstract reasoning (Wulff, 1985). In addition, play is seen as a fundamental way in which young children connect socially, both with adults and with other children (e.g., Mueller & Brenner, 1977). Therefore, interventions that improve symbolic play skills in children with autism may also have collateral effects on language, cognitive skills, and social skills. Early toy play skills are associated with later communication development (Toth, Munson, Meltzoff, & Dawson, 2006). In addition, children receiving play intervention have shown increases in other skills not specifically targeted in these interventions, such as language, joint attention, and interaction skills (Stahmer et al., 2003).

Goals and Objectives

Play intervention is designed to target a variety of object-interaction and social play skills. For children who interact little with objects or engage primarily in stereotyped play, play intervention targets are likely to be simple meaningful toy interactions, such as combining toys in a meaningful manner (e.g., stacking blocks). This type of simple relational play is seen as a necessary precursor to more complex symbolic or pretend play (van Berckelaer-Onnes, 2003), and increases in appropriate play are associated with decreases in less-meaningful stereotyped play (Stahmer & Schreibman, 1992). For children with more advanced play skills or who are further into a play intervention treatment program, more complex actions and play schemes such as doll play, multiple-step pretend schemes, and sociodramatic play with a partner are likely to be targeted.

Treatment Participants

Play intervention has primarily been targeted at relatively young children (approximately 2–6 years of age). Some research has indicated that play intervention is likely to be more successful for children with higher IQ's (Wulff, 1985) and higher initial object-interaction skills (Ingersoll, 2010).

Treatment Procedures

Play intervention is typically carried out in a play-based setting, with a number of toys available to the child and therapist. Structure of the sessions may vary depending on the specific approach used, but most play interventions include at least a portion of the session that provides opportunities for teaching within a semi-structured play setting. More structured approaches, such as pivotal response training, may include table-top drills to teach new skills during a portion of the session. Less structured approaches, such as incidental teaching, are more child-directed and rely heavily on teaching around the child's chosen focus of interest. Sessions are usually conducted two to seven times per week for 30–60 min. Major tenets of play intervention include the use of techniques to engage the child in interaction (e.g., following the child's lead, talking about what the child is doing, sitting close to the child) and the use of modeling, prompting, and reinforcement strategies (e.g., telling or showing the child what to do, giving verbal praise for correct responses, providing corrective feedback, rewarding the child's correct responses with continued access to toys). Play intervention has been successful in a number of treatment formats, including therapist-, parent-, peer-, and sibling-implemented models (Stahmer et al., 2003).

Efficacy Information

Play intervention has been successful at teaching functional and symbolic play skills for children with autism (Kasari, Freeman, & Paparella, 2006). In many cases, collateral benefits on other skills, such as language and social skills, have also been observed (Kasari, Paparella, Freeman, & Jahromi, 2008). These skill improvements have been found to persist up to 1 year later. Increases in both spontaneous and prompted play skills have been observed in nontreatment settings (e.g., standardized assessments, parent–child play sessions) following play intervention. However, generalization of these skills to settings with typically developing peers has not been evident, suggesting that peer play may need to be targeted explicitly. In addition, the play of children with autism often remains qualitatively different from that of typically developing children even following play intervention (Stahmer, Schreibman, & Powell, 2006).

Outcome Measurement

Researchers have measured play in a variety of ways, including total time spent playing with toys, time spent in appropriate play, diversity of

object play, and play complexity or level. All of these elements of play have been found to significantly discriminate children with autism from those with typical development, intellectual disability, hearing impairment, and language impairment (Stone, Lemanek, Fishel, Fernandez, & Altemeier, 1990).

Several structured assessments have been used to assess treatment outcome and relationships between play skills and other skills in children with autism. The Structured Play Assessment (SPA; Ungerer & Sigman, 1981) provides children with four different sets of toys and a variety of structured play prompts designed to elicit play skills at a number of different play levels. Both prompted and spontaneous play acts are coded for play level: manipulative, relational, functional, or symbolic. Manipulative play consists of actions such as mouthing, banging, fingering, or throwing toys. Relational play consists of combining objects in nonfunctional ways (e.g., nesting or stacking objects). Functional play consists of using objects in a way they were intended, such as brushing a doll's hair, placing a truck in a garage, or holding a phone to one's ear. Symbolic play consists of object substitution (pretending one object is another), use of a doll as an independent agent, and imaginary play (creation of an object or effect that is not actually present). The SPA has been used by a number of researchers to measure treatment outcome and relationship among play skills and other social-communication skills in children with autism (Kasari et al., 2008; Sigman & Ungerer, 1984; Ungerer & Sigman, 1981).

The Developmental Play Assessment (DPA; Lifter, Edwards, Avery, Anderson, & Sulzer-Azaroff, 1988) consists of a 30-min videotaped free play session with a child and an administrator. The administrator comments on the child's play, but does not provide prompts or instructions for play. Each play act on the videotape is later coded to determine what play category the act fits in to. Each play act is then placed into one of eight play categories (e.g., indiscriminate actions, child as agent, doll as agent, sociodramatic play) and the total number and diversity of acts in each category are tallied to determine whether the child has absent skills, emerging skills, or mastery in each category. Play categories were designated based upon numerous studies of the development of play skills in children with typical development and with disabilities. The DPA has been used as a measure of play skills in children with and without autism in number of research studies (Pierce-Jordan & Lifter, 2005; Lifter, Sulzer-Azaroff, Anderson, & Cowdery, 1993; Yoder & Stone, 2006).

Qualifications of Treatment Providers

Play intervention is provided by a wide range of treatment providers, including teachers, speech pathologists, psychologists, social workers, and physicians. In addition, family members and peers can be trained to serve as treatment providers or treatment aids in play intervention. A number of play intervention programs are accessible through training workshops or published materials.

See Also

- Naturalistic interventions
- Pivotal response training
- Play
- Self-management interventions
- Symbolic play
- Video Modeling/Video Self-Modeling

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Play Therapy

Jeffrey J. Wood
Departments of Psychiatry and Education, University of California, Los Angeles, CA, USA

Synonyms

Directive play therapy; Nondirective play therapy; Play-based interventions

Definition

Play therapy is a method of treatment that is provided to children by a trained professional. It uses play within a therapeutic setting to address social, emotional, and behavioral difficulties. Traditionally, the underlying premise of play therapy was that children use symbolic play as a way to represent their internal experiences (e.g., beliefs, feelings) and, simultaneously, can develop and practice healthy coping skills through play. Play therapy is significantly different from the play children engage in with their peers or other untrained adults in their lives (e.g., parents or babysitters) because the therapist interprets children's play behaviors in an effort to achieve treatment goals. There are various forms of play therapy interventions as well as growing empirical evidence for treating childhood difficulties, such as trauma and anxiety. In addition, play therapy has been incorporated into other empirically established treatments for children, such as cognitive behavior therapy. Play therapy varies based on

the reason the child enters into treatment, the age of the child, and the training background of the therapist. The therapist observes and joins in the play to obtain a better understanding of the child, connects the information gathered from these interactions to the reasons for which treatment was initially requested, and then applies this understanding to develop and implement treatment goals. Positive changes are achieved by sharing interpretations with the child in an understandable and child-friendly manner within the play, collaborating with the child to develop and practice better coping skills using play, facilitating communication of feelings and thoughts in a safe and emotionally corrective environment, as well as involving and coordinating treatment goals with the child's family.

At this time, there is no established empirical support for the use of play therapy in treating youth with ASD (National Research Council, 2001). Historically, traditional talk and play therapies have not been considered a helpful intervention to address the core symptoms of autism spectrum disorder (ASD), a point noted early in the field by Kanner and others. Impairments in symbolic, imaginary play characteristic of ASD (Stahmer et al., 2003) as well as the strong empirical evidence in support of behavioral interventions based on the principles of applied behavior analysis to treat core ASD impairments (Dawson et al., 2010, Koegel, Koegel, Vernon, & Brookman-Frazee, 2010, Lovaas, 1987) have precluded play therapy as an intervention for ASD. However, one area of focus of behavioral intervention for children with ASD has been to develop play skills, including symbolic play (Stahmer et al., 2003). Additionally, for children with ASD, play has been used to facilitate functional communication and social skills (e.g., Dawson et al., 2010; Koegel et al., 2010).

See Also

- ▶ Early Intensive Behavioral Intervention (EIBI)
- ▶ Naturalistic Interventions
- ▶ Pivotal Response Training
- ▶ Symbolic Play

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Play-Based Interventions

- ▶ Play Therapy

Pleiotropy

Ellen J. Hoffman
Albert J. Solnit Integrated Training Program, Yale Child Study Center, New Haven, CT, USA

Synonyms

Multiple phenotypes associated with disruption of a single gene

Structure

An individual's set of genes is referred to as their *genotype*, and how these genes influence the expression of physical characteristics, or the presence of a disorder, is considered an individual's *phenotype*. Because most genes encode an RNA molecule or a protein sequence, disruption of a gene by a mutation that prevents it from functioning has the potential to interfere with whatever processes the gene product influences. For this reason, mutations in a single gene or pair of genes may affect organ systems ranging from, for example, the central nervous system, cardiovascular system, and connective tissue. *Pleiotropy* is the genetic phenomenon in which disruption of the same gene results in a range of clinical symptoms. Because multiple organ systems may be affected, often, it is challenging to explain how disruption of one gene leads to such a diversity of phenotypes or clinical presentations (Jorde, Carey, & Bamshad, 2010; Nussbaum, McInnes, & Willard, 2007).

Although ASDs are considered to be the most genetic of developmental neuropsychiatric disorders, based on studies of monozygotic twins and recurrence risk in siblings, marked heterogeneity at both the genotypic and phenotypic levels has made elucidating the genetic underpinnings of ASD a formidable challenge (O'Roak & State, 2008). ASD is characterized by marked *locus* and *allelic heterogeneity*, such that multiple genes at different locations throughout the genome and distinct variants within the same gene, respectively, can influence an individual's clinical presentation. Our current conceptualization of the genetic architecture of ASD is that it is complex, involving the interplay of genetic variation, which may be present in multiple risk genes throughout the genome, inherited or *de novo*, rare or common, and present at the level of the sequence of DNA (single nucleotide variants) or the structure of chromosomes (copy number variants, CNVs); environmental; and epigenetic components – all of which contribute to clinical presentation, which also may be heterogeneous (State & Levitt, 2011).

Further complicating our ability to elucidate how genes associated with risk cause clinical symptoms in ASD are emerging findings from recent studies showing that these genes are highly pleiotropic, in that they appear to confer risk for multiple clinical presentations. On the one hand, there is strong evidence for a number of candidate genes and chromosomal regions, such as *Neuroligin 4X* (*NLGN4X*), *SH3 and multiple ankyrin repeat domains 3* (*SHANK3*), *contactin-associated protein-like 2* (*CNTNAP2*), 16p11, 22q11, and others (see below), in ASD. However, recent large-scale studies have implicated the same genes and structural variants across a range of psychiatric disorders, including schizophrenia, attention-deficit hyperactivity disorder (ADHD), and Tourette syndrome (TS), and in some cases, neurological disorders, such as seizure disorder, and even obesity (discussed in more detail below). Therefore, pleiotropy has emerged as a central theme in the genetics of ASD, forcing us to reexamine our understanding of how genetic risk informs phenotypic specificity (State, 2010; State & Levitt, 2011).

Function

There are a growing number of examples of variation in the same gene or chromosome region predisposing to a diversity of phenotypes, including ASD. All of the examples discussed here are genes or CNVs that were initially identified as susceptibility genes/regions through what can be described as a rare variant approach. This approach involves looking for outliers, in particular rare, *de novo* abnormalities in chromosome structure, and is hypothesized to enrich for the identification of genes of major effect. Therefore, there is strong evidence implicating these risk genes and CNVs in ASD, which makes finding these same variants in other disorders difficult to interpret.

One chromosomal region that has been strongly implicated in ASD in multiple studies is *16p11.2*. Specifically, structural abnormalities affecting this region have been found in ~1% of families with ASD. These studies showed that recurrent deletions and duplications of this region occur with increased frequency in individuals with ASD. CNVs in this region were found to

be either transmitted or *de novo* (Kumar et al., 2008; Marshall et al., 2008; Sanders et al., 2011; Sebat et al., 2007; Weiss et al., 2008). Despite the strong evidence for this region in ASD, CNVs at 16p11 have also been implicated across psychiatric diagnoses. For example, Weiss and colleagues identified deletions in this region in individuals with schizophrenia, bipolar disorder, ADHD, and dyslexia.

Additional studies provided further support for an association of CNVs, specifically duplications at 16p11 in schizophrenia and childhood-onset schizophrenia (McCarthy et al., 2009; Walsh et al., 2008). Moreover, one of these studies specified that 16p11.2 microduplications were significantly associated not only with the risk of schizophrenia but of bipolar disorder and autism, while the reciprocal microdeletion was associated with autism and developmental disorders (McCarthy et al., 2009). In addition, more recent studies have reported that structural abnormalities in this region are found in intellectual disability that is not associated with autism (Bijlsma et al., 2009) and even in obesity (Bochukova et al., 2010).

Therefore, it would seem that instability of chromosome structure in this region predisposes to a range of psychiatric disorders. However, it is important to observe that CNVs in this region have also been found in unaffected individuals (Glessner et al., 2009). In addition, even some of the first deletions in this region identified in families with multiple affected individuals with ASD by Weiss and colleagues did not segregate with the presence of the disorder, such that affected siblings did not share this CNV. While this observation flies in the face of what would be expected in Mendelian disorders, it is consistent with findings in disorders with complex genetic architecture, such as ASD (O'Roak & State, 2008).

Another highly pleiotropic region is chromosome *22q11.2*. Deletion of this region causes velocardiofacial syndrome or DiGeorge syndrome, a pleitropic syndrome that leads to abnormalities in multiple organ systems, including immune deficiencies, cardiac defects, and mild dysmorphic facial features. While CNVs in this region have been associated with ASD (Glessner, et al., 2009; Marshall, et al., 2008), 22q11 deletions have also been found to increase the risk of a range of psychiatric disorders, most notably early-onset psychotic disorders, schizophrenia, ADHD, and anxiety (Green, et al., 2009).

While it seems plausible that pleiotropy might occur due to disruption of a chromosomal region, which encompasses many genes, it is surprising that single genes and gene families strongly associated with ASD are being implicated in other psychiatric disorders as well. This finding has led to the conclusion that perhaps similar biological mechanisms underlie these seemingly disparate disorders (see discussion below). For example, *neuroligins* and *neurexins*, which are cell adhesion molecules that are found at the synapse and play a role in synapse formation by interacting with each other across the synaptic cleft, and *SHANKs*, which interact intracellularly with neuroligins (Sudhof, 2008), and were first identified as susceptibility genes in ASD (Durand et al., 2007; Glessner et al., 2009; Jamain et al., 2003; Laumonnier et al., 2004; Marshall et al., 2008), have also been implicated in schizophrenia (Gauthier et al., 2010, 2011).

Similarly, *CNTNAP2* was identified as a risk gene for ASD because it was disrupted by a single base pair deletion that was found in consanguineous families, such that individuals homozygous for the mutation had a syndrome characterized by focal epilepsy and cortical abnormalities (Strauss et al., 2006). Multiple additional studies, including those adopting both rare and common variant approaches, have provided evidence that disruption of this gene is likely to be associated with an increased risk of ASD. As was the case with the neurexins and neuroligins, subsequent studies have implicated *CNTNAP2* in multiple psychiatric and neurodevelopmental disorders, including intellectual disability, Tourette syndrome, language disorders, ADHD, and schizophrenia (State, 2010).

Pathophysiology

How then do we interpret the overlapping clinical presentations associated with the same structural and single gene variants, as described above?

Possible explanations that have been proposed in response to these observations include differences in diagnostic assessments, such that social disability could be defined as ASD in one study, and as representative of the negative symptoms of schizophrenia in another (State & Levitt, 2011). However, as discussed in State and Levitt (2011), this scenario is unlikely to account for the breadth of findings described above, particularly given that ASD and schizophrenia, as defined in *DSM-IV-TR*, have distinct diagnostic criteria, ages of onset, and clinical courses. Alternatively, it is possible that variation in the same chromosomal region or at the same locus might produce either gain- or loss-of-function effects, with respect to the gene product that is disrupted, or divergent effects on gene expression, ultimately leading to different clinical presentations. Another possibility is type I error associated with publication bias (State & Levitt).

At the same time, one current model proposes that the high degree of pleiotropy associated with these genes and chromosomal regions predisposes to a diverse range of clinical presentations. More specifically, structural variation at regions such as 16p11 or 22q11, or sequence variation in risk genes, including *NLGN4X* or *CNTNAP2*, may represent a risk for the disruption of common biological processes, such as synapse formation. Variation at other sites throughout the genome, i.e., locus heterogeneity, interacts with the known risk variant(s) to influence the same biological processes. Moreover, environmental and epigenetic factors also affect gene expression and these same processes in ways that are not well understood (State, 2010; State & Levitt, 2011).

Support for this hypothesis comes from recent whole-exome sequencing studies of families with developmental brain malformations, in which homozygous mutations in the gene *WDR62* were found to lead to multiple distinct cortical abnormalities, including microcephaly, lissencephaly, and hypoplasia of the corpus callosum (Bilguvar et al., 2010). Because psychiatric disorders involve behavioral abnormalities, which are markedly heterogeneous, it is possible that disruption of a single gene is even more likely to predispose to a range of behavioral symptoms. Taken together, according to this model, neurodevelopmental processes are uniquely shaped by the combination of variation in pleiotropic genes/regions, their interaction with other genetic loci, and environmental factors, which has the potential to result in a diverse range of neuropsychiatric disorders (State, 2010; State & Levitt, 2011).

See Also

- ▶ Chromosomal Abnormalities
- ▶ Neuroligins

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Plica Palpebronasalis

▶ Epicanthic Fold

PLS-5

▶ Preschool Language Scale-IV

PLSI

▶ Pragmatic Language Skills Inventory

Plumbism

▶ Lead Exposure and Autism

Pms-Haloperidol

▶ Haloperidol

Pneumoencephalography

Sara Jane Webb
Psychiatry and Behavioral Sciences and UW Autism, University of Washington, Seattle, WA, USA

Synonyms

Encephalography; PEG; Ventriculography

Definition

A medical procedure allowing for the structure of the brain to show up more clearly on an x-ray. First introduced in 1919, this procedure uses a lumbar puncture to remove cerebrospinal fluid from the brain, and then air, helium, or oxygen is injected into the lumbar subarachnoid space. The procedure is rarely used due to significant side effects. It has largely been replaced by CT scan and other imaging techniques.

In 1968, Aarkrog reported 25 of 46 children with infantile autism or borderline autism had an abnormal PEG (also see Melchior, Dyggve, & Gylstorff, 1965). Hauser and colleagues (1975) reported on 18 cases with autism and PEG and found enlargement of the left ventricular system (13/18) and widened left temporal horn reflected in flattening of the hippocampal contours (15/18); only 1 case was reported as "normal." The authors concluded that deficits of the medial temporal lobe may be a contributing factor to infantile autism.

See Also

- ▶ Computed Tomography
- ▶ Magnetic Resonance Imaging

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POI

- ▶ Perceptual Organization Index (POI)

Point Prevalence

- ▶ Prevalence

Point-Light Displays

Martha D. Kaiser
Child Neuroscience Laboratory, Yale Child Study Center, New Haven, CT, USA

Definition

Point-light displays are constructed by recording movements of people, animals, or objects with markers or point lights attached to the major joints and then processing the videos so that only the point-lights are visible in the resultant displays. These stimuli are used to isolate motion perception processes as they contain limited form information.

Individuals with autism are able to identify human actions in point-light displays. Some behavioral studies indicate typical performance by individuals with ASD on a variety of tasks with point-light displays. However, disruptions in their visual sensitivity to point-light displays of human motion have been found in a variety of tasks including preferential attention, direction detection, and coherence detection. Some studies have reported deficits in labeling emotion in point-light displays. Unlike typically developing individuals, those with autism do not show an enhanced ability to detect human versus animal motion in point-light displays.

Functional magnetic resonance imaging studies present more consistent results as individuals with ASD have repeatedly been found to exhibit atypical neural responses to biological motion in point-light displays. The posterior superior temporal sulcus is one area of dysfunction reported in such studies. Some researchers have proposed that PSTS dysfunction and disrupted perception of biological motion (in point-light displays) serve as a hallmark of autism spectrum disorders.

See Also

► Biological Motion

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Pondimin

► Fenfluramine

Population Norms

► Normative Data

Positive Behavior Intervention

► Positive Behavioral Support

Positive Behavior Support

► Positive Behavioral Support

Positive Behavioral Support

Erik Bromberg
University of California, Santa Barbara, USA

Synonyms

Positive behavior intervention; Positive behavior support

Definition

Positive behavioral support is both a values-based and an empirically verified system that uses specific nonaversive procedures to improve an individual's quality of life as well as reduce their problem behaviors in community settings. Positive behavioral support procedures were developed from the literature of applied behavioral analysis and operant conditioning and were created in response to the concern over the possible detrimental effects of aversive behavioral interventions on a person. Positive behavioral support comprises varied treatment methods including pivotal response treatments; however, there are themes central to all techniques. One, functional analysis is used to identify both the context as well as the adaptive function of the problem behavior. Two, the intervention provides behavioral change while minimizing the use of punishers. Three, the use of the intervention is justified by the outcome. Four, the intervention considers the ecological context of the behavior. Five, the intervention is socially valid and respectful of a person's dignity.

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Positive Reinforcement

Rebecca Doggett[1] and Lynn Koegel[2]
[1]Koegel Autism Center, Gevirtz Graduate School of Education, University of California, Santa Barbara, Santa Barbara, CA, USA
[2]Koegel Autism Center, Eli and Edythe L. Broad Center for Asperger Research, University of California, Santa Barbara, CA, USA

Definition

Positive reinforcement is a critical component of B. F. Skinner's behavioral theory of learning. Positive reinforcement is defined as the presentation of a stimulus contingent on a behavior that results in an increased frequency of that behavior in the future. The reinforcing stimulus is strongest if it is presented immediately following the behavior. For example, if a child with autism is told to sit in a chair and receives a desired treat such as a candy immediately after sitting, the likelihood of the child sitting down more frequently in the future increases. The effect of reinforcement depends on the strength of the reinforcer being used. However, procedures are also available for using delayed or partial reinforcement schedules. Strong reinforcers are idiosyncratic and depend on the individual as well as the environmental context, availability of other reinforcers, etc. Commonly used reinforcers include edibles, activities, praise, and tangibles such as toys or stickers.

See Also

▶ Negative Reinforcement
▶ Reinforcement
▶ Schedule of Reinforcement

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Positron-Emission Tomography

Kevin A. Pelphrey
Child Study Center, Yale University School of Medicine, New Haven, CT, USA

Synonyms

PET

Definition

Positron-emission tomography (PET) is an imaging technique from the field of nuclear medicine. The technique produces a three-dimensional image or picture of functional processes in the body including the brain. The technique involves the use of a detector to measure pairs of gamma rays emitted indirectly by a positron-emitting

radionuclide (tracer), which is introduced into the body on a biologically active molecule. Three-dimensional images of tracer concentration within the body are then constructed by computer analysis. With this technique, it is possible to image brain function and its disruption in neuropsychiatric and neurodevelopmental disorders. Because the technique involves ionizing radiation, it is not typically used in research studies of children.

See Also

► Computed Tomography

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Posttraumatic Stress Disorder

J. Don Richardson[1] and Wanda L. Smith[2]
[1]Department of Psychiatry, University of Western Ontario, London, ON, Canada
[2]Department of Psychiatry and Behavioural Neurosciences, McMaster University, Hamilton, ON, Canada

Synonyms

Combat disorder; Combat fatigue; Combat neurosis; Complete exhaustion; Operational exhaustion; Operational stress injury; Shell shock; Stress disorder

Short Description or Definition

Posttraumatic stress disorder (PTSD) is an anxiety disorder which can develop after exposure to a potential traumatic event (PTE) where an individual is confronted with actual or threatened death and responds with extreme fear, helplessness, or horror. In PTSD, the individual will relive the traumatic event in intrusive thoughts and recollections during the day or experience disturbing dreams at night. When triggered by reminders, they become emotionally upset and exhibit physical symptoms of anxiety. They will often avoid thinking and talking about their traumatic event or avoid specific reminders. They may numb their unpleasant emotions and loose interest in pleasurable activities. They also display hyperarousal symptoms including difficulty sleeping, poor concentration, irritability, hypervigilance, and being easily startled. Potentially traumatic events in the general community may involve rape, motor vehicle accidents, assault, natural disasters, or terrorism. In the military, war zone or peacekeeping exposure including imprisonment, torture, or witnessing atrocities or comrades being wounded or killed might serve as a significant traumatic event.

Categorization

PTSD is classified as an anxiety disorder under the *Diagnostic and Statistical Manual of Mental Disorder* (American Psychiatric Association [APA], 1994). PTSD is unique among psychiatric diagnoses because of the requirement of a traumatic event in order to make the diagnosis. The traumatic event must involve actual or threatened death or injury, or a threat to the physical integrity of himself/herself or others. In order to meet the criteria for the "traumatic event," the response of the individual exposed to the event must involve intense fear, helplessness, or horror (Criterion A). The symptoms are grouped in three main symptom clusters: reexperiencing, avoidance and emotional numbing, and hyperarousal. In addition to the traumatic stressor criteria, the individual must present with at least one intrusive reexperiencing (Criterion B) symptoms where the individual will relive the traumatic event in intrusive thoughts and recollections, at least three symptoms of avoidance or emotional numbing (Criterion C),

and at least two symptoms of hyperarousal (Criterion D). Finally, to make the diagnosis, the individual exposed to the traumatic event must experience significant impairment in social and/or occupational functioning as a result of their symptoms (Criterion F). According to DSM IV, acute PTSD has a duration of between 1 and 3 months, while chronic PTSD has a duration of over three months (Criterion E) (American Psychiatric Association [APA], 2001) (Fig. 1).

Epidemiology

Exposure to a potentially traumatic event is common; approximately 75.7% of individuals are exposed to a traumatic event sufficient to cause PTSD. However, not all individuals exposed to a traumatic event develop PTSD. The National Comorbidity Survey in the United States reported PTSD rates of 3.5% (12-month) and 6.8% (lifetime) (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). PTSD rates are higher in women; the National Comorbidity Survey demonstrated prevalence rates of 10% in women and 5% in men (Kessler et al., 1995).

In Canada, the lifetime prevalence of PTSD is similar to that found in the United States. In a community study in Canada, prevalence rates of PTSD were 2.4% (current and 1-month) and 9.2% (lifetime) (Van Ameringen, 2003).

In veteran and military populations, the current and lifetime prevalence of PTSD among serving Canadian Forces members has been estimated at 2.8% and 7.2% (Statistics Canada, 2002). In a sample of Canadian peacekeeping Veterans pensioned with a medical condition, a 1-month prevalence of probable PTSD of 10.3% was reported (Richardson, Elhai, & Pedlar, 2006). In samples of US military members following deployment to Iraq and Afghanistan, the rates of PTSD were estimated between 11.2% and 17.1% compared to a baseline rate of 5% before deployment (Hoge et al., 2004), while in a sample of UK military members, the reported rates were significantly lower at 4.8% (Iversen et al., 2009).

Natural History, Prognostic Factors, Outcomes

In general, the posttraumatic stress symptoms which might appear following exposure to a potentially traumatic event are generally considered to be a normal response. In most individuals, the symptoms gradually subside and do not cause significant long-term impairment. However, if the symptoms persist and cause significant impairment in social and/or occupational functioning, then it is considered a disorder. Individuals who develop posttraumatic stress disorder do not acquire new symptoms; rather, the initial posttraumatic stress symptoms which presented following the traumatic event do not subside.

Many risk factors have been identified for PTSD. Understanding risk factors is important in order to better identify and screen those who might be at increased risk of developing posttraumatic stress disorder following exposure to a traumatic event. Pretrauma risk factors include a family and/or personal history of psychiatric illness and past trauma including history of childhood abuse (Brewin, Andrews, & Valentine, 2000; Ozer, Best, Lipsey, & Weiss, 2003). Gender is a risk factor; although women are more likely to develop PTSD, men are more likely to be exposed to a traumatic event (Breslau et al., 1998; Kessler et al., 1995). Other pretrauma risk factors include younger age, single marital status, and lower socioeconomic status (Breslau, Lucia, & Alvarado, 2006; Richardson, Naifeh, & Elhai, 2007). Peritraumatic risk factors include trauma severity and life threat (Brewin et al., 2000; Hoge et al., 2004; Richardson et al., 2007), and bodily injury (Koren, Norman, Cohen, Berman, & Klein, 2005). Risk factors specific to military-related PTSD include the number of operational deployments (Dohrenwend et al., 2006; Hoge et al., 2004; Richardson et al., 2007; Statistics Canada, 2002). Posttraumatic risk factors may include lack of access to treatment, stigmatization, ongoing life stressors, and lack of social support (Brewin et al., 2000; Ozer et al., 2003; Yehuda, McFarlane, & Shalev, 1998). Shame and guilt

Posttraumatic Stress Disorder, Fig. 1 DSM-IV-TR Diagnostic Criteria for Posttraumatic Stress Disorder (DSM-IV-TR code 309.81) (Reprinted with permission from the Diagnostic and Statistical Manual of Mental Disorders. Copyright 2000. American Psychiatric Association)

A. The person has been exposed to a traumatic event in which both of the following were present:

1. the person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others
2. the person's response involved intense fear, helplessness, or horror. Note: In children, this may be expressed instead by disorganized or agitated behavior

B. The traumatic event is persistently reexperienced in one (or more) of the following ways:

1. recurrent and intrusive distressing recollections of the event, including images, thoughts, or perceptions. Note: In young children, repetitive play may occur in which themes or aspects of the trauma are expressed.
2. recurrent distressing dreams of the event. Note: In children, there may be frightening dreams without recognizable content.
3. acting or feeling as if the traumatic event were recurring (includes a sense of reliving the experience, illusions, hallucinations, and dissociative flashback episodes, including those that occur on awakening or when intoxicated). Note: In young children, trauma-specific reenactment may occur.
4. intense psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event
5. physiological reactivity on exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event

C. Persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness (not present before the trauma), as indicated by three (or more) of the following:

1. efforts to avoid thoughts, feelings, or conversations associated with the trauma
2. efforts to avoid activities, places, or people that arouse recollections of the trauma
3. inability to recall an important aspect of the trauma
4. markedly diminished interest or participation in significant activities
5. feeling of detachment or estrangement from others
6. restricted range of affect (e.g., unable to have loving feelings)
7. sense of a foreshortened future (e.g., does not expect to have a career, marriage, children, or a normal life span)

D. Persistent symptoms of increased arousal (not present before the trauma), as indicated by two (or more) of the following:

1. difficulty falling or staying asleep
2. irritability or outbursts of anger
3. difficulty concentrating
4. hypervigilance
5. exaggerated startle response

E. Duration of the disturbance (symptoms in Criteria B, C, and D) is more than 1 month.

F. The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning. Specify if:

Acute: if duration of symptoms is less than 3 months

Chronic: if duration of symptoms is 3 months or more

Specify if: With Delayed Onset: if onset of symptoms is at least 6 months after the stressor.

for developing PTSD symptoms are also posttraumatic risk factors (Yehuda et al., 1998).

Although the majority of people with posttraumatic stress symptoms will recover without treatment, a significant proportion will present with significant persistent symptoms of PTSD. As such, they would benefit from treatment. Although remission is not always possible, complete remission can be achieved in 30–50% of cases of PTSD (Friedman, 2006). Pharmacological interventions, in addition to psychotherapy, can assist with symptom reduction and improve functioning and quality of life.

Clinical Expression and Pathophysiology

Clinically, posttraumatic stress disorder rarely occurs on its own. Over 90% of individuals with PTSD will have another Axis I disorder. Comorbidity is the rule rather than the exception. The most common comorbid disorders are major depressive disorder; other anxiety disorders (social phobia, generalized anxiety disorder, obsessive-compulsive disorder, and panic disorder); and alcohol and substance use disorders (Kessler et al., 1995). Less common comorbid disorders are bipolar disorder and Axis II personality disorders, especially borderline (Pagura et al., 2010) and antisocial (Sareen, Stein, Cox, & Hassard, 2004); it is critical that these disorders be diagnosed as they complicate the clinical picture and can compromise treatment. There is also emerging evidence demonstrating a strong relationship between PTSD and physical health problems (Jakupcak, Luterek, Hunt, Conybeare, & McFall, 2008; Sareen et al., 2007). The most common medical complaints associated with PTSD include chronic pain syndromes, asthma, gastrointestinal complaints, and cardiovascular disease (Sareen et al., 2007; Sareen, Cox, Clara, & Asmundson, 2005).

Although the exact neurophysiology of PTSD is not known, there are neurobiological alterations that have been implicated in PTSD including adrenergic hyperresponsiveness (Southwick et al., 1999), low cortisol levels and enhanced negative feedback sensitivity of the hypothalamic-pituitary-adrenal axis (Yehuda et al., 1993; Yehuda, Golier, Halligan, Meaney, & Bierer, 2004), dysregulation of the immune response (Altemus, Cloitre, & Dhabhar, 2003; Raison & Miller, 2003), and decreased hippocampal volume (Bonne et al., 2001; Bremner et al., 1995, 1997; Stein, Koverola, Hanna, Torchia, & McClarty, 1997).

Evaluation and Differential Diagnosis

Important factors in the history to consider PTSD in the differential diagnosis include prior exposure to psychological trauma and presence of any PTSD symptoms. Patients with PTSD present with three symptom clusters: reexperiencing, avoidance and numbing, and hyperarousal symptoms (Canadian Psychiatric Association, 2006).

PTSD symptoms and signs are generally nonspecific, so initially the differential diagnosis of presenting symptoms may include both physical and mental disorders (Jetly & Cooper, 2008). Check for physical, psychological, and social symptoms, inquire about exposure to psychological trauma, and then work through the differential diagnosis (Friedman, 2006). While no physical health condition explains full-spectrum PTSD (Staab, 2009), the condition may not be apparent initially owing to avoidance or reluctance to discuss trauma-related events. Comorbid physical and mental health conditions are common in PTSD, and many have overlapping symptoms.

There are well-validated screens available for PTSD. Short screening instruments such as the four-item yes/no screening instrument, Primary Care PTSD Screen, are designed for use by primary care practitioners. This screen has a sensitivity of 78% and specificity of 87% for PTSD in individuals who endorse three or more items (Friedman, 2006 (Fig. 1). Individuals who screen positive should then be assessed for PTSD using the DSM IV diagnostic criteria, Fig. 1, or using more elaborative screening instruments such as the Clinician Administered PTSD Scale (CAPS) (Blake et al., 1995) or a self-rating scale such as the PTSD Checklist (Military or Civilian Version) (Weathers, Litz, Herman, Huska, & Keane, 1993).

Treatment

Treatment of PTSD may include several disciplines and approaches and can vary dependent on the severity and chronicity of trauma symptoms and the presence of comorbid disorders. Most often a phase-oriented approach to treatment is utilized which includes behavioral stabilization, psychoeducation, anxiety management, trauma work, relapse prevention, and aftercare (Herman, 1992).

Once a diagnosis has been established, psychoeducation in group or individual format detailing diagnosis and treatment is critical for both patient and family (American Psychiatric Association [APA], 2004; Foa, Keane et al., 2000; Turnbull & McFarland, 1996; Van der Kolk, McFarland, & Van der Hart, 1996). Educating patients regarding the phases of treatment reassures those frightened by the notion of psychiatric medication and psychotherapy as well as to set appropriate expectations for treatment. The main goal of stabilization is to manage acute symptoms and improve current functioning with psychoeducation, medication, and anxiety management training. Once symptoms stabilize, patients are more able to engage in psychotherapy (Van der Kolk et al., 1996).

Psychotherapy

Psychotherapy aims to reduce symptom severity and improve global functioning quality of life and functioning in social and occupational areas. Psychotherapeutic interventions for PTSD with the strongest empirical evidence are those that include components of prolonged exposure (PE) and/or cognitive processing therapy (CPT) (APA, 2004; Resick & Schnicke, 1993; US Department of Veterans Affairs/Department of Defense, 2010). In prolonged exposure, the patient confronts the trauma imaginally or in vivo during planned treatment sessions with a goal of diminishing distress by forming new associations. CPT focuses on the appraisal of the traumatic event and the emotions resulting from the event, i.e., cognitive distortions; common cognitive distortions include perceiving the world as dangerous, seeing oneself as powerless or inadequate, or feeling guilty for outcomes believed preventable (Friedman, 2006). In CPT, the patient engages in writing narratives of the trauma with a goal of processing the emotions and restructuring the dysfunctional beliefs. Eye Movement Desensitization and Reprocessing (EMDR) has received some empirical support and is generally considered to be an evidence-based treatment for PTSD (APA, 2004; Friedman, 2006). In EMDR, patients are instructed to imagine the painful traumatic memories and associated negative cognition such as guilt and shame while visually focusing on the rapid movement of the clinician's finger (Friedman, 2006). Regardless of the psychotherapeutic treatment modality, prior behavioral stabilization is critical as some comorbid conditions may preclude the introduction of treatment, e.g., suicidality, self-injurious behavior or psychosis, as well as initiating "trauma-focused psychotherapy" prior to stabilization may exacerbate preexisting comorbid symptoms of depression and substance abuse.

Group-based psychotherapy is also commonly used, focusing on psychoeducation, anger, depression, substance use, social and vocational skills, relaxation training, as well as other facets of PTSD (APA, 2004; Foy et al., 2000).

Pharmacological Management

Selective serotonin reuptake inhibitors (SSRIs) have the most empirical evidence for efficacy in the treatment of all three PTSD symptom clusters and are usually considered as a first-line treatment for PTSD (APA, 2004; National Institute for Clinical Excellence, 2005; Schoenfeld, Marmar, & Neylan, 2004). SSRIs are also effective agents for the treatment of comorbid mood and anxiety disorders commonly associated with PTSD. Both paroxetine and sertraline have received FDA approval for the treatment of PTSD in the United States (APA, 2004). In Canada, only paroxetine has Health Canada approval for the treatment of PTSD.

Second-generation, dual-acting antidepressants such as venlafaxine and mirtazepine are widely used in treating major depression and other anxiety disorders, but have less empirical data demonstrating their efficacy for the specific treatment of PTSD (Chung et al., 2004; Connor, Davidson, Weisler, & Ahearn, 1999; Davidson et al., 2003; Hopwood et al., 2000; Smajkic et al., 2001). They are often considered as a second-line treatment in patients who have failed to respond to a trial of an SSRI. However, since SSRIs have not demonstrated their efficacy in the treatment of Vietnam or combat-related PTSD thus far (Friedman, Marmar, Baker, Sikes, & Farfel, 2007;

Schoenfeld et al., 2004), second-generation antidepressants may be considered as first-line treatment. The tricyclic antidepressants (TCAs) and monoamine oxidase inhibitors (MAOIs) have some limited data to support their use in the treatment of combat-related PTSD (Davidson et al., 1990; Kosten, Frank, Dan, McDougle, & Giller, 1991). However, they are not commonly used because of their side effect profile and toxicity.

Benzodiazepines are not recommended as monotherapy for the treatment of PTSD (Friedman, 2006), but are sometimes used as adjuncts in treating anxiety or insomnia (APA, 2004). There is a risk of rebound insomnia when a benzodiazepine, used as a hypnotic, is discontinued especially after long-term use (Cooper, Carty, & Creamer, 2005).

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See Also

- ▶ Antianxiety Medication
- ▶ Antidepressant Medications
- ▶ Antidepressants
- ▶ Anxiety
- ▶ Anxiety Disorders
- ▶ Anxiolytics
- ▶ Psychotherapy

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Postural Control Assessment

► Posturography

Posturography

Jenny McGinley[1] and Nicole Rinehart[2]
[1]Physiotherapy, Centre for Movement Disorders and Gait Research, Southern Health, The University of Melbourne, Parkville, VIC, Australia
[2]Faculty of Medicine, Nursing and Health Sciences, Monash University, Melbourne, VIC, Australia

Synonyms

Postural control assessment; Standing balance assessment

Definition

Posturography is the study of an individual's control of their upright body position and balance

in standing. It typically includes the measurement of body alignment while standing quietly, or in response to visual, postural, or environmental perturbation, or while performing dynamic tasks. Postural control in standing relies on the integration of multisensory information from the vestibular system, vision, and somatosensory information including cutaneous sensation (foot pressure against the floor) and proprioception (joint position sense). Posturography commonly includes conditions to test the function of these systems, such as closing the eyes, introducing conflicting visual information, or altering the angle of the support surface. This assesses the relative contribution and integration of these systems to regulate balance. The ability to maintain smooth control of an upright body position in standing is an essential part of everyday life and needed to successfully manage everyday tasks such as reaching into cupboards, bending down, or catching balls in standing.

Balance control in standing improves as developmental maturation occurs across early to middle childhood. Compared to age-matched peers, children with autism have been found to have reduced stability in standing, reflected by greater postural sway, especially in the sideways (mediolateral) direction. This has been shown in studies of children with low intelligence (Kohen-Raz, Volkmar, & Cohen, 1992) and normal intelligence (Chang, Wade, Stoffregen, Hsu, & Pan, 2010; Minshew, Sung, Jones, & Furman, 2004; Molloy, Dietrich, & Bhattacharya, 2003). Postural deficits have been shown in both adults and children with autism, but the differences are larger in children (Minshew et al., 2004), suggesting that the development of the postural system in children with autism may be delayed (Fournier et al., 2010; Minshew et al., 2004). Children with autism may thus appear less stable or coordinated in standing activities than their age-matched peers.

These deficits in postural control may be due to difficulty in the integration of multiple sensory input or adaptation to altered sensory input. Individuals with autism have greater difficulty with standing with eyes closed (Gepner, Mestre, Masson, & de Schonen, 1995; Minshew et al., 2004; Molloy et al., 2003), or in conditions where the standing surface is angled (referenced to sway), or vision is altered (Minshew et al., 2004). This suggests that these children may have more difficulty with challenging balance activities in some outdoor situations where the ground may be soft or compliant, the level of light fluctuating, or when vision is occupied by tracking the motion of balls or people. Children with impaired balance control in standing are likely to have comparable or greater difficulties with walking and running activities, where the demand for rapid and efficient sensory-motor integration is greater. There are currently no empirical studies which have investigated the functional significance of difficulties in standing balance; however, clinically, it is suspected that this may impact negatively on children's proficiency and ability in school and recreational physical activities such as sport.

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PPS

► Revised Knox Preschool Play Scale (PPS)

Practice Guidelines in Autism

Iain McClure
The Royal Hospital for Sick Children, Edinburgh, UK

Definition

Practice guidelines have two basic purposes. First, to promote effective care by reinforcing good practice. Second, by promoting change in professional practice where this does not comply with current best practice. In autism spectrum disorder (ASD), a significant number of practice guidelines have now been developed. This section focuses specifically on clinical guidelines, used in healthcare, but also applicable in educational and other relevant settings.

Even as recently as 10 years ago, clinicians working in ASD assessment and intervention had little in the way of a "road map" advising them which approaches had a reliable and valid evidence base and which did not. The situation was even more confusing for people with ASD and their carers. Rapid developments over the last 10 years in ASD practice guideline development have reduced much of that uncertainty, but, as a corollary, successive guidelines have revealed the extensive gaps in the ASD evidence base and the research that is now required.

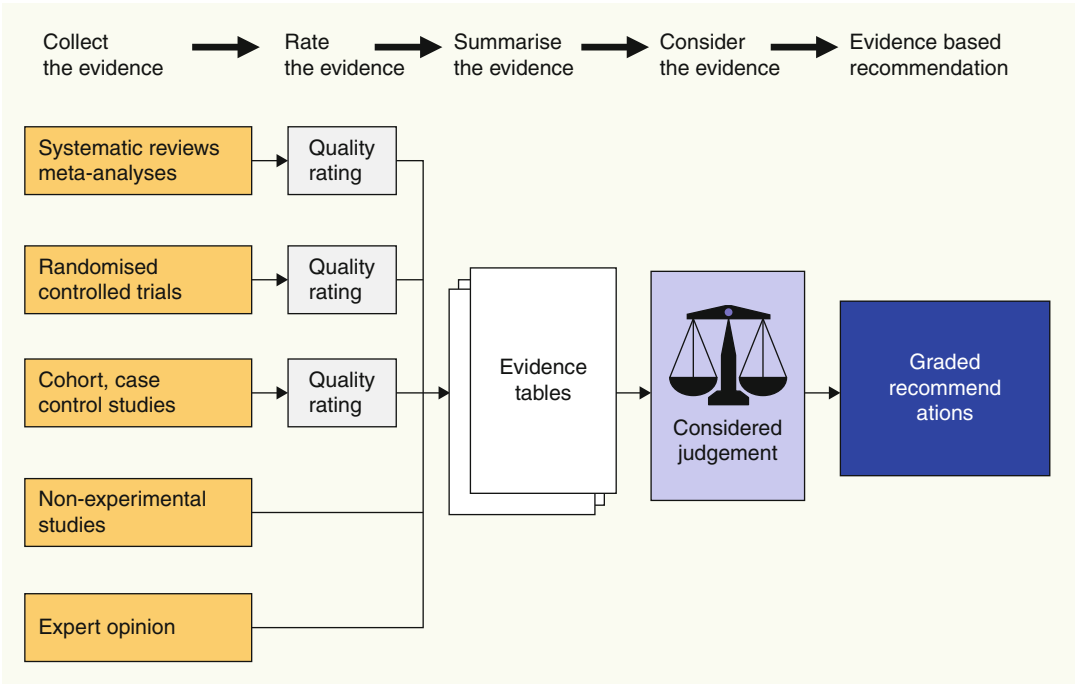
Clinical practice guidelines are developed by multiprofessional groups that are locality (region or state) or nationally representative. A systematic review is undertaken to identify and critically appraise the scientific literature. Guideline recommendations are then explicitly linked to (and graded according to the strength of) the supporting evidence. The guideline development group (GDG) needs to be representative of the key constituencies within the field under study. This is paramount in a politically sensitive field such as ASD. The ASD GDG should aim to represent all facets of the ASD multiagency, parent/carer, and voluntary network within the geographic area that the guideline pertains to. In order to build this consensual and representative approach, GDG composition needs to be carefully constructed.

First, a chairman is recruited to lead the development of the practice guideline. Second, the guideline chair has to then recruit the GDG. The chair and GDG then have to clarify the guideline's exact remit, a clue which is often to be found in the guideline title. For example, the guideline *Assessment, diagnosis and clinical interventions for children and young people with autism spectrum disorders* published by the Scottish Intercollegiate Guidelines Network (SIGN) in 2007 (SIGN 98, 2007) explains the basic remit and range of its approach. Its emphasis on "clinical" interventions implies that it does not aim to cover primarily educational-based interventions, for example (although in ASD, it is hard to apply exact cutoff points in regard to types of interventions).

The GDG then needs to decide on key themes within the agreed remit. From these themes, "key questions" are generated. These questions aim to clarify and identify the field of evidence that needs to be sought. For example, in SIGN 98, key question 12 asked: "*Which conditions occur in association/comorbidly with ASD, and can their presence be specifically excluded or confirmed?*" (SIGN 98, 2007). This question was then used to generate search terms in the literature search for that area of enquiry (i.e., comorbidity in ASD).

The process of evidence gathering and its subsequent analysis is varied, according to different guidelines. The highest standards of scientific validity and reliability tend to be found in those guidelines produced by national guideline organizations, such as the Scottish Intercollegiate Guidelines Network (SIGN) or the National Institute for Clinical Excellence (NICE) for England and Wales. Other guidelines may have somewhat more relaxed processes of evidence gathering and data analysis, especially relevant for a field such as ASD where there is comparatively little quantitative "high-level" evidence, but where it is felt important to make recommendations across all aspects of the care agenda, in order to influence uni- or multiprofessional practice. This explains why, for example, that in

Practice Guidelines in Autism, Table 1 SIGN's evidence rating process (Copyright SIGN, reproduced by permission)



regard to the recommendation levels in SIGN 98 (SIGN 98, 2007) and the *New Zealand guideline on ASD* published in 2008 (Ministries of Health and Education, 2008), there is a significant disparity of levels of evidence recommendation, despite the fact that the two guidelines conducted their international literature searches at approximately the same time. The SIGN guideline makes far less recommendations at the higher levels (i.e., A or B) than its New Zealand counterpart, due to its tighter evidence gathering, analysis, and rating criteria. Also the grades of recommendation systems are different, so that in SIGN 98 a level D recommendation denotes nonanalytic studies, for example, case reports, case series, or expert opinion, while in the NZG, expert opinion qualifies as a level C recommendation.

SIGN's evidence gathering and analysis process are explained in Table 1.

This includes systematic reviews and meta-analyses, randomized controlled trials (RCTs), cohort and case control studies, nonexperimental studies and expert opinion. Second, the evidence gathered is rated according to its quality. Third, the evidence is summarized in evidence tables. Fourth, the guideline development group considers this evidence and rates it into considered judgment forms. Fifth, these forms then generate graded, evidence-based recommendations.

Table 2 shows the SIGN system of rating evidence levels, using a numerical scoring system and asterisks. Thus, an evidence level of 1^{++} denotes high-quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias. At the other end of the evidence-rating spectrum, an evidence level of 4 denotes expert opinion (i.e., evidence that has not even been scrutinized within a nonanalytic study).

Table 3 shows how grades of recommendation are stratified in the SIGN system. The highest level of evidence-based recommendation (level A) denotes an evidence level that includes at least one meta-analysis, systematic review, or RCT rates as 1^{++} and that is directly applicable to the

Practice Guidelines in Autism, Table 2 SIGN's levels of evidence (Copyright SIGN, reproduced by permission)

SIGN levels of evidence	
1^{++}	High-quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
1^{+}	Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias
1^{-}	Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias
2^{++}	High-quality systematic reviews of case-control or cohort studies
	High-quality case-control or cohort studies with a very low risk of confounding, bias, or chance and a high probability that the relationship is causal
2^{+}	Well conducted case-control or cohort studies with a low risk of confounding, bias, or chance and a moderate probability that the relationship is causal
2^{-}	Case-control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal
3	Nonanalytic studies, e.g., case reports, case series
4	Expert opinion

Practice Guidelines in Autism, Table 3 SIGN grades of recommendation (Copyright, SIGN, reproduced by permission)

SIGN grades of recommendation	
A	At least one meta-analysis, systematic review, or RCT rated as 1^{++}, and directly applicable to the target population
	or
	A systematic review of RCTs or a body of evidence consisting principally of studies rated as 1^{+}, directly applicable to the target population, and demonstrating overall consistency of results
B	A body of evidence including studies rated as 2^{++}, directly applicable to the target population, and demonstrating overall consistency of results
	or
	Extrapolated evidence from studies rated as 1^{++} or 1^{+}
C	A body of evidence including studies rated as 2^{+}, directly applicable to the target population and demonstrating overall consistency of results
	or
	Extrapolated evidence from studies rated as 2^{++}
D	Evidence level 3 or 4
	or
	Extrapolated evidence from studies rated as 2^{+}

target population of the evidence-based guideline. Alternatively, this grade of recommendation can be achieved by the existence of a systematic review of RCTs or a body of evidence consisting principally of studies rated as 1^{+} that is directly applicable to the target population and that demonstrates overall consistency of results. At the other end of the spectrum of graded recommendations, level D denotes that the evidence level available is rated as 3 or 4, or that it is evidence extrapolated from studies rated as 2^{++}. An important point to remember about the resulting recommendation gradings is that, as the New Zealand ASD guideline states, "the attached grading reflects the rigour of the studies providing the evidence rather than an indication of the importance of the recommendation" (Ministries of Health and Education, 2008).

Historical Background

Practice guidelines in ASD are a fairly recent phenomenon. The main initial guideline development activity took place in the USA toward the end of the 1990s and early 2000s. These were either unidisciplinary national guidelines (Filipek, 2000; Volkmar, 1999) or multiprofessional but state based (New York state Department of Health, Early Intervention program, 2000; California Department of Developmental Services, 2002). Thereafter, guideline development activity spread to Europe (Le Couteur, 2003; SIGN 98, 2007) and New Zealand (Ministries of Health and Education, 2008). The difference with these later guidelines was that they were both national and multiprofessional. Subsequent guideline development has been more targeted, using the work completed by previous GDGs which are relevant to universal geographical localities but focusing on specific aspects that are geographically particular. For example, in 2009, the National Institute for Clinical Excellence (NICE) for England and Wales decided to limit the remit of its forthcoming ASD guideline for children and young people to clinical assessment only. NICE decided not to undertake a more extensive evidence review to look at clinical interventions and treatments, because

that work had been only recently done by SIGN, NICE's sister organization in Scotland. Therefore, subsequent national guideline approaches seem to be becoming more targeted, reflecting previous work undertaken and, perhaps, a more cost-conscious financial climate.

All of the published guidelines, whether by unidisciplinary, state, or national organizations, contain unique and interesting approaches which means that all of them repay close examination. For example, the New York State guideline (New York state Department of Health, Early Intervention program, 2000) restricted its remit to 0–3 years and in this regard may be seen as one of the most detailed surveys of this crucial epoch regarding ASD. Information for "clinical clues" that should point the clinician to signs of possible autism in a child of this age range were carefully evidence based. For this reason, SIGN 98 (SIGN 98, 2007) deliberately adopted this aspect of the New York guideline for its own recommendation, as being the best evidence base available. This is an example of a practice guideline becoming the source of the available evidence base for subsequent guidelines.

The *National Autism Plan for Children* for England and Wales (Le Couteur, 2003) is unique in that it not only considered the evidence base for its various recommendations, but it also developed a consensus set of recommendations as regards what an ASD clinical service for preschool and primary-school-aged children should consist of in terms of basic requirements. These suggestions are not, strictly speaking, evidence based, because they were the product of clinical consensus (i.e., they constitute level 4 evidence). However, given that no subsequent guideline group has developed as detailed a description of the different tiers of an ASD service, the NAPC recommendations have gained increasing importance over the years as a point of reference and, effectively, as evidence.

SIGN 98 produced perhaps the most robust and extensive survey of the international evidence regarding ASD up to its publication date. In addition, it was the first guideline to raise the important issue of validity and reliability of ASD diagnosis as regards subject recruitment for scientific studies. Simply put, SIGN's GDG asked, can researchers provide a reliable and valid guarantee that the subjects entered into their research studies, whom they claim have ASD, actually *do have* the condition (as defined by categorical classification systems)? The GDG argued that if researchers cannot do this, their research findings, no matter how "groundbreaking," must be accordingly downgraded. To back up this approach, SIGN 98's GDG developed a sliding scale of reliability and validity for diagnosis as regards study subject recruitment (SIGN 98, 2007) (see Table 4).

Cultural factors are a key parameter to consider in a condition such as ASD. The NZG (Ministries of Health and Education, 2008) has provided a fascinating lead in this regard, with its sensitive consideration of the particular needs and interests of New Zealand's Maori community. Presumably any subsequent national multiprofessional guideline will need to seriously consider following this benchmark in its design, if cultural diversity is an issue pertaining to that population.

Current Knowledge

The most recent clinical practice guidelines have been those developed by the Scottish Intercollegiate Guidelines Network on *ASD in children and young people* published in June 2007 (SIGN 98, 2007), which covers the epoch from 0 to 19 years and the New Zealand guideline on *Autism Spectrum Disorder*, published in March 2008, which considers ASD in the whole age range, including adults (Ministries of Health and Education, 2008). This section will therefore consider the evidence base according to these two guidelines. It is important to note, however, that these two guidelines "stand on the shoulders" of previous guidelines. For example, in the NZG, its section on diagnosis and assessment of young children is based on the *National Autism Plan for Children* (Le Couteur, 2003) and "further reference was made" to the *Autistic Spectrum Disorders Best Practice Guidelines for Screening, Diagnosis and Assessment* that was

Practice Guidelines in Autism, Table 4 Criteria for assessing the reporting of the diagnosis of ASD in the literature (Reproduced by permission of SIGN)

A. Components of diagnostic assessment	
*1. A recognized **process** of obtaining information in necessary domains, usually by multidisciplinary or multiagency personnel*	
*2. Mapping of the resulting information into a recognized **classification system** such as DSM–IV or ICD–10 (see Section 2.2)*	
*3. Assessment using a recognized and published **diagnostic instrument***	
B. Components of a reliable diagnosis	
Increasing accuracy and reliability ↑	Use of a process ***and*** diagnostic classification system, ***and*** an instrument (i.e., 1, 2, ***and*** 3, from A)
	1. Use of a process ***and*** a diagnostic classification system
	or
	2. Use of an instrument ***and*** a diagnostic classification system
	The use of a process, a diagnostic classification system, ***or*** an instrument, used ***singly***
	Diagnosis simply stated
NB each component of the assessment should be explicitly stated in the study/report under consideration	

developed by the California Department of Developmental Services (California Department of Developmental Services, 2002).

As explained earlier, SIGN 98 and the NZG demonstrate different levels of evidence recommendation, with SIGN using tighter criteria, being less able to make recommendations generally or certainly higher-level (A or B) recommendations. In addition, the scope of the NZG is wider than SIGN 98, in that it covers the whole age range as opposed 0–19 years inclusive, and it considers educational interventions, for example, whereas SIGN 98 focuses on clinical interventions (or educational interventions that have a clinical application). If SIGN had considered the more general spread of educational interventions, it is unlikely that much of the evidence gathered would have been suitable for evidence-based recommendation, within SIGN's evidence-rating system. This is an example of guidelines being pitched at the level for which they are required, either by a professional group or by a national government, to determine health and education policy. Theoretically, SIGN's tighter criteria mean that its recommendations are more applicable internationally, which explains why they have been adopted in countries other than Scotland. A downside of this tighter approach, however, may be that important clinical areas (especially to patients and carers), for example, sensorimotor development, are left undirected in regard to the (lower) levels of evidence that are available. Sometimes, such gaps can be filled by the GDG stating "good practice points" (GPPs), and these can be found in both SIGN 98 and the NZG but, again, at possibly different criteria levels.

This section follows the structure of SIGN 98's presentation of the evidence, with slight modifications and therefore specifically limits its remit to "assessment, diagnosis and clinical interventions." Readers who wish to consider the broader evidence base for educational interventions, for example, should look at the NZG.

Definitions and Concepts

SIGN 98 uses the term "autism spectrum disorders" (ASD) to cover the ICD-10 conditions termed autism, atypical autism, and Asperger's syndrome (World Health Organization [WHO], 1993), and the NZG uses the term "ASD" to cover the DSM-IV-TR conditions of autistic disorder, Asperger's disorder, and PDD-NOS (American Psychiatric Association, 1994). Both

guidelines consider both classification systems. SIGN 98 defers to ICD-10 in any difference of terminology between it and DSM-IV-TR. The NZ guideline follows DSM-IV-TR.

Recognition, Assessment, and Diagnosis

Recognition in Primary Care

Screening Both guidelines state that population screening for ASD is "not recommended" (SIGN at level C and the NZG at level B).

Surveillance SIGN 98 explains that, "as part of the core programme of child health surveillance," clinicians can help to identify early those children who may have ASD or other developmental disorders. At level D recommendation, SIGN 98 states:

> clinical assessment should incorporate a high level of vigilance for features suggestive of ASD, in the domains of social interaction and play, speech and language development and behaviour

and that:

> CHAT or M-CHAT can be used in young children to identify clinical features indicative of an increased risk of ASD, but should not be used to rule out ASD.

While the NZG does not make such specific recommendations, it recommends, at level C, that "health and education professionals should take regular opportunities (at least at 8–12 months, 2–3 years and 4–5 years) to discuss the child's development with parents."

SIGN 98 provides three useful tables which consider "warning signs" suggestive of possible ASD in the three age ranges of preschool and school-age children and in adolescents. The preschool table comes from the New York guideline (New York state Department of Health, Early Intervention program, 2000) and the school-age table is from the NAPC (Le Couteur, 2003). The NZG also uses the NAPC concepts in its similar tables. Table 5 from SIGN 98 was developed as expert consensus by the SIGN 98 guideline development group.

Practice Guidelines in Autism, Table 5 Additional warnings of possible ASD in adolescents (Copyright, SIGN. Reproduced by permission)

Warning signs
General picture
– Long-standing difficulties in social behaviors, communication, and coping with change, which are more obvious at times of transition (e.g., change of school, leaving school)
– Significant discrepancy between academic ability and "social" intelligence, most difficulties in unstructured social situations, e.g., in school or work breaks
– Socially "naïve," lack common sense, not as independent as peers
Language, nonverbal skills, and social communication
– Problems with communication, even if wide vocabulary and normal use of grammar. May be unduly quiet, may talk at others rather than hold a to-and-fro conversation, or may provide excessive information on topics of own interest
– Unable to adapt style of communication to social situations, e.g., may sound like "a little professor" (overly formal), or be inappropriately familiar
– May have speech peculiarities including "flat," unmodulated speech, repetitiveness, use of stereotyped phrases
– May take things literally and fail to understand sarcasm or metaphor
– Unusual use and timing of nonverbal interaction (e.g., eye contact, gesture, and facial expression)
Social problems
– Difficulty making and maintaining peer friendships, though may find it easier with adults or younger children
– Can appear unaware or uninterested in peer group "norms," may alienate by behaviors which transgress "unwritten rules"
– May lack awareness of personal space or be intolerant of intrusions on own space
Rigidity in thinking and behavior
– Preference for highly specific, narrow interests or hobbies, or may enjoy collecting, numbering, or listing
– Strong preferences for familiar routines, may have repetitive behaviors or intrusive rituals
– Problems using imagination, e.g., in writing, future planning
– May have unusual reactions to sensory stimuli, e.g., sounds, tastes, smell, touch, hot or cold

Screening of High-Risk Groups In addition, SIGN 98 considers screening of high-risk groups (so-called secondary screening) and recommends, at level C, that "the use of an appropriate structured instrument may be a useful supplement to the clinical process to identify children and young people at high risk of ASD."

Timing of Diagnosis SIGN 98 also considers the evidence for the timing of diagnosis, explaining that "the evidence regarding the minimum age at which ASD can be reliably diagnosed is not clear." It makes the level D recommendation that "ASD should be part of the differential diagnosis for very young (preschool) children displaying absence of normal developmental features, as typical ASD behaviours may not be obvious in this age group."

Methods of Assessment

Initial Assessment Both SIGN 98 and the NZG recognize that initial assessment will, in the NZG's words, "be undertaken by an individual practitioner" (level B recommendation). SIGN 98 explains that "those (multiprofessional colleagues) involved in carrying out the initial assessment should be aware of the core features of ASD as well as of the wide range of different possible presentations." Both guidelines advise that "if on the basis of initial assessment, it is suspected that a child or young person may have ASD, they should be referred for specialist assessment."

Specialist Assessment SIGN 98 explains that, because a diagnosis of ASD may be seen as "a lifelong 'label'," "it is of equal importance that clinicians diagnose, and not diagnose, accurately." Therefore, both guidelines advise that specialist assessment should be undertaken by "a multidisciplinary team of health care practitioners experienced in ASD" (level B recommendation). The multiprofessional approach is recommended because "it may identify different aspects of ASD and aid accurate diagnosis" and collaborative multiprofessional conclusions will enable informed intervention with "effective educational, behavioural, physical, emotional, social and communication strategies. . .to promote development."

NZG also recommends that "diagnostic assessment of young people and adults should be comprehensive" and "involve the person concerned in interview and observation" and that "formal pathways for diagnostic assessment of young people and adults should be developed" (level C recommendation).

Components of Specialist Assessment

(a) History taking (parent/carer interview)

SIGN 98 explains that taking an "ASD-specific diagnostic history" is an important component of an ASD assessment because "without it, evidence of ASD-like behaviour cannot be put into context" (level D recommendation). Although ASD-specific history-taking instruments can be "useful" "as a means of improving the reliability of ASD diagnosis" (level C recommendation), SIGN 98 explains the paramount importance of clinicians keeping "a global perspective" of the patient's circumstances in mind, "taking into consideration the possibility of comorbidities and the possible differential diagnoses." In addition, the NZG advises that "if the person taking the developmental history is not medically trained, then the medical history and examination should be completed separately."

(b) Clinical observation/assessment (child/young person assessment/interview)

SIGN 98 recommends that "healthcare professionals should directly observe and assess the child or young person's social and communication skills and behaviour" (level D recommendation). Again, there is a recommendation that clinicians "should consider using ASD-specific observational instruments, as a means of improving the reliability of ASD diagnosis" (level C recommendation). Such aids would include instruments like ADOS-G (Lord, 2000).

(c) Contextual and functional information

The NZG explains that "direct observation of the child's behaviour in an unstructured setting is essential" and SIGN 98 states the good practice point that "information about children's functioning outside the clinic setting, should be routinely obtained from as many sources as is feasible."

Individual Profiling

Because people with ASD vary considerably as regards their individual difficulties and strengths, SIGN 98 recommends that "all children and young people with ASD should have a comprehensive evaluation of their speech and language and communication skills, which should inform intervention" (level D recommendation).

The NZG recommends in addition that "the assessment of intellectual, adaptive and cognitive skills" associated with ASD "should be seriously considered and, where possible and appropriate, formally assessed" (level B recommendation).

Biomedical Investigations

SIGN 98 makes a level D recommendation that "where clinically relevant" all children and young people with ASD should have their physical status examined "with particular attention to neurological and dysmorphic features"; undergo karyotyping, fragile X DNA analysis, and audiological examination; and be investigated to rule out recognized etiologies of ASD (such as tuberous sclerosis). In addition, SIGN 98 explains its awareness of the "considerable interest in the role of the immune system and the influence of bowel function" in ASD and that it conducted "an extensive search" for research into this area. SIGN 98 explains that its GDG "found no research evidence of an acceptable level in support of the clinical use" of investigations aimed at supporting such biomedical theories and that, therefore, in respect of this controversial area, it is "not possible at present to make a recommendation."

Conditions Associated with ASD

SIGN 98 makes a level C recommendation that clinicians should "be aware of the need to routinely check for comorbid problems in children and young people with ASD" and that "where necessary, detailed assessment should be carried out to accurately identify and manage comorbid problems."

The NZG makes three recommendations covering this area that "differential diagnosis must be covered during diagnostic assessment" and "must be thorough and cover all conditions commonly confused with ASD and those known to coexist with ASD" (level C). Thirdly, the NZG recommends that clinicians "must have a good understanding of the different forms of expression of ASD symptomatology across developmental stages and the symptomatology of common coexisting and alternative conditions" (level B).

Nonpharmacological Interventions

Communication Interventions

Support for Early Communication Skills SIGN 98 recommends that "interventions to support communication in ASD are indicated, such as the use of visual augmentation, e.g. in the form of pictures of objects" (level D).

Interventions for Social Communication and Interaction SIGN 98 recommends that "interventions to support social communication should be considered for children and young people with ASD, with the most appropriate intervention being assessed on an individual basis" (level D).

Behavioral/Psychological Interventions

SIGN 98 explains that these types of interventions fall into three groups: intensive behavioral programs "aimed at improving overall functioning and altering outcome"; interventions which "aim to address specific behavioural difficulties associated with ASD," for example, sleep disturbance; and interventions which do not fall into either of the first two categories.

Intensive Behavioral Programs SIGN 98 explains that "most intensive behavioural programmes for ASD are based on the principles of behaviour modification using applied behavioural analysis (ABA)." While the NZG does not comment on specific interventions in this category, SIGN 98 recommends that "the best known of the intensive ABA interventions," the Lovaas program, "should not be presented as an intervention that will lead to normal functioning" (level A).

Interventions for Specific Behaviors The NZG recommends that "behaviour management techniques should be used to intervene with problem behaviours" (level A). SIGN 98 recommends that behavioral interventions "should be considered to address a wide range of specific behaviours. . .both to reduce symptom frequency and severity and to increase the development of adaptive skills" (level B).

Auditory Integration Training SIGN 98 recommends that "auditory integration training is not recommended" (level A).

Facilitated Communication SIGN 98 recommends that "facilitated communication should not be used as a means to communicate with children and young people with ASD" (level A).

Biomedical and Nutritional Interventions

Recognizing that this is an area of importance and focus for many parents and carers of people with ASD, SIGN 98 looked for evidence justifying or ruling out any such interventions, for example, exclusion diets. However, SIGN 98 states that there was "insufficient evidence" to meet "the criteria set for the review and therefore no recommendation can be made."

Pharmacological Interventions

Risperidone

SIGN 98 recommends that risperidone is "useful for short term treatment of significant aggression, tantrums or self injury in children with autism" (level B); however, it does not define "short term." The NZG issues similar level B recommendation about risperidone, advising that "monitoring for side effects should be carried out on a regular basis."

Methylphenidate

SIGN 98 recommends, at level B, that methylphenidate "may be considered for treatment of attention difficulties/hyperactivity in children or young people with ASD." The NZG recommends, at level C, that methylphenidate "is effective for some children with ASD and co-morbid ADHD" but "should be used with caution because of the high risk of adverse effects."

Fluoxetine

The NZG recommends, at level B, that SSRIs in general, including fluoxetine, "may be effective for some children with ASD and high anxiety and/or obsessive symptoms" but that, however, "in the absence of good evidence, these drugs should be used with caution and careful monitoring."

Secretin

SIGN 98 recommends, at level A, that "secretin is not recommended for use in children and young people with ASD."

Melatonin

At level B, the NZG recommends that melatonin "may be useful for improving sleep in children with ASD who have impaired sleep," and at level D, SIGN 98 recommends that melatonin "may be considered for treatment of sleep problems which have persisted despite behavioural intervention."

Other Treatments

The NZG recommends, at level B, that "typical" antipsychotics, such as haloperidol, "are effective in reducing motor stereotypies, temper tantrums and improving social relatedness," but "these drugs have a high rate of adverse effects and are not recommended for first-line use."

Service Provision

Training and Support for Parents

Information Provision SIGN 98 recommends that "professionals should offer parents good quality written information and an opportunity to ask questions when disclosing information about their child with ASD." This information should be provided "in an accessible and absorbable form" (level D). The NZG issues similar guidance.

Meeting Support Needs SIGN 98 recommends that "education and skills interventions for parents of pre-school children with ASD should be offered" (level B).

Information for Discussion with Children, Young People, Parents, and Carers

Providing information and support

At the Time of Diagnosis

The NZG makes recommendations for this area, nearly all at level C, including that "formulation is the necessary next step from assessment" and that "clarity of diagnosis should be the goal of assessment and formulation." The NZG also recommends that all diagnostic assessments "should include a detailed written report" that "disclosure of diagnosis of older teens and adults. . .should take into consideration the wishes of the person concerned" and that "sources of post-diagnosis support should be identified." Finally, the NZG recommends that "information on ASD and support services should be available at all diagnostic disclosure interviews" (level B). SIGN 98 provides similar advice but at good practice point level only.

Recommendations for Research

SIGN 98 explains that further research is required "to address numerous areas where there is insufficient evidence to make a recommendation or to support existing clinical practice." The guideline identifies several examples within each of four key areas:

Recognition, assessment, and diagnosis
Nonpharmacological interventions
Pharmacological interventions
Service provision

Future Directions

Given the cost of practice guideline development, it may be that the era of large, national, multiprofessional guidelines such as those conducted by SIGN and in New Zealand (and the two guidelines soon to be published by NICE as regards both children and young people and adults in 2011–2012) is coming to an end. Instead, subsequent national guideline groups have elected to substantially follow the evidence-searching strategy of previous guidelines in order to save time and cost and to survey evidence from the dates of previous completed surveys (as is currently the case in Italy, which is using SIGN 98 in this way).

Thus, guideline organizations can assist each other, the international autism community, their carers, and clinicians to cultivate the evaluation of the evidence base as an ever-expanding tapestry of activity. Guideline development, in this way, provides fascinating and exciting opportunities for international collaboration. The information that will accrue from such collaboration may even generate its own contribution to the evidence base.

Furthermore, guideline organizations have been developing new ideas to spread the information available to the widest possible readership. For example, in 2009, the UK Academy of Medical Royal Colleges commissioned SIGN and the Royal College of Physicians and Surgeons of Glasgow (RCPSG) to publish two pilots of extant SIGN guidelines on the World Wide Web as resources for continuing professional development. The SIGN guideline on ASD was chosen as one of these initiatives and will be the first to be published (SIGN website; http://www.sign.ac.uk in 2012). This e-CPD module contains the SIGN 98 guideline itself and also contains embedded "think points" that help the reader develop their understanding of the information provided. Having read through this embellished version of the guideline, any clinician, from anywhere in the world, can then complete the multiple choice questions that examine the clinician's understanding of the guideline.

Thus, evidence-based guidelines on ASD are now more widely available to the professional and lay public than ever. This hopefully will combat the bewildering effect of information overload that confronts the parent who, on receiving a diagnosis of ASD for their child, types "*autism*," "*ASD*," or "*autism treatments*" into a web search engine. There is no possible way that even the best informed lay person could reliably navigate the millions of hits that inevitably will result. For this reason alone, guideline

organizations need to keep up with the possibilities inherent in information technology, to ensure that people with ASD, their carers, and the professionals who try to help them are provided with the most valid and reliable evidence base to date, in an accessible and understandable format.

See Also

- ▶ CHAT
- ▶ Comorbidity
- ▶ M-CHAT

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Prader-Labhart-Willi Syndrome

▶ Angelman/Prader-Willi Syndromes

Pragmatic Communication

▶ Pragmatics

Pragmatic Communication Disorder

▶ Semantic Pragmatic Disorder

Pragmatic Language

▶ Discourse Management
▶ Pragmatics

Pragmatic Language Disorder

▶ Pragmatic Language Impairment

Pragmatic Language Impairment

Catherine Adams
Human Communication and Deafness/School of Psychological Sciences, University of Manchester, Manchester, UK

Synonyms

Social communication disorder; Semantic-pragmatic language disorder; Pragmatic language disorder

Short Description or Definition

Pragmatic language impairment (PLI) is a type of developmental language impairment in which there is disproportionate difficulty with pragmatics and social communication compared to the structural aspects of language such as grammar and vocabulary.

Categorization

Pragmatic language impairment is not included in DSM-IV. In proposals for DSM-V, PLI equates to social communication disorder (SCD). This is a subcategorization of language impairment, which is listed under the broader category of communication impairment. In DSM-V, SCD is proposed to be a distinct category from autism spectrum disorder (ASD) and specific language impairment (SLI). The terms PLI and SCD appear to be used interchangeably; SCD is the preferred term in the USA and PLI is preferred in the UK, reflecting the original uses of the terms by key researchers.

Epidemiology

There are no prevalence figures for pragmatic language impairment since it is not recognized in diagnostic models as a category. Botting and Conti-Ramsden (1999) identified 22% of elementary school-age children attending specialist language units in the UK as having PLI. Although prevalence rates are not available, pragmatic deficits are probably not rare in the population of children with communication disorders and are being increasingly identified.

Natural History, Prognostic Factors, Outcomes

Children with PLI show late emergence of language, including receptive language delay (sometimes severe) and an early history of mild autistic features (such as echolalia) with impaired social relationships (Adams, 2001). By 5–6 years of age, there are relatively few problems with grammar and phonology, though receptive language problems may persist. A full profile of PLI emerges at this stage as the contrast between structural language and pragmatic competence becomes more marked.

Time spent in special educational provision by children with PLI is longer than that of children with other types of language impairment. Pragmatic difficulties in the primary school years may be related to emotional and behavior difficulties (van Agt, Verhoeven, van den Brink, & Koning, 2011). Long-term outcomes for individuals who have PLI reveal a specific difficulty in forming adult relationships in later life (similar to that in ASD), some persistent difficulties with social use of language. However, adults with a PLI history have relatively normal literacy and structural language skills, fewer autism symptoms than comparable ASD individuals, and better work skills outcomes than adults with a history of SLI (Whitehouse, Watt, Line, & Bishop, 2009).

Clinical Expression and Pathophysiology

The main aspects of communication affected in PLI are:

1. *Pragmatic behaviors in naturalistic social interactions:* Table 1 sets out pragmatic

Pragmatic Language Impairment, Table 1 Principal pragmatic features observed in pragmatic language impairment

Verbosity	The child talks at length about a topic and offers more than would be expected in cooperative talk
Loquacity	The child talks at length within one conversational turn; the impression is of a monologue rather than a genuine conversational exchange
Domination of interaction	The overall impression is that the child is dominating the interaction by being verbose/loquacious and not allowing the other speaker a turn
Initiations	The child initiates exchanges of information (a) more frequently than expected by making many unsolicited statements or by asking many questions or (b) the child is relatively passive or appears uninterested by making no or very few initiations
Responsiveness	The child does not respond to a conversational overture such as a question or a clear cue from the other speaker that it is his turn to talk, appears to ignore the other speaker
Turn taking	There are problems with taking turns in interactions so that speakers talk at the same time. Signals (intonation, grammatical, and nonverbal signs), which are given by one speaker to another to indicate that the turn to talk is being passed over, are not detected by the child or he is verbose and presses on with his talk over the other speaker. Alternatively frequent pausing between turns indicates that the child is not able to identify change of turn
Information management	The child offers too much information in the interaction and thus appears pedantic or odd. The same child may offer too little information so that intended meaning is vague and the listener has difficulty following meaning
Reference	The child does not specify clearly objects, actions, or people who are being talked about; he does not take into account how much the listener knows already or could be expected to work out from the linguistic or physical context
Topic	The child changes topic suddenly (topic shift) or provides an unexpected link to a topic unrelated to the current exchange (topic drifting or linking). Shifting/drifting can occur to topics which are not relevant to the situation or may represent attempts to return to recurrent topics/favored interests
Coherence	The child's talk is disorganized, with unclear references and confused sequences in narratives, leading to loss of overall meaning of the discourse
Cohesion	The child does not use correct linguistic markers (e.g., pronouns) to indicate links between different utterances or turns resulting in confusion for the listener
Speech acts	Most children with PLI of school age show a normal range of speech act forms (e.g., questions, statements, denials) but may not always use these in optimal contexts

language behaviors observed in children who have PLI, typically after 4–5 years of age. These are present in conversational interactions or other unstructured talk. This account of pragmatic errors is based on the Gricean view of pragmatics as cooperative behavior between speakers. That is, talk should be relevant and informative.

2. *High-level language difficulties* refer to the level of language processing at above-sentence level, for example, conversational discourse, understanding stories, narrated events, printed text in books. These are apparent on formal tasks and standardized testing but also pervade the child's everyday functioning. Table 2 lists the main high-level language deficits seen in PLI and describes how these affect communication.

Semantic errors and immaturities do occur in children with PLI and are similar in nature and proportion to semantic behaviors seen in SLI. Semantic errors appear more predominant in PLI because grammar is relatively unaffected by the school years. Bishop (2000) revised the original label of "semantic-pragmatic language impairment" to PLI to reflect these findings. Vocabulary development, use of abstract vocabulary (e.g., adjectives), and complex verbal concepts ("time" and "spatial" vocabulary) are similar in SLI and PLI. Use of semantically related substitutions or replacement of advanced vocabulary by earlier acquired words is common in all language impairments. Word-finding deficits may be present in PLI but are not universal in this group and are more common in SLI. Less well explained is the presence

Pragmatic Language Impairment, Table 2 High-level language and comprehension deficits in PLI

Nonliteral interpretations	The child misinterprets, or interprets literally, nonliteral language such as metaphors, idioms, jokes, sarcasm
Inferential comprehension	The child with PLI typically shows limited ability to make appropriate inferences, particularly in naturalistic discourse, and may therefore misinterpret meanings
Comprehension of discourse	The child is unable to follow complex verbal interactions and may therefore not be able to contribute meaningful responses. Most children with PLI have some deficits in inference comprehension and in applying world knowledge to discourse comprehension
Misinterpretation of meanings in context	Words which have multiple meanings (e.g., bank, glasses) are misinterpreted by the child because he does not use the context (usually the sentence, but sometimes a physical context) to identify the correct meaning
Narrative organization	The child shows disorganized narratives (stories, accounts of recent events), leaving listeners confused as to what actually happened. Many behaviors contribute to poor narrative organization such as inadequate reference, poor coherence and cohesion, as well as features of language impairment (e.g., poor vocabulary)

in PLI and high-functioning autism (HFA) of unusual/bizarre substitutions (the classic example from Bishop's work is "bedtime uniform" for "pajamas"), neologisms (rare), and precocious vocabulary development.

Children with PLI may present with one or many other language deficits such as lag in sentence comprehension or expressive vocabulary (see section "Evaluation and Differential Diagnosis" below).

3. *Other communication features* of some children with PLI appear to be associated with the social communication deficits in ASD/HFA. These are (a) stereotyped language: the child inserts learned sentences or phrases (e.g., " all of a sudden") into conversation or other interactions, often repeatedly, where they have no meaning; (b) unusual or stereotyped intonation: a proportion of children with PLI may use exaggerated intonation patterns or speak in a monotone; (c) abnormalities of nonverbal communication: limited use of gesture to supplement communication, gaze aversion; (d) associated characteristics such as social cognition deficits, difficulty with peer relations, behavioral difficulties, anxiety, and depression have been reported.

Heterogeneity in PLI

Children with PLI rarely demonstrate all of behaviors listed above. Some children may show mild pragmatic impairments and social interaction problems with relatively good language skills; others show multiple pragmatic, language, and social characteristics frequently and in all types of interactions.

Evaluation and Differential Diagnosis

Evaluation of the communication features of pragmatic language impairment follows three main principles:

A comprehensive assessment must include assessment of language skills, pragmatic ability, and social interaction

- Since presentation of PLI is variable, evaluation should be individualized in order to pursue in depth characteristics which should be targeted in intervention
- Ideally, evaluation should be carried out as part of a multidisciplinary assessment to address ASD and language characteristics

Language, pragmatics, and social communication assessments should be carried out by a speech-language practitioner with experience in language disorders and autism. A combination of observational and formal assessment techniques will be used. The context of assessment is crucial. Functional deficits of social communication apparent in the child's everyday life may not be easy to observe in structured elicitation procedures or tests, even those dedicated to pragmatics, so test scores alone may overestimate ability. Expert assessment should be extended to

non-clinical contexts (home, classroom, and playground) to obtain a representative profile of social interactions. Evaluation should include interviews with carers and teachers to gain additional information about the impact of communication deficit on daily life and peer relationships.

Pragmatic skills shown in Table 1 are typically evaluated using observational checklists and naturalistic sampling such as classroom or family interactions or simple conversation in clinic. Before 4–5 years of age, it may be difficult to identify problematic pragmatic behaviors. In preschool children, who are at a stage where pragmatics and structural language are at the same stage of development, these pragmatic features may be considered charming rather than problematic. Speech-language practitioners will use clinical experience and knowledge of communication development to identify pragmatic behaviors which are not commensurate with the age of the child. There are no detailed normative data for the emergence of complex pragmatic behaviors in late preschool to school-age children. All aspects of language skills including word and sentence level, in addition to the higher-level language skills shown in Table 2, need to be assessed by a specialist speech-language practitioner. Formal tests which have pragmatic content, for example, Expression, Reception, and Recall of Narrative Test (Bishop, 2004), Test of Pragmatic Language-2 (Phelps-Teraski & Phelps-Gunn, 2007), and others can be used.

An indication of the presence of PLI can be obtained using the Children's Communication Checklist (CCC-2) (Bishop, 2003). In the CCC-2, parents or teachers rate the frequency of occurrence of a range of structural language, pragmatic, and autism communication behaviors. Two summary scores are then derived: a general communication composite which indicates the presence of communication impairment and a social interaction deviance composite which can indicate the presence of a disproportionate pragmatic impairment.

Diagnostic criteria which would distinguish children with PLI from other conditions have been proposed. However, these criteria should be treated with caution since they make assumptions about the characterization of PLI which are not supported by evidence. Criteria for IQ cutoffs are well accepted, but methods for distinguishing PLI from SLI and from ASD have caused considerable controversy over the last two decades. Differential diagnostic criteria are set out below alongside discussion of problematic areas.

(a) Intellectual impairment is distinguished from PLI using nonverbal IQ cutoff. PLI have nonverbal IQ >70, intellectual impairment nonverbal IQ <70. This is identical to the IQ cutoff used for SLI diagnosis. Narrower definitions of SLI use >85 cutoff. In clinical practice, children with PLI with nonverbal IQ in the range 70–85 are likely to present with a similar profile of language impairment as children with PLI who have nonverbal IQ >85.

(b) PLI is differentiated from SLI by consideration of disproportionality of the impairment of pragmatics compared to the impairment in structural aspects of language such as grammar, vocabulary, and phonology.

The social interaction deviance composite (SIDC) score of the CCC-2 can indicate the likely presence of PLI but should not be used in isolation as there is no precise cutoff between SLI and PLI. Caution is required since SLI expressive language difficulties (word-finding problems, difficulties in constructing complex sentences) may be perceived by observers on CCC-2 as affecting pragmatic competence. Significant SLI receptive language difficulties can result in the child adopting compensatory strategies in naturalistic interactions which appear bizarre and may mimic some of the characteristics of PLI in Table 1. Best diagnostic practice is to combine use of the CCC-2/SIDC with language assessment findings and specialist speech-language practitioner opinion.

(c) It has been proposed that SCD/PLI can be differentiated in diagnosis from ASD since SCD/PLI does not demonstrate the repetitive behaviors and restricted interests dimension of ASD.

Whereas children with PLI often resemble able children on the autism spectrum, they typically do not meet diagnostic criteria for core autism as they do not have impairment in all three aspects of the autism triad (Bishop & Norbury, 2002; Leyfer, Tager-Flusberg, Dowd, Tomblin, & Folstein, 2008). Bishop proposed that PLI may represent an intermediate state on a continuum between SLI and HFA since children with PLI tended to move in and out of ASD diagnosis over time. Instead of assigning children to overlapping categories, a solution is to adopt a dimensional theory of autism in which symptoms are continuous with behavioral traits occurring in the general population (Happé & Ronald, 2008). PLI may therefore represent a group with elevated yet subthreshold autistic symptoms, impaired in the social dimension but not the nonsocial dimension (repetitive behaviors) Alternatively, social and language impairments may be seen as separate disorders which can co-occur but vary independently (Loucas et al., 2008, Norbury, 2005). This view goes some way to explaining diagnostic overlaps and heterogeneity in PLI but requires further research.

Treatment

Treatment for PLI is via a holistic, multidisciplinary approach, taking into account priorities of children, carers, and other service users. Communication treatments for PLI are directed toward the language, pragmatic, and social interactional elements of the condition. Treatments can be direct (therapeutic activities and practice with a speech-language practitioner) and indirect (advice and training offered to teaching staff and parents). Ideally, a combination of approaches should be instigated, but specialist knowledge and expertise is essential. Children may also require other treatments for associated conditions at the same time as communication therapy.

Preschool speech-language treatments are likely to be aimed at encouraging use of language and establishing skills which underpin language comprehension, supplemented by advice on language facilitation to carers. Recognition is now given to the importance of early intervention for social use of language by increasing appropriate communicative intents and working in small groups. These treatments should be delivered by speech-language practitioners.

Direct treatments for language impairment as the child enters the school years are diverse and will be matched to the individual child's profile. Language therapy techniques are used to target needs such as receptive language or word-finding difficulties (McCartney et al., 2004). A substantial body of work on social communication interventions for children with language impairments is available (Brinton & Fujiki, 1995; Timler, Olswang, & Coggins, 2005). Pragmatic skills deficits are approached directly using metapragmatic therapy in which the child is encouraged to apply pragmatic rules in social interactions via self-monitoring. Social communication deficits are often treated in groups using a social skills approach, but this can lack individualization or targeting of specific skills. An integrated model of direct intervention, in which language, pragmatic, and social communication therapies are matched to the individual needs of the child, is described in Adams (2008).

Indirect support can be provided for classroom/home generalization of language goals and social communication via training of education support workers, teachers, and parents. Speech-language practitioners can provide advice on the level and complexity of language input and strategies for problem-solving difficult communication situations. Children may also require a number of personalized support strategies such as visual timetables.

The evidence for treatments of PLI is sparse. Despite widespread use of social skills training for PLI, evidence of its specific effects on communication for any population is very limited indeed (Reichow & Volkmar, 2010). Case reports of conversation treatments for children with SLI and/or have PLI demonstrated positive effects of intervention on pragmatic function and indicate appropriate methods of treatment (Adams, 2001; Brinton, Robinson, & Fujiki, 2004; Timler et al., 2005). A single-case study series of intervention

for children with PLI (Adams, Lloyd, Aldred & Baxendale, 2006) gave an indication of change in language and pragmatic functioning using Adams' model of integrated therapy.

See Also

► Semantic Pragmatic Disorder

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Pragmatic Language Skills Inventory

Joanne Valdespino
Test Development, PRO-ED, Inc., Austin, TX, USA

Synonyms

PLSI

Description

The *Pragmatic Language Skills Inventory* (PLSI; Gilliam & Miller, 2006) is a 45-item, standardized, norm-referenced, teacher-rating instrument designed to assess the pragmatic language abilities of children ages 5 through 12 years. It is based on long-standing theories of pragmatic language defined as use of language in context.

As an objective measurement scale, it allows educators to document progress and can also assist in targeting instruction and intervention goals for IEPs and Section 504 Plans. The PLSI can be used by teachers, speech-language pathologists, and early interventionists for further data collection and research.

Children are rated on the PLSI by a teacher or other professional (rater) who is familiar with his or her pragmatic skills compared to others of the same age and gender. The rater should, therefore, be familiar with the child's skill sets in different school settings and as well as the abilities of average children of the same age and gender. The rater uses a 9-point scale to assess the child against three areas: personal interaction (initiating conversation, asking for help, participating in verbal games, and using appropriate nonverbal communicative gestures), social interaction (knowing when to talk and when to listen, understanding classroom rules, taking turns in conversations, and predicting consequences for one's behavior), and classroom interaction (using figurative language, maintaining a topic during conversation, explaining how things work, writing a good story, and using slang appropriately). Each of these areas represents a PLSI subscale. Each subscale consists of 15 items for a total of 45 items which can be completed in approximately 10 min.

PLSI scoring and interpretation is done by an examiner. This person may be a speech clinician, teacher, or education professional knowledgeable in assessment and basic psychometrics. Raw scores for each subscale can be converted to percentile ranks and standard scores using reference tables. The standards scores for each of the three subscales can also be summed to determine the child's pragmatic language index. The PLI is a standardized score (M = 100, SD = 15) and represents overall performance.

Historical Background

The PLSI is based on theories of pragmatic language by Bates (1976) and Snow (1994), which specify language in social context as a system of rules ensuring social appropriateness and the clarity of the speaker or author's intent. Snow specifies pragmatic language as a system of conversational rules. These rules include participating in conversation turn taking; telling the truth; offering new, relevant, and appropriate amounts of information to the listener; requesting appropriate information; providing the correct amount of background information in context; using unambiguous as well as figurative speech; as well as changing language appropriately to each social situation (Bates 1976). Gilliam and Miller developed the PLSI to assess school-age children in the above areas.

Psychometric Data

The PLSI was standardized on 1,175 school-age children, representative of population in regard to race, gender, rural or urban residence, ethnicity, family income, parent education, and disability.

The reliability of the PLSI was estimated using coefficient alpha (content sampling), test-retest (time sampling), and interrater reliability (correlation between raters). Coefficient alphas

were calculated for each of the subscales by gender and disability status. All coefficient alphas for the PLSI's subscales exceed .95. Test-retest reliability was estimated to range between .78 and .91. Interrater reliability was estimated to range between .85 and .90.

The criterion-prediction validity of the PLSI was estimated by examining the relationship between the PLSI and the *Test of Pragmatic Language* (TOPL; Phelps-Terasaki & Phelps-Gunn, 1992). Correlation coefficients ranged between .50 (large) and .86 (very large). Exploratory factor analysis indicated the items loaded as expected on both a single factor and on the three PLSI subscales. Correlation coefficients between the PLSI subscales and the total index score ranged from .75 to .86. Finally, the PLSI diagnostic subgroups were rated by teacher in expected ways. Individuals with intellectual disabilities exhibited the lowest scores and individuals identified as gifted and talented exhibited the highest scores.

The PLSI allows children's pragmatic language skills to be evaluated using norm-referenced scores. Scores can be used to determine if the child exhibits characteristics of a pragmatic language disorder and should be referred for a more comprehensive language assessment. Guidelines are provided to assist the examiner in interpreting the results. The PLSI can be used to identify children with pragmatic language disorders, document progress in ability, collect data for research, and target pragmatic language goals.

Clinical Uses

The PLSI is intended to be used in diagnosis of a pragmatic language disorder in conjunction with other assessment results, observations, case histories, and parent interviews. It provides reliable and valid scores in order to differentiate children who have little likelihood of having a disorder.

The PLSI's objective scale of measurement allows educators to document a child's progress in pragmatic language ability. Administration is quick and simple enough to facilitate frequent use. The test can be used for special education and regular annual evaluations and in conjunction with other data in order to make transition and extended-year decisions.

The PLSI can help teachers and other professionals evaluate children's pragmatic language skills and assist in setting pragmatic language goals. Items from the PLSI can be utilized as specific targets in goal planning and intervention in Individualized Education Plans (IEPs) and Section 504 Plans.

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Pragmatic Rating Scale

Rebecca Landa
Director Center for Autism and Related Disorders, Kennedy Krieger Institute, Baltimore, MD, USA

Synonyms

PRS-SA (Pragmatic rating scale-school age)

Description

The Pragmatic Rating Scale-School Age (PRS-SA) is a assessment tool designed for documenting social communicative behaviors that violate pragmatic rules. It is designed for use with individuals aged 4 years through adulthood whose cognitive and linguistic functioning ranges from mild

impairment through the gifted level. The definition of "pragmatics" used here is the set of rules governing the social use of language.

Pragmatics

Communication is a vital component of human interaction. It is one of the primary means of keeping people connected to each other. Communication may happen for a wide variety of purposes, such as informing someone (e.g., that you will be late), requesting permission, making a promise, teasing, showing something of interest, asking for information, greeting, negotiating, and so forth. To ensure that communication between people is coherent and socially appropriate, every culture has unwritten (tacit) rules for how communication is to transpire. The tacit rules that guide conversation, or social discourse, are known as the rules of pragmatic language behavior. Grice (1975) defined a set of maxims that, when adhered to, result in coherent conversation. These maxims are basic principles that enable conversational partners to organize and construct their communication behavior in ways that are interpretable and socially acceptable to each other, including such things as not saying more than is necessary, making sure that what you say is relevant (and that you indicate how and why it is relevant). When these maxims are systematically violated, people are signaling something to their conversational partner that serves to ensure the coherence of the communication. For example, when violating the maxim that requires speakers to say what they believe to be true, a speaker will signal through the tone of their voice or through facial expressions or gestures that their statement is not meant to be taken seriously (e.g., when we exaggerate to make a point or to convey sarcasm). At times, violation of the Gricean maxims or pragmatic rules is permissible. For example, we may allow someone who is upset to monopolize a conversation, knowing that this is an extenuating circumstance. If, however, a particular person consistently monopolizes conversations, or if a person fails to systematically signal, in socially appropriate ways, their intentional violation of pragmatic rules, communication breakdown, and/or barriers to successful social interaction will arise. Such behavior may be indicative of a pragmatic language impairment.

Pragmatic Rating Scale-School Age

There are six scales within the PRS-SA: (1) Speech Acts; (2) Presupposition/Theory of Mind; (3) Discourse Management; (4) Speech and language behaviors; (5) Suprasegmental Speech Characteristics; and (6) Nonverbal Communicative Behaviors that affect Pragmatics. Within each of these scales, there are a number of items that provide a discrete set of communicative behaviors to be rated by the clinician. Ratings involve scores that range from 0 (unaffected; no evidence for pragmatic error involving this specific behavior or set of behaviors) to 2 (clear violation of pragmatic rules associated with the behavioral feature(s) being coded for this item). Within the Speech Acts scale, a checklist is provided on which clinicians record occurrences of the client's or patient's production of specific types of speech acts (communicative intents) and whether these were expressed in pragmatically appropriate or inappropriate ways. At the end of the PRS, two additional ratings are made that permit the clinician to provide an overall clinical judgment of the client's or patient's pragmatic behavior. The scores generated from the PRS include the summary scores for each scale, an overall composite score representing a sum of all the scale scores, and the clinical impression scores.

Scoring of the PRS-SA is based on a conversational sample that is designed to elicit a natural communicative exchange. Specific probes are embedded into the conversation that provides opportunities to observe the full range of pragmatic behaviors rated within the PRS-SA. It may be used with already established behavior sampling procedures that include conversation segments between the clinician and child, such as the Autism Diagnostic Observation Scale – Generic, Modules 2 through 4 (Lord, Rutter, DiLavore, & Risi, 2001). It may also be used to rate pragmatic behavior over a number of

interactive events so that clinicians may observe variability in pragmatic behavior linked to different types of contexts that involve a variety of social demands and supports, conversational partners, and social rules (e.g., playing games vs joint project development with peers; conversations with authority figures; conversations at lunchtime).

Historical Background

Pragmatic language disorders are not identifiable through existing cognitive assessment tools, nor through standard measures of grammatical and semantic language functioning. To assess pragmatic skill, an instrument is needed that enables clinicians and researchers to document pragmatic behavior in contexts that mimic true communicative exchanges. Pragmatic behavior, by definition, is dependent on context. In fact, it is the very ability to flexibly adapt one's communicative behavior to the context at hand, in socially appropriate ways, that defines healthy pragmatic functioning.

The PRS was originally developed in the early 1990s to document social discourse variations in a family study of autism. Soon after the PRS was developed, it began to be utilized to study pragmatic behavior in individuals with autism and to examine social discourse impairment as an endophenotype in other genetic disorders, including obsessive compulsive disorder. Next, the PRS was revised for use with school-aged children. In 2010, the PRS-School-Age version began to be used in a multi-site social skills intervention study focusing on elementary school-aged children with autism spectrum disorder (ASD). It is now being used to study the broader autism phenotype in school-aged siblings of children with autism. Norms are also being established for children aged 4 through 12 years.

The PRS was developed because there was no other assessment instrument available for identifying individuals with social discourse difficulties. Many individuals with pragmatic impairments are viewed as socially odd and experience considerable social rejection, but because standard assessment tools do not assess pragmatic language functioning, these individuals often remain unidentified and, thus, untreated. The PRS was designed to facilitate identification of individuals with pragmatic impairment, providing a systematic method for defining the nature of their social communication difficulties and an objective basis for justifying intervention when needed. The PRS enables clinicians and researchers to document social discourse (pragmatic) variations or impairment, which is important for many types of endeavors such as identifying endophenotypes in genetic studies, identifying individuals with pragmatic disorders who are in need of intervention (or who may meet inclusion criteria for an intervention study), and educating family members, teachers, and employers about the nature of pragmatic difficulties that an individual is experiencing. Identifying and treating pragmatic impairment is important because such impairment may threaten success at the workplace, the ability to form and sustain friendships, the ability to gain access to social networks, and so forth.

Psychometric Data

At the time of preparation of this document (2011), the only psychometric data available on the PRS involves data presented in scientific manuscripts. Those data may be used to obtain general thresholds for PRS scores that fall in the "typical" range, though those studies focus primarily on adults and high-functioning individuals with autism spectrum disorders (including non-ASD controls). However, psychometric data are presently being compiled on children between the ages of 4 and 12 years. Thus, in the near future, there will be empirical data on school-aged individuals with typical development, non-ASD delays, and ASD.

Clinical Uses

The PRS has a variety of clinical uses.

1. *Documenting the presence of a pragmatic language delay or impairment*. Elevated scores on the PRS, in combination with a speech-language pathologist's clinical judgment of

pragmatic language impairment, are likely to be indicative of impaired pragmatic ability and the need for intervention services. The PRS provides clinicians with a structured system for documenting communicative behaviors that may be contributing to breakdowns in social engagement and social communication. The operationally defined behaviors that are scored within the PRS provide clinicians with a systematic means of observing communicative behavior. The PRS items focus the clinician's attention on dimensions of communication that otherwise may be missed or attributed to a different type of impairment. Documenting the types of communication behaviors that are problematic (based on the PRS items receiving a score of "1" or "2"), and the degree to which communicative behavior is disrupted for each PRS item, enables clinicians to glean information about whether a pragmatic impairment exists, and if so, how extensive and severe the impairment may be. The organization of communicative behaviors into different categories within the PRS (see "Description") further enables clinicians to determine whether a child's social communicative difficulties are primarily related to nonsocial processes (e.g., grammar, articulation), or are directly linked to difficulty with social inferencing, ability to link his/her ideas to the ideas of others through the use of linguistic devices, and so forth. Thus, the PRS is useful in clinical decision-making regarding need for intervention services and determination of intervention goals.

2. *Identifying specific behaviors that contribute to the pragmatic difficulties that an individual is displaying*. As indicated above, the specific types of items to be scored within the PRS permit documentation of the communicative behaviors that vary from the norm. For each PRS item, clinicians select a score ranging from 0 (within normal limits) to 2 (sign of abnormality). Clinicians may examine the items for which individuals received scores of 1 or 2, and look for patterns of communicative behavior that are problematic for their client or patient. By identifying specific aspects of pragmatic functioning that are difficult for an individual, clinicians may begin to define intervention goals and conversational supports, with the aim of improving the pragmatic language skills of the individual. Using the PRS, clinicians are able to objectively document specific pragmatic behaviors that are problematic as they help children or adults to develop greater levels of self-awareness and insight about their own communicative behavior. This is likely to enhance therapeutic response as individuals with pragmatic language difficulties often require explicit explanation of pragmatic rules, which are implicitly learned by most individuals. The operationally defined PRS items and objectively defined scoring system enable clinicians to discuss children's communication behavior with parents, helping them to develop a clearer understanding of their child's difficulties and how to develop strategies for helping their child achieve greater levels of success in communication.
3. *Documenting treatment response and progress*. The capacity of the PRS to document improvement in response to intervention has not been established, but is in the process of being evaluated through an intervention study. A short form of the PRS has been developed for use within treatment sessions to rate children's pragmatic behavior. This short PRS form is being studied to determine its utility for providing feedback to children on their advances in pragmatic behavior during and across intervention sessions, and for record-keeping purposes (e.g., progress notes).
4. *Communicating with teachers and family members about the client's needs*. As indicated above, the PRS provides a clear and objective means of describing the pragmatic behaviors and skills of an individual when providing test results to teachers and family members. This helps them to focus on specific behaviors rather than on a global impression of a socially challenged individual, thereby fostering the use of targeted skill-enhancing strategies.

See Also

- ▶ Discourse Management
- ▶ Pragmatic Communication
- ▶ Pragmatic Language Impairment
- ▶ Pragmatics
- ▶ Presupposition
- ▶ Social Cognition
- ▶ Social Communication

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Pragmatics

Diane R. Paul
Clinical Issues in Speech-Language Pathology, American Speech-Language-Hearing Association, Rockville, MD, USA

Synonyms

Language use; Pragmatic communication; Pragmatic language; Social cognition; Social communication; Social thinking; Use of language; Use of language in context

Definition

Effective communication requires mastery and integration of multiple components of language: structure or form (phonology, morphology, syntax); content or meaning (semantics); and use of language in context (pragmatics; Bates, 1976; Bloom & Lahey, 1978). Difficulty with any of these language components – either singly or in combination – may result in a language disorder. Difficulty with pragmatics is one of the core features of autism.

Pragmatics is one aspect of a broader category known as *social communication*. Social communication is supported by an array of skills important to effective communication: social cognition (e.g., taking the perspective of another person, making inferences, understanding facial

expressions); sociolinguistics (e.g., cultural influences, gender differences in communication, influences of different languages for multilingual speakers); and social interactions and relationships with peers (Adams, 2005; Timler, 2008; Timler, Olswang, & Coggins, 2005). Pragmatics involves three main communication tasks: (a) using language for multiple purposes, (b) adapting language for different settings and communication partners, and (c) engaging in conversation and narrative discourse (Roth & Spekman, 1984).

Use of Language for Different Purposes

Language is used for different reasons (e.g., greet, comment, ask, promise). By speaking certain utterances, certain actions are accomplished. Therefore, these purposes of speaking are known as *speech acts* (Austin, 1962; Searle, 1969).

Individuals with autism may use language in a more limited way. For example, they may not greet people, comment, or ask questions.

Adapting Language to Setting and Communication Partner

A pragmatic language disorder may be apparent when individuals do not use language appropriate to the setting or the communication partner. They may use the same language in all places and with all people. They may use a loud voice in a movie theater or restaurant. They may be impolite to their boss or abrupt with a grocery clerk.

Conversation and Narrative Discourse

Conversations require speakers to take turns; to appropriately initiate, maintain, and change conversational topics; to know when to interrupt; and to modify utterances following a misunderstanding. Nonverbal behaviors are also an integral part of conversations, such as using gestures and facial expressions and knowing how close to stand when speaking to another person. Speakers follow a set of conversational rules related to the quantity, quality, relevance, and manner in which they speak (Grice, 1975).

Following conversation rules involves social cognition, which includes perspective-taking. The ability to take the perspective of another person is known as *theory of mind*. Speakers need to be aware of what their listener already knows. They need to know how much background information to provide.

Conversation problems, which may result from autism, may include difficulty following the rules for conversation-interrupting, not answering a question, bringing up topics unrelated to what is being discussed or talking about only one subject. Speakers with autism also may experience problems in perspective-taking (American Speech-Language-Hearing Association [ASHA], 2006). They may talk about people their communication partner does not know or omit important details.

Conversational use and narrative discourse vary across cultures. Therefore, it is critical to know the appropriate cultural expectations before determining that a particular pattern of conversation or storytelling is a pragmatic disorder.

Narrative discourse involves telling stories and talking about personal events. Speakers need to tell stories in a certain order and describe events in sequence.

Narrative discourse problems, which may result from autism, may involve telling a story out of sequence or omitting important parts.

Speech-language pathologists assess and treat pragmatic language disorders that may affect academics, self-esteem, behavior, and relationships.

Pragmatic language intervention is designed to capitalize on strengths and address weaknesses that affect language use and facilitate the individual's social activities and participation by assisting the person to acquire new communication strategies (verbal and nonverbal). Intervention is expected to result in improved social functioning and participation (ASHA, 2004).

See Also

- ▶ Pragmatic Communication
- ▶ Pragmatics
- ▶ Social Cognition
- ▶ Social Communication
- ▶ Social Thinking
- ▶ Speech-Language Pathologist (SLP)
- ▶ Theory of Mind

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Praise

Rebecca Munday
The Center for Children with Special Needs, Glastonbury, CT, USA

Definition

Praise is the act of delivering positive statements by individuals in regard to a person, object, action, or idea. Praise can be delivered publicly so others have the ability to see or hear it or in private. Praise is often awarded after the completion of a task or an accomplishment. Praise can be delivered verbally, gesturally, and visually. Some examples of praise are saying "Good job" or "Way to go" and "I like how you are sitting so tall and steady," giving a thumbs-up, or providing a cue card that says "Nicely done."

See Also

► Positive Reinforcement

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Praxis

Kristen M. Powers
Coordinator of Rehabilitative Services, Center for Children with Special Needs, Glastonbury, CT, USA

Synonyms

Motor planning

Definition

Praxis refers to the brain's ability to develop, organize, and carry out the necessary steps to complete an unfamiliar task or a series of tasks (Ayres, 1973). Ayres (1972, 1979) noted that effective motor planning is dependent on an

individual's ability to integrate information from the sensory systems, including visual, proprioceptive, vestibular, and tactile stimuli. Three components of praxis have been defined as ideation, planning, and execution (Ayres, 1973, 1985). Ideation is defined as generating a plan of action (Parham & Mailloux, 2001) and can impact an individual's ability to fluidly perform motor actions, particularly in new situations or with novel materials. Planning and execution further allow the individual to plan and anticipate body movements necessary for action and can incorporate sequencing a series of steps when necessary. Children with autism spectrum disorders may show difficulty within the domain of praxis, resulting in awkward motor execution, poor pretend and imaginative play skills, and compromised sequencing abilities for new and novel situations.

See Also

- ▶ Ayres, A. Jean
- ▶ DeGangi-Berk Test of Sensory Integration
- ▶ Sensory Integration and Praxis Test

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Pre-, During, and Posttest Design

- ▶ Qualitative Versus Quantitative Approaches

Precentral Gyrus

Susan Y. Bookheimer
Department of Psychiatry and Biobehavioral Sciences, UCLA School of Medicine, Los Angeles, CA, USA

Synonyms

Brodmann's area 4; Motor cortex; Primary motor cortex

Definition

The precentral gyrus (PCG), also known as the motor strip or primary motor cortex, is the part of the brain's neocortex responsible for executing voluntary movements. This gyrus is located in the most posterior portion of the frontal lobe, lying immediately anterior to (in front of) the central sulcus, and extending from the apex of the brain down to the sylvian fissure, which delineates the temporal lobe. Histologically, neurons in the precentral gyrus have a similar architecture and are denoted as Brodmann's area 4. The functional organization of the PCG follows a topographical representation of an inverted homunculus (small human), such that the head and face regions are represented at the lowermost portion of the gyrus, the body and limbs extend toward the upper part of the gyrus, and the feet "dangle" over the apex of the brain. Areas of increased fine motor dexterity, especially the lips, tongue, and hands, have a far more extensive representation on the motor strip, while areas with little motor dexterity such as the torso have a minimal motor representation. In motor cortex, the left hemisphere controls the right side of the body and right brain controls the left body. Lesions to the motor cortex will result in an inability to move that portion of the body represented in the homunculus.

While there is little evidence that primary motor cortex plays a key role in autism, there is

some evidence of motor cortex abnormalities. Behaviorally, many individuals with autism have motor deficits (e.g., Jansiewicz et al., 2006), though other brain regions such as pre-motor cortex, cerebellum, and basal ganglia may contribute to these deficits. Several brain imaging studies in autism have found differences in precentral gyrus morphology including increased white matter (Mostofsky, Burgess & Gidley Larson, 2007; Mengotti et al., 2011) and decreased cortical thickness (Cauda et al., 2011; Scheel et al., 2011). Decreased connectivity between motor cortex and cerebellum during motor performance (Mostofsky et al., 2009) may indicate that motor abnormalities in autism may reflect a deficit in how brain areas involved in movement coordinate their activity.

See Also

- ▶ Motor Control
- ▶ Motor Planning

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Preciseness

- ▶ Perfectionism

Precision Teaching (PT)

Marjorie H. Charlop[1] and Catherine A. Miltenberger[2]
[1]Department of Psychology, Claremont Mckenna College, Claremont, CA, USA
[2]Claremont Graduate University, Claremont, CA, USA

Definition

Precision teaching is a set of educational strategies and tools that are intended to individualize each learner's program to best meet his or her needs (Merbitz, Vieitez, Merbitz, & Binder, 2004a). More specifically, precision teaching requires that instructors set a specific measureable and observable goal, select a method of instruction, conduct daily assessments of the learner's performance, and chart the number of correct and incorrect responses on a standard celeration chart. This constant progress monitoring and charting provides the instructor with an easy-to-read, graphic representation of the learner's progress that can be used to develop an effective instructional program. If the student is learning at a rate that allows him or her to reach the set goal in the specified time frame, the instructor can conclude that the current instructional strategy is effective and continue with that program. If the learner is not progressing at the desired pace, the instructor can supplement or change the

instructional strategy in an attempt to facilitate the learner's progress. Precision teaching can be used with and is believed to enhance the efficacy of almost any educational or treatment program (Lindsley, 1992).

Historical Background

Ogden Lindsley and his colleagues began developing precision teaching in the 1960s. At this time, behavioral techniques (e.g., schedules of reinforcement and punishment, response shaping, stimulus control) were commonly used in educational settings. While generally effective, these strategies did not allow all students to reach the desired level of achievement.

Instead of focusing on specific behavioral techniques, Lindsley applied behavioral measurement and charting procedures to educational programs (Binder & Watkins, 1990). More specifically, Lindsley and his colleagues used assessments of active and observable behavior, frequency counts, and charting to examine individual student progress. It was believed that using this behavioral measurement system would provide instructors with the information required to discover an effective instructional strategy for each learner.

Collecting frequency data enabled early precision-teaching researchers to discover the importance of rate of correct responding. Eric Haughton and his colleagues found that both accuracy and speed of responding influenced the acquisition of more advanced skills (Binder, 1993). Based on this finding, precision teaching came to emphasize the importance of learning each skill to fluency, or the accuracy and rate of responding required to make that skill functional (for more information on fluency, please see section "Goals and Objectives").

Although not widely implemented, educators and researchers continue to develop precision-teaching manuals, tools, and fluency databases. Research on precision teaching is published in *The Journal of Precision Teaching and Celeration* (previously *The Journal of Precision Teaching)* and other peer-reviewed journals.

Rationale or Underlying Theory

Precision teaching is based in the belief that all learners can succeed with the appropriate support. Unlike traditional educational programs, this perspective attributes failure to the program rather than the learner. If a learner is not succeeding, the instructor must change the environment (e.g., the type of instruction, intensity of instruction) to better support learner progress.

Creating appropriate learning environments means that the instructor must know when a learner is struggling, the environmental variables that were in place, and what changes need to be made. Precision teaching provides a systematic framework for identifying and replacing ineffective teaching strategies. This is believed to facilitate the development of effective programs and learner progress.

Goals and Objectives

Precision teaching is intended to maximize learner progress by monitoring their response to intervention and modifying the instructional strategies as necessary. It is a content-free method of evaluating program effectiveness. As such, it can be and has been used to address a wide range of academic (e.g., reading words, solving addition problems), social (e.g., answering questions, making eye contact), and other (e.g., aggressive behaviors, welding) issues and skills (Merbitz, Vieitez, Merbitz, & Binder, 2004a).

Regardless of the program goal, precision teaching recognizes that both the learner's ability to demonstrate a skill and the time it takes him or her to do so influence his or her ability to use this skill in real-world situations. Therefore, precision teaching emphasizes that the individual learn a skill to fluency, or the level of accuracy or quality and speed required to make a skill functional (Fabrizio & Moors, 2003). Individuals who learn a skill to fluency are more likely to retain the skill following intervention; engage in the skill long enough to complete real-world tasks; and demonstrate that skill in new situations,

distracting environments, and in combination with related skills (Fabrizio, & Moors, 2003; Kerr, Smyth, & McDowell, 2003).

Treatment Participants

Because precision teaching is a method of evaluating and increasing the effectiveness of existing programs rather than a specific treatment, it can be used to benefit a diverse range of learners. In the past, precision teaching has been used with individuals with autism and other disabilities and neurotypical and gifted children and adults (Merbitz et al., 2004a).

Precision teaching may be especially useful for increasing the efficacy of treatment programs for individuals with autism. Individuals with autism are heterogeneous in both their needs and response to intervention. Precision teaching's systematic, daily assessments and charting mean that the instructor is continually aware of the learner's progress and can advance or change the individual learner's program as soon as the need arises (Kerr et al., 2003; Merbitz, Vieitez, Merbitz, & Binder, 2004b). Further, these individuals with autism often fail to maintain the learned behaviors over time or apply them to different settings. Precision teaching's emphasis on fluency (see section "Treatment Procedures" for more detail) addresses these common issues (Kubina, Morrison, & Lee, 2002).

It has been suggested that it may be particularly important to use precision teaching with lower-functioning individuals (Merbitz et al., 2004b). By definition, these individuals are further behind their peers and are especially in need of effective instruction if they are to reach the normative level of achievement. More information is needed to identify individual characteristics associated with rate of learner progress.

Treatment Procedures

Precision teaching is an ongoing process of goal setting, assessment, charting, and program modification. The goals, assessments, charts, and program decisions are generally developed and completed by one or more instructors. However, when those receiving the treatment are able, they may assess and chart their own progress and contribute to the goal setting and program decisions (Lindsley, 1992). Precision teaching requires that each individual learner has their own goals, assessments, and charts, but has been implemented to whole classes or treatment groups (Lindsley, 1992). The main components of precision teaching (pinpointing, counting, and charting) are described below.

Pinpointing

Pinpointing refers to the identification of the targeted behavior. Regardless of the program goal, the instructor should identify an active and observable behavior that can be assessed to monitor learner progress (Binder & Watkins, 1990; Kerr et al., 2003). For example, if a program is intended to increase a learner's addition skills, an appropriate measure would be the number of problems the learner correctly answers in 1 min. In other cases, the measureable behavior may be less obvious. For instance, the instructor may be trying to increase a learner's silent reading. The instructor cannot directly measure how many words a learner reads silently and will have to develop a less direct behavioral measure. The instructor may ask the learner to answer questions to determine his or her comprehension of the silently read passage (White, 1986).

In pinpointing the targeted behavior, the instructor must select a learning channel. The learning channel refers to the type of instruction the individual receives and the type of response he or she is expected to demonstrate (Kerr et al., 2003). For example, an individual's program intended to increase the learner's vocabulary could use a hear/give or see/say learning channel. The learning channel hear/give could involve the instructor saying a word and the individual giving the instructor the corresponding picture, while the learning channel see/say would involve the instructor showing the individual the picture and the individual verbally labeling it. Other learning channels include hear/do, hear/say, see/do, and see/match (Fabrizio & Moors, 2003; Kerr et al., 2003).

These different learning channels allow teachers to select the learning channel that best facilitates a particular individual's learning style. This may be especially relevant to the development of effective programs for individuals with autism, who do not always have the speech or academic skills required to say or write answers (Kerr et al., 2003).

Once the learning channel is established, the instructor must define the program goal and the correct and incorrect responses. Because of precision teaching's emphasis on fluency (see section "Goals and Objectives"), goals are stated as a frequency aim (i.e., the number of correct responses within a unit of time) that is likely to lead to skill application, maintenance, and generalization. Researchers have compiled a database of frequency aims that have been associated with retention, endurance, stability, and application across a range of skills for individuals with autism (Fabrizio & Moors, 2003). Although there is individual variability, instructors can consult this and other databases when developing frequency aims.

Counting

Progress is monitored by counting demonstrated behavior. The instructor selects a teaching strategy and a teaching time (e.g., discrete trial training for 15 min a day) and an assessment period (e.g., 1 min). The learner receives the instruction and then participates in an assessment. During the assessment period, the learner is given the opportunity to demonstrate the targeted behavior, and the instructor counts the number of correct and incorrect responses. Unlike traditional percent correct measures, counting the number of correct and incorrect responses allows the instructor to determine the accuracy and frequency of response.

Charting

Instructors monitor learner progress with standard celeration charts, which have days along the x-axis and frequency counts along the y-axis. In other words, a change from 10 to 20 correct responses looks the same as the change from 20 to 40. Each day, the instructor marks the number of correct and incorrect responses demonstrated during the assessment period.

On standard celeration charts, the frequency count axis is scaled to show changes in the rate of progress instead of number of responses. This means that a change of 10–20 will look the same as a change of 20–40 because the individual has doubled their performance in both cases (Kubina, Morrison, & Lee, 2002).

Regularly charting learner performance in this way provides teachers with a clear picture of learner learning. If the chart shows a steep and steady rate of learning, the instructor can conclude that the existing program is sufficient. However, if the individual's progress flattens or will not allow the individual to meet his or her goal by the established timeline, the instructor should modify the program to better facilitate learning. Lindsley recommended that the instructors review the charts weekly and make these instructional decisions weekly (Lindsley, 1992).

Efficacy Information

There is evidence that precision teaching increases learner progress with typical, low-performing, and disabled students. A series of studies conducted in Great Falls, Montana, found that typical and low-performing elementary and high school students who were taught with precision teaching tend to make more progress and score higher on measures of math and writing skills than assigned or matched control groups (White, 1986).

Other studies have examined the use of precision teaching with individuals with mild, moderate, and severe learning disabilities. In one, all participating teachers were taught to use PT procedures and data-based decision rules. Findings indicated that teachers who used these teaching and decision-making strategies were more likely to implement effective teaching strategies on their first attempt. Further, 97% of the teachers reported that precision teaching facilitated student progress (White, 1986). Another study assigned students with disabilities to receive traditional teaching strategies or a less intensive precision-teaching program. More students who received the precision-teaching instruction scored above the 25% percentile on tests of phonic skill and sight-word

vocabulary than those who received the traditional instruction (White, 1986).

Less research has examined the effectiveness of precision teaching with individuals with autism. There are a number of case studies indicating that individuals with autism do make progress and meet set goals when their instructors use precision-teaching strategies. However, more extensive and methodologically rigorous research is needed to determine the extent to which precision teaching increases the progress of children with autism.

Outcome Measurement

Individual performance is measured via frequent assessments (Lindsley, 1992). These assessments are specific to the targeted skill (e.g., if the targeted skill is labeling objects, the assessment will only measure the learner's labeling of objects). Data from each are charted on the previously described standard celeration charts and provide a graphic representation of the learner's learning (see section "Treatment Procedures" for more detail). For more general indicators of learner progress, instructors can use validated and appropriate assessment tools.

Qualifications of Treatment Providers

Precision teaching can be utilized by general and special education teachers, clinicians, paraprofessionals, or any other individual attempting to teach skills. There are a number of resources available to individuals interested in learning and implementing precision teaching, including treatment manuals, workshops, and fluency databases (e.g., Fabrizio & Moors, 2003; Lindsley, 1992). There are no training, credentials, or licensure requirements for individuals implementing precision teaching.

See Also

- ▶ Behavioral Assessment
- ▶ Behaviorism
- ▶ Education
- ▶ Educational Interventions

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Predictive Value of Screening Measures

Michele Villalobos
The Edward Zigler Center in Child Development and Social Policy, Yale Child Study Center, New Haven, CT, USA

Definition

The predictive value of a screening instrument refers to the accuracy of a screening measure.

It measures whether an individual actually has a disease. The predictive value can be positive or negative. A positive predictive value (PPV) refers to the percentage of people who screen positive for the condition who actually have the condition. Whereas, the negative predictive value (NPV) is the percentage of people who screen negative for the condition and do not have the condition. The predictive value of screening instruments is determined by sensitivity, specificity, and prevalence of a condition.

See Also

- ▶ Prevalence
- ▶ Sensitivity and Specificity

Prefrontal Cortex

Susan Y. Bookheimer
Department of Psychiatry and Biobehavioral Sciences, UCLA School of Medicine, Los Angeles, CA, USA

Definition

The term "prefrontal cortex" refers to the part of the brain's frontal lobe that lies in front of the primary motor cortex and the areas immediately anterior to motor regions, called premotor cortex. The functions of the prefrontal cortex are vast but include the higher cognitive processes such as planning, decision-making, working memory, cognitive control, and response inhibition. These sophisticated brain functions are often called the "executive functions" reflecting the high level decision-making processes performed here. In humans, the prefrontal cortex is more highly developed in all other animals and constitutes the major brain differences between human and nonhuman primates. Damage to the prefrontal cortex will cause many cognitive, behavioral, and personality changes including impulsivity, difficulty in controlling and regulating emotion, problems making good decisions and integrating information, difficulty in organizing information, planning activities, keeping information in one's mind, generating new thoughts and ideas, flexibility in thinking and behaving, difficulty retrieving information from memory, and problems in time awareness and future directedness. Thus, the prefrontal cortex is often thought of as the part of the brain that makes us most human.

See Also

- ▶ Executive Function (EF)
- ▶ Frontal Lobe Findings in Autism

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Prelinguistic Autism Diagnostic Observation Schedule

Rhiannon Luyster
Department of Communication Sciences and Disorders, Emerson College, Boston, MA, USA

Synonyms

PL-ADOS

Description

The PL-ADOS (DiLavore, Lord, & Rutter, 1995) is a semistructured evaluation of play, social interaction, and communication skills in young children suspected of having an autism spectrum disorder. It was designed to generate a social context in which behaviors relevant for a diagnosis of ASD may be observed in a clinical setting.

The PL-ADOS is intended for children under the chronological age of 6 years and under the developmental age of 3 years; it is aimed specifically toward children who are not yet using phrase speech. It includes 12 activities with 17 accompanying activity ratings along with 31 overall codes. There is an algorithm that includes a subset of codes and generates a binary classification (autism, non-spectrum) based on DSM-IV and ICD-10 criteria. Administration takes approximately 30 minutes and can be completed in a professional's office or playroom, although a caregiver is present. Codes are completed immediately after administration and are based on all behaviors during the administration. Scores on each code generally range from 0 to 2, with higher scores indicating greater abnormality.

Historical Background

The PL-ADOS was developed at a time when early diagnosis of ASD was an emerging field of study. Existing instruments, which were largely intended for older individuals, offered insufficient sensitivity for young nonverbal populations. The ADOS had proved to be a useful instrument to aid in the diagnostic process, and the PL-ADOS modified the ADOS for children with limited language skills. The tasks and administration were adapted to reduce the need for language skills and to make them more suitable for developmentally and chronologically younger children. Moreover, additional activities were created that addressed known areas of difficulty for young children with autism.

Psychometric Data

Instrument development involved both validity and reliability studies. The validity study included 21 children with autism and 42 children with non-autism developmental disorders (21 in a 3-year-old group and another 21 in a 2-year-old group). Nine of 17 activity ratings showed a group effect, successfully discriminating the autism sample from both groups with developmental disorders. The remaining items distinguished the group with autism from only one of the comparison samples or did not differ across group at all. Similar analyses on 31 overall summary codes revealed that the autism sample differed from both comparison samples on all items but five (*overall level of language, tantrums and aggression, functional play, imagination/creativity, showing*). However, the autism sample differed from the 3-year-old comparison sample on the latter three items. As expected, the group of children with autism had a higher average score on all items than the comparison samples.

An algorithm was generated by selecting items that met theoretical and empirical thresholds for optimal group classification. Algorithm items were grouped into two categories: social interaction/communication and restricted, repetitive behaviors. Algorithm items in each category were summed, yielding two separate algorithm scores. Cutoff scores were then selected based on maximal sensitivity and specificity, with a final cutoff of 12 in social interaction/communication and a cutoff of 2 in restricted, repetitive behaviors.

The reliability study included a subsample of 20 children, 12 with autism, 4 with non-autism developmental disorders, and 4 typically developing children. Interrater reliability was evaluated using weighted kappas; weighted kappas of .60 or greater were considered to indicate acceptable reliability (Cicchetti & Sparrow, 1981). A subsample of 20 children was included in these analyses; item ratings (associated with particular activities) on the PL-ADOS yielded weighted kappas between .63 and .95, while weighted kappas for the 31 overall codes ranged from .60 to 1.00.

Clinical Uses

The PL-ADOS was developed as a research measure and was not sold as a widely available clinical measure. It was eventually subsumed by ADOS (including the Module 1 and Toddler Module), which is currently offered for clinical and research use.

See Also

- ▶ Autism Diagnostic Observation Schedule
- ▶ Autism Diagnostic Observation Schedule (ADOS): Toddler Module

References and Readings

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Prelinguistic Communication

- ▶ Preverbal Communication

Prelinguistic Communication Assessment

Andrea McDuffie
M.I.N.D. Institute, Sacramento, CA, USA

Definition

Both theory and research focused on the early development of spoken language suggest an important causal relationship between prelinguistic or preverbal communication skills and the later emergence of the ability to communicate through spoken language. Thus, assessing the types of preverbal communication acts that a child with autism may use and the situations in which the child is most likely or motivated to communicate has become an important component of comprehensive assessments for young children with autism. Prelinguistic communication refers to a group of behaviors that children use, prior to the emergence of first words, to direct the attention and actions of other people. This category of behaviors is sometimes referred to as "joint attention" or "social communication" with behaviors in this category emerging between 9 and 14 months in typically developing children. Specifically, prelinguistic communication behaviors consist of a combination of gestures (shows, gives, reaches, points), eye gaze, and vocalizations which are used purposefully by children to send a message to a communicative partner. Thus, these behaviors are often referred to as preverbal "intentional communication." Prelinguistic communication behaviors are used to convey two primary pragmatic functions: to comment on actions and events in the environment and to request an instrumental response from the communicative partner. These two prelinguistic functions often are termed "initiating joint attention" and "initiating behavioral regulation." The latter behavior also is referred to as "requesting." One additional behavior that often is included within the umbrella category of joint attention skills as well as included in assessments measuring prelinguistic communication is termed "attention-following" or "responding to joint attention (RJA)." This behavior refers to the child's ability to follow into the attentional focus of a communicative partner by responding to cues such as the adult's point, head turns, and direction of eye gaze. Thus, there are some prelinguistic communication skills which the young child uses to initiate interaction with a social partner and some skills which are used to respond to the partner's overtures to the child. For children with autism, research has indicated that children's spontaneous use of prelinguistic communication behaviors are positive predictors of later language outcomes and may present an area of special challenge; that is, children with autism may initiate preverbal communication acts and respond to the adult's attentional directives at lower rates than their typically developing peers. In addition, children with autism are likely to use a higher proportion of communicative

initiations that serve as requests than they are to use initiations which function to comment or share attention with a social partner.

Historical Background

Many research studies conducted since the 1980s have examined and characterized the prelinguistic communication of preschool-aged children with autism. This research has indicated that children with autism most frequently communicate for purposes of behavior regulation and less frequently communicate to share attention and/or affect with another person. Children with autism who have mental ages under 20 months also show deficits in responding to the attentional directives of other people. Response to joint attention at the pretreatment period also has been shown to be a moderator of the relation between the amount of intervention received by young children with autism and language gains 1 year later for a group of preschool-aged children with autism. Indeed, a deficit in joint attention is considered by many to be a core feature of ASD. Because the ability to initiate and respond to joint attention precedes the emergence of single-word spoken language in typical development, a deficit in joint attention may be considered a core impairment for young children with autism. In addition to characterizing deficits in social communication for young children with autism, other studies have detected robust associations between early prelinguistic communication behaviors and later language for these children. Theoretically, deficits in prelinguistic communication skills may impact language learning in several ways. One theory posits that prelinguistic initiations are foundational because they represent the child's motivation to engage in the kinds of shared interactions with social partners that support the development of socially transmitted skills. Once children develop expertise in initiating to social partners prelinguistically, they need only map spoken words onto the communicative functions they already possess. Another theory suggests that children who direct prelinguistic initiations will elicit language facilitating verbal input from responsive social partners, thus supporting language growth. Finally, theory suggests that children who are able to respond to the attentional directives of others will be more successful in learning language incidentally from the interactions of those around them and less likely to require explicit instruction to learn to speak. All of these theoretical approaches provide a rationale for understanding the emergence of prelinguistic communication skills in young children with autism and targeting these skills in interventions aimed at increasing early language development.

Current Knowledge

The background of research focusing on prelinguistic communication behaviors highlights the importance of assessing prelinguistic communication skills whether for diagnostic or intervention purposes. To this end, several instruments have been constructed to provide this type of information. The most common method of assessing prelinguistic communication skills is by collecting a sample of these behaviors during an interaction with an examiner. The Early Social Communication Scales (ESCS) and the Communication and Symbolic Behavior Scales (CSBS) are two such instruments including activities that press for initiating joint attention, behavior regulation, and responding joint attention. Module 1 of the Autism Diagnostic Observation Schedule (ADOS) also includes activities designed to elicit prelinguistic communication skills (such as initiating joint attention, reaching, giving, and attention-following). Module 2 of the ADOS includes activities designed to sample attention-following as well as conventional, instrumental, and informational gestures that are used communicatively. In addition to tests which sample prelinguistic skills in an interactive format, parent report also is used to measure these behaviors; the words and gestures subscale of the MacArthur-Bates Communicative

Development Inventory includes a section that queries the child's use of communicative gestures. Prelinguistic communication skills also have been included in measures developed for early autism screening. The Modified Checklist for Autism in Toddlers (MCHAT), for example, has an item querying the parent as to whether the child ever points or shows items to them or if the child can respond to the parent's point. The Screening Test for Autism in Two-Year-Olds (STAT) includes items that assess the child's ability to request using eye gaze and vocalization, and to direct attention.

Future Directions

Careful and accurate assessment of the prelinguistic communication skills of young children with autism will contribute to a more nuanced characterization of trajectories of development for these children. In addition, future studies should continue to examine whether interventions targeting early prelinguistic communication skills can improve spoken language outcomes for children with autism relative to interventions that exclusively target spoken language goals. Finally, assessment of early prelinguistic communication skills may be informative to studies examining aptitude by treatment interactions. It may be that children with different profiles of prelinguistic communication skills would differentially benefit from different intervention approaches.

See Also

- ▶ Joint Attention
- ▶ Preverbal Communication
- ▶ RJA/IJA (Initiating/Responding to Joint Attention)

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Prelinguistic Sounds

- ▶ Vocalization

Preliteracy

► Emergent Literacy

Premack Principle

Erin E. Barton
University of Colorado Denver, Denver, CO, USA

Synonyms

Grandma's rule

Definition

The Premack principle is a principle of reinforcement which states that an opportunity to engage in more probable behaviors (or activities) will reinforce less probable behaviors (or activities). For example, if a child enjoys playing computer games (more probable) and avoids completing math problems (less probable), we might allow her to play the computer after (contingent upon) completing 15 math problems. Prior to the introduction of the Premack principle, systems of reinforcement were viewed as the contingency between a stimulus and behavior. The Premack principle expanded the existing reinforcement contingency of stimulus behavior to include contingencies between two behaviors. This principle is often referred to as "grandma's rule" because grandmothers (or any caregivers) often apply this principle: "you have to eat your vegetables (less probable) before you can have dessert (more probable)" or "you have to clean your room (less probable) before you can go outside and play (more probable)." In these example, the highly preferred (or probable) activity is used as reinforcement for the less preferred (or probable) activity. David Premack demonstrated this principle with Cebus monkeys and humans, including young children. For example, Premack and his colleagues demonstrated the power of the Premack principle by showing high-probability activities (i.e., playing pinball or eating candy) can be effective reinforcement for low-probability activities, but only if the child prefers the high-probability activity. In this study, highly preferred activities were effective as reinforcers for less preferred behaviors. This study also highlighted the concept that reinforcers are relative and defined in relation to the behaviors they reinforce. For example, eating candy functioned as reinforcement for playing pinball only for children who preferred eating candy to pinball. Conversely, playing pinball functioned as reinforcement for eating only for children who preferred pinball to candy.

See Also

► Reinforcement
► Reinforcer

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Pre-post Design

► Qualitative Versus Quantitative Approaches

Pre-post-Posttest Design

► Qualitative Versus Quantitative Approaches

Preschool

Kathy Lawton[1] and Connie Kasari[2]
[1]Special Education & Nisonger Center, The Ohio State University, Columbus, OH, USA
[2]Graduate School of Education and Information Studies and the Semel Institute, University of California, Los Angeles, Los Angeles, CA, USA

Definition

Preschools are mandated to provide free and appropriate educational programming to children with autism. The communication, social/emotional, and cognitive delays that children with autism often display qualify them to receive a range of services under Parts B and C of the Individuals with Disabilities Education Act (Stahmer & Mandell, 2007). Parts C and B of IDEA require states to provide individualized educational programming to children with disabilities (P.L. 108-446, 2004).

A large number of children with autism attend preschool (Department of Education, 2006). In 2006, 35,081 preschoolers with autism received individualized educational programming as a result of their autism diagnosis (Department of Education, 2006). Most studies report the number of preschoolers served under the autism label is increasing (Bitterman, Daley, Misra, Carlson, & Markowitz, 2008; Department of Education, 2006; White, Scahill, Klin, Koenig, & Volkmar, 2007).

Standard preschool practices do not currently seem to optimize the development of preschoolers with autism. Many public preschool teachers report that they do not use "scientifically based" or "evidence-based" strategies (Hess, Morrier, Heffin, & Ivey, 2008; Stahmer, Collings, & Palinkas, 2005; Stahmer et al., 2007). In one study, less than 10% of the strategies public school teachers reported using were scientifically based and 33% of the strategies had a limited evidence base (Hess et al., 2008). The most common strategies that public preschool teachers reported using were floor time, incidental teaching, visual schedules, social stories, sensory integration, and music therapy. In a similar study, approximately 33% of the strategies that preschool teachers reported using were evidence based and teachers acknowledged that there was no research regarding 30% of the strategies they used (Stahmer et al., 2005). The most common intervention techniques were applied behavior analysis, floor time, occupational therapy, PECS, sign language, and social stories.

Preschoolers with autism exhibit characteristic impairments in communication and social skills (DSM-IV, 1994). Currently, most preschools do not effectively improve upon the communication and social skill deficits of children with autism. Teachers infrequently use validated strategies to promote the social communication of young children with autism. For example, despite that research suggests it is important to respond to the communicative gestures of children with autism (Smith, Adamson, & Bakeman, 1988), preschool teachers tend to respond to very few communicative gestures of young children with autism (Keen, Sigafoos, & Woodyatt, 2005; Wong, 2006). When teachers do respond to the communication of children with autism, they typically do not respond in ways that will facilitate better social communication (McCathren, 2000). Likewise, although children with autism benefit when adults use joint attention gestures (Smith et al., 1988), teachers of children with autism use few joint attention and behavior regulation gestures (McCathren, 2000). Similarly, teachers of children with autism typically prompt for verbal communication much less than is recommended for children who are typically developing or developmentally delayed (Chiang, 2009).

Preschool teachers also spend relatively little time engaging in pretend play with children who are typically developing or who have autism (Kontos & Keyes, 1999; Wong, 2006). This reality is troubling because pretend play is believed to be an important component of early childhood autism interventions targeting communication and social skill (Charman et al., 2003). Some contend that preschool programs devote less attention to pretend play than previous decades for several reasons: teachers failing to recognize

the importance of play, teachers not knowing how to teach play, class schedules that do not allow time to properly play, as well as greater emphasis upon academic standards (Malone & Langone, 1999).

There have been some peer-reviewed publications of preschool interventions targeting the communication and social skill deficits of young children with autism. Most of the experimental interventions report significant improvement in child performance, though they are overwhelmingly plagued by methodological weaknesses. Common shortcomings include a weak experimental design, lack of detail regarding participants, too little information regarding the subjects and experimental treatment, failure to include independent coders and/or assessors, as well as improper data analyses. Future work must correct these weaknesses so that public preschools become a context where the communication and social skill deficits of young children with autism can be effectively improved.

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Preschool Curricula

Connie Wong[1] and Lauren Turner Brown[2]
[1]FPG Child Development Institute, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA
[2]Department of Psychology, Carolina Institute for Developmental Disabilities, CB #3367 University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

Definition

Preschool curriculum provides a guide for *what* to teach young children. Usually organized in

a developmental sequence, preschool curriculum traditionally refers to the content of what is taught, which can be comprehensive or focus on specific domains. For children with autism, preschool curriculum typically addresses the following target areas: social-communication skills, problem behaviors, sensory and motor skills, pre-academic skills, and adaptive behavior.

Beyond content, preschool curriculum can also include assessment procedures for setting goals and monitoring progress as well as intervention strategies for guiding *how* to teach young children. Practitioners working with young children with autism can follow a published preschool curriculum or draw from multiple sources to design a more specific curriculum.

Curriculum Design/Selection

Autism is a spectrum disorder in which there is a great deal of heterogeneity. Therefore, curricular decisions must be individualized for young children with autism as well as their families. Following is a brief summary of issues to consider when selecting and adapting preschool curriculum for young children with autism.

Target Early Core Characteristics of Autism

In designing or selecting curriculum for a young child with autism, the child's skills must be considered in relation to the early core characteristics of autism: social-communication and repetitive behavior or restricted interests. Specifically, young children with autism have difficulty with engagement, joint attention, and symbolic play, all of which affect learning and development (Kasari, Paparella, Freeman, & Jahromi, 2008).

Engagement. If a child is not purposefully engaged in activities or interactions, the opportunities for learning are dramatically reduced (Iovannone, Dunlap, Huber, & Kincaid, 2003). In addition to active engagement, an important curricular goal for young children with autism is to increase the amount of time children with autism are *jointly* engaged in activities while shifting their attention between the activity and their interaction partners (Kasari, Gulsrud, Wong, Kwon, & Locke, 2010).

Joint Attention. Joint attention refers to the ability to shift attention between objects or events and other people in order to share interest and plays an important role in language development (Loveland & Landry, 1986). Specific skills include pointing and showing with coordinated joint looks which involves a child looking at a target object, then making eye contact with another person, and then back to the target object. For example, to share interest about a toy, a child may be looking at the toy, then glance up to look at the caregiver, and then look back at the toy. Compared to typically developing children and children with intellectual disabilities matched on mental age, children with autism have specific deficits in initiating and responding to joint attention (Mundy, Sigman, Ungerer, & Sherman, 1986). Children with autism are more likely to use pointing and attention skills to regulate others' behaviors rather than to share interest.

Symbolic Play. Symbolic or pretend play involves the representation of objects as something else. Children typically progress developmentally from playing with toys functionally, such as in constructive and manipulative play, to playing with toys symbolically (Lifter, Sulzer-Azaroff, Anderson, & Cowdery, 1993). However, in comparison to typically developing peers, children with autism at the same mental ages have significant delays in the development of symbolic play (Jarrold, Boucher, & Smith, 1993). Children with autism tend to manipulate toys or objects in a rigid or stereotyped manner rather than spontaneously initiate creative symbolic play activities (Libby, Powell, Messer, & Jordan, 1998).

Functionality

In addition to targeting the early core characteristics of autism, a well-designed preschool curriculum for young children with autism must also include content that serves a functional purpose for the child (Schertz, Wong, & Odom, 2010). It is critical to focus on skills that are required for the child to be functional in a less restrictive or natural environment. For example, reducing aggressive behaviors and tantrums will allow the child to engage socially with others and,

thus, may serve a more functional purpose than being able to color a picture within the lines.

Generalizability. A key concept regarding functionality is generalizability. Generalizing refers to extending what has been learned in one context to new and different contexts. Care must be taken so that children with autism can perform particular acts beyond the specific setting and manner they were taught. For curricular goals to be truly functional, they should have meaning in the child's everyday activities. Therefore, preschool curriculum must extend beyond interactions with only one person, setting, and/or activity. Furthermore, because generalizing may be particularly difficult for young children with autism, learning may be more meaningful and effective when specific skills are taught in natural settings.

Developmentally Appropriate

Preschool curricula are usually organized in a developmental sequence beginning with more basic skills and leading to more complex skills within a domain. In deciding where to begin within a curriculum, the individual goals or targets for the young child with autism must be developmentally appropriate, meaning that they are just above the child's level (zone of proximal development; Vygotsky, 1978). Content that is too easy may not be stimulating enough while content that is too difficulty may lead to frustration. Therefore, it is important to target a child's emerging skills and then guide or scaffold the child to master that skill.

Socially and Culturally Relevant

Finally, preschool curriculum needs to be socially and culturally relevant to children with autism, their families, and their communities. In addition to considering developmental level, the curriculum and materials must also reflect what is socially appropriate for the child's age (age appropriateness; Schertz et al., 2010). Although children with autism often show an uneven pattern of development, it is important to note the general characteristics of typically developing preschool-aged children in the community. While strengths and special interests should be nurtured and integrated within a child's curriculum, especially to help increase skills in areas of weakness, special attention must be paid to social norms in order to better facilitate independent functioning in natural environments. Indeed, in preschool, play is the natural setting for learning and interacting with others. The involvement of a professional familiar with typically developing preschoolers (e.g., preschool teacher) is essential to validating social relevance.

Even more critical is the inclusion of the family in determining social and cultural relevance. Input from the family will determine the curricular goals that are most valued and should be prioritized. It is the responsibility of the professionals to provide information to the families to help empower them to make informed decisions and make their preferences known.

Curriculum materials that reflect children's cultural and ethnic backgrounds will also promote generalization and positive ethnic identity (Hall, 2009).

Assessment

Many of the issues identified previously in designing and/or selecting preschool curriculum require extensive knowledge of the individual child with autism, thereby requiring assessments in order to appropriately individualize preschool curriculum. Assessment is a process of collecting information in order to make decisions. In this case, assessment of a child is needed to provide data for making decisions about what to teach the child with autism. This process is important initially for deciding upon the curriculum and then adapting the curriculum as appropriate in order to monitor progress on an ongoing process (Schertz et al., 2010). The most helpful type of assessments for curricular decisions is usually curriculum-based assessments.

Curriculum-based assessments (also known as criterion-referenced tests) include a list of skills and behaviors (usually linked to a specific curriculum) that can be measured and recorded. To be useful, the assessment measure must be sensitive to changes. Performance on these objectives is scored which provides information on the

child's mastered and emerging skills. In this way, a developmentally appropriate curriculum can be specified for the individual child with autism. The skills are then measured at regular intervals in order to track progress with objectives. This monitoring provides data to determine if curricular content and sequence and/or intervention strategies need to be modified. Most published preschool curriculum guides will include a curriculum-based assessment that parallels the curriculum content.

Intervention

Although the strict definition of preschool curriculum only refers to the *content* of what is taught, many published curricula today often include intervention strategies that guide *how* to teach the specified skills and behaviors. Intervention guidelines may range from providing a general approach or practices to offering specific activities and materials for facilitating the target skills. Although interventions within a curriculum may be based off of different theoretical models, it is imperative to acknowledge the same key issues for making curricular decisions: targeting the early core characteristics of autism and ensuring functionality, developmental appropriateness, and social and cultural relevance.

Commonly Used Preschool Curricula

Published preschool curricula that can be used for young children with autism include those designed for typically developing children, children with special needs, and specifically for autism. Following is a brief description of commonly used published curricula for preschoolers with autism. This list is presented in alphabetical order and is not intended to be comprehensive:

- *Assessment, Evaluation, Programming System for Infants and Children, Second Edition* (AEPS; Bricker, 2002). The AEPS is a 4-volume set of assessment and curriculum materials for use with young children at birth through age 6. Assessment and curriculum items are organized into six key domains: social, social-communication, fine motor, gross motor, adaptive, and cognitive.
- *Assessment of Basic Language and Learning Skills-Revised* (ABLLS-R; Partington, 2006). The ABLLS-R includes a curriculum-based assessment, curriculum guide, and skills tracking system for use with children with autism or other developmental disabilities between the ages of 3 and 9. With a particular emphasis on language skills, the ABLLS-R also includes information for developing an Individualized Education Program (IEP) for the child.
- *The Carolina Curriculum for Preschoolers with Special Needs, Second Edition* (CCPSN; Johnson-Martin, Hacker, & Attermeier, 2004). The CCPSN is designed for assessing and teaching children with mild to severe special needs from 2 to 5 years' developmental age. Organized into 22 teaching sequences spanning five developmental domains, each curricular item includes suggested teaching procedures, materials, routine integration strategies, and sensorimotor adaptations.
- *The Creative Curriculum for Preschool, Fourth Edition* (Dodge, Colker, & Heroman, 2006) provides suggestions for arranging educational environment so that goals and objectives can be embedded within a daily schedule while balancing both teacher-directed and child-initiated learning. The Creative Curriculum includes an assessment instrument as well as specific intervention strategies.
- *Hawaii Early Learning Profile 3–6* (HELP 3–6; Teaford, Wheat, & Baker, 2010). HELP 3–6 is a family-centered, comprehensive, and developmentally sequenced curriculum-based assessment that also offers play-based activities and intervention strategies for the behaviors and skills. Covering 622 skills in six domains, HELP 3–6 is designed for typically developing children as well as children who may have developmental delays.
- *More Than Words* (Sussman, 1999). Drawn from *More Than Words – The Hanen Program for Parents of Children with Autism Spectrum Disorder*, this resource book was developed by speech-language pathologists and provides practical, research-based strategies using everyday activities and includes charts and checklists. Designed for parents, *More Than*

Words specifically focuses on promoting communication and social skills in children with autism spectrum disorder.

- *The SCERTS Model: A Comprehensive Educational Approach for Children with Autism Spectrum Disorders* (Prizant, Wetherby, Rubin, Laurent, & Rydell, 2006). The SCERTS model stands for social-communication, emotional regulation, and transactional supports to improve the communication and social-emotional abilities in individuals with autism spectrum disorders. This resource includes two volumes: Volume I targets assessment and Volume 2 targets program planning and intervention.
- *Selecting Teaching Programs* (Taylor & McDonough, 1996, chapter in Maurice, Green, & Luce (Eds.), *Behavioral intervention for young children with autism: A manual for parents and professionals*). This chapter provides detailed teaching programs and a simple curriculum guide for implementing a behavioral program for children with autism.
- *Teaching Individuals with Developmental Delays: Basic Intervention Techniques* (Lovaas, 2003). Guided by a behavioral approach and targeted towards the education of individuals with autism, this book provides detailed descriptions of current programs within the following sections: basic concepts, transition to treatment, early learning concepts, expressive language, strategies for visual learners, and programmatic consideration.
- *A Work in Progress: Behavior Management Strategies and a Curriculum for Intensive Behavioral Treatment of Autism* (Leaf & McEachin, 1999). A Work in Progress is a comprehensive and detailed curriculum guide that presents behaviorally based intervention strategies for families and/or professionals working with children with autism.
- *The Ziggurat Model – A Framework for Designing Comprehensive Interventions for Individuals with High-Functioning Autism and Asperger Syndrome* (Aspy & Grossman, 2011). The Ziggurat Model provides a process for designing interventions for individuals with autism spectrum disorder. Included in the book is the Underlying Characteristics Checklist for Early Intervention which identifies characteristics associated with autism across multiple domains.

Historical Background

Although Public Law 94–142 gave students with disabilities the right to a free and appropriate public education in 1975, it was not until 1986 when those provisions were extended to preschool-aged children with disabilities (P.L. 99–857). Additionally, while autism was first described in 1943, autism was not added as a distinct federal disability category until 1990 (P.L. 101–476). Paralleling the recognition of autism as a separate category is the rising prevalence of autism. In the 1980s, prevalence rates for autism were estimated to be between 2 and 5 per 10,000. The Centers for Disease Control and Prevention (2009) now report current prevalence rates to be 1 in 110 (Schertz et al., 2010). Furthermore, while symptoms of autism appear before the age of 3, diagnosis often occurred later. However, with the broadening of the autism diagnostic criteria, greater public awareness of autism, and improved screening and diagnostic assessment tools and procedures, the majority of children with autism are diagnosed during the preschool years (Howlin & Moore, 1997; Wiggins, Baio, & Rice, 2006). In fact, the U.S. Department of Education, Special Education Programs and Data Analysis System (2007) reported that 35,081 preschoolers received special education services under the autism category in 2006.

Different theoretical models of intervention have guided the development of distinct curriculum for children with autism (Olley, 1999). Specific intervention for children with autism began in the 1970s with the structured teaching approach that has now become the TEACCH program and the applied behavioral approach (Schertz et al., 2010). Developmental approaches produced curricula based upon typical developmental sequences of learning (Mirenda & Donnellan, 1987), while behavioral approaches

tended to target eliminating or reducing interfering behaviors while promoting more positive behaviors. Current preschool curriculum for children with autism tends to provide a more integrated approach and now includes content for each of the major developmental domains. However, specific emphasis may be given to communication, social skills, and reduction of interfering behaviors, consistent with the core symptoms of autism. At this time, there are no national curricular standards for educating young children with autism (Olley, 1999).

Rationale or Underlying Theory

Children with autism who participate in preschool programs with curriculum that targets core domains of impairment tend to have improved outcome and prognosis than those who do not. Curriculum provides a guide for systematic intervention. Regardless of intervention approach, the critical factor seems to be providing instruction that is thoughtfully planned and systematically delivered (Schertz et al., 2010). According to Iovannone, Dunlap, Huber and Kincaid (2003) "Systematic instruction involves carefully planning for instruction by identifying valid educational goals, carefully, outlining instructional procedures for teaching, implementing the instructional procedures, evaluating the effectiveness of the teaching procedures, and adjusting instruction based on data." (pp. 157). Therefore, preschool curriculum plays a critical role in the education of young children with autism in being linked systematically with assessment and intervention.

Treatment Participants

The preschool years are typically defined as ages 3–5. In the United States, local school systems provide education for children with special needs beginning at age 3, while Part C early intervention programs provide services under age 3.

Individuals responsible for preschool curriculum planning will include all members of the instructional or Individualized Educational Planning (IEP) team. This team includes family members and an intervention specialist or teacher as well as other specific service providers such as a speech-language pathologist, occupational therapist, adaptive physical education teacher, physical therapist, and/or school psychologist. A general education teacher can arrange for adaptations and supports needed for access to the general preschool curriculum as well as to promote successful inclusion with typically developing peers. Autism specialists may also be included to help the team design curriculum for young children with autism (Hall, 2009).

Efficacy Information

Although research shows that intervention at young ages can improve developmental outcomes and trajectories for children with autism (National Research Council, 2001), there is less consensus regarding specific intervention approaches. As a result of this controversy, the importance of curriculum has been overlooked in the literature (Olley, 1999). Therefore, at this time, there is no standard curriculum for young children with autism as no single curriculum has been show to be universally effective.

Overall, because of the focus on intervention and establishing evidence-based practices, little research has been conducted on determining what is important to teach and the sequence in which content should be taught. Reviews of the literature have identified domains of functioning that warrant intervention, strategies often used to target those domains, and a brief description of existing programs (Dawson & Osterling, 1997; National Research Council, 2001; Odom, Boyd, Hall, & Hume, 2010). Indeed, there have been many well-designed studies evaluating intervention programs with well-developed curricula but few have evaluated the curriculum guides themselves. Research findings typically address outcomes as a result of the entire treatment package which address both content and intervention strategy, thus making it difficult to

determine the specific effects of the curricular component versus the instructional component (Olley, 1999).

Future research should look more closely at preschool curriculum to determine the scope and sequence of skills in order to determine the content most critical for young children with autism to learn for promoting later development.

See Also

- ▶ Curriculum
- ▶ Education
- ▶ PL94-142
- ▶ Preschool

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Preschool Language Scale-IV

Megan Lyons
Laboratory of Developmental Communication Disorders, Yale Child Study Center, New Haven, CT, USA

Synonyms

PLS-5

Description

The Preschool Language Scale-Fifth Edition (PLS-5) was developed to identify language disorders or delay in children from birth to 7.11 years of age. Item responses are obtained through a combination of direct testing, observation of spontaneous interactions, and through caregiver report. It is comprised of two subscales: auditory comprehension and expressive communication. Areas covered in the receptive and expressive subscales include attention, play, gestures, vocabulary development, language structure, concept development, social communication, integrative language skills, phonological awareness, and emergent literacy. Standard scores, percentile ranks, and age equivalents are derived for each subscale as well as an overall total language score. It also provides three supplemental assessments: language sample checklist, articulation screener, and caregiver questionnaire. Criterion scores are derived for the articulation screener for children 2 years 6 months to 7 years 11 months.

Historical Background

The Preschool Language Scale was first developed in 1969 as a measure of language development in young children. It was revised several times, and in 1992, the PLS-3 was published using normative data for standard scores and percentile ranks; the PLS-IV appeared in 2002, with a Spanish language version. The PLS-V, published in 2011, is the latest edition, which also includes a Spanish version.

Psychometric Data

From 45 states in the USA, 1,400 children participated in the standardization normative sample, collected in more than 45 states in the United States. The standardization sample matches US Census figures (March 2008 update) for region, race/ethnicity, and level of caregiver education. Norms are reported for 3-month intervals for children from birth to 11 months and 6-month intervals for ages 12 months to 7 years 11 months. Clinical studies include a developmental delay study and three language disorder studies

(children with receptive language disorder, expressive language disorder, and both receptive and expressive disorder); case studies include children identified as high risk (environmental risk) and children identified with autism. Multiple reviews for bias were conducted throughout the test development. Nationally recognized experts in assessment and bias issues conducted a thorough review of test items and art. An additional sample of African American and Hispanic children were tested to conduct the statistical analysis of bias. Split-half reliabilities range from .80 to .97. Sensitivity for the total language score is .83; specificity is .80.

Clinical Uses

It may be administered by a variety of qualified users such as speech-language pathologists, early childhood specialists, and psychologists as well as professionals trained to administer the assessment. Paraprofessionals may also administer the assessment; however, it should be scored and interpreted by experienced professionals. The purpose of the assessment is to identify delays in expressive and/or receptive language development.

See Also

- ▶ Expressive Language
- ▶ Receptive Language

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Present Level of Growth or Knowledge

- ▶ Annual Review

Pressure/Squeeze Machine

Winifred Schultz-Krohn
Department of Occupational Therapy, San José State University, San José, CA, USA

Definition

The squeeze machine, otherwise known as Grandin's Hug Machine, is a device that allows self-administered deep pressure along the sides of the body. This device was developed by Temple Grandin, a woman who has autism, to reduce her level of anxiety and arousal. The machine allows an individual to be positioned prone in the machine with the head supported outside of the machine, which looks like a large box. The box is open on each end with your head and forearms out one end and your lower legs out the other end. The individual is then able to control and grade the amount of pressure using a switch. An investigation using two groups of children, all diagnosed with autism, demonstrated the effectiveness of using Grandin's Hug Machine to decrease the level of arousal measured by galvanic skin response and the level of anxiety measured by the Connors Parent Rating Scale. Children who used Grandin's Hug Machine twice a week for 6 weeks displayed reduction in the level of arousal and reduced anxiety using these measures and when compared to children who were positioned in the Hug Machine but without the availability of receiving the deep pressure.

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Presupposition

Megan Lyons
Laboratory of Developmental Communication Disorders, Yale Child Study Center, New Haven, CT, USA

Synonyms

Theory of mind

Definition

Presupposition is an aspect of pragmatic or social language use. It entails an implicit assumption about the background knowledge relating to an utterance whose truth is taken for granted in discourse. A presupposition must be mutually known or assumed by the speaker and listener for the utterance to be considered appropriate in context. Example of presupposition includes:

- Jim no longer teaches children with ASD.
  - Presupposition: Jim once taught children with ASD.

Presuppositional knowledge allows speakers to provide the correct amount of information necessary to get their message across to a listener. For example, it is not necessary to say "Jim once taught children with ASD. Jim no longer teaches children with ASD." The second sentence presupposes the first, so the first does not need to be stated explicitly.

Many individuals with ASD have difficulty with presuppositional knowledge. They may provide too much or too little information because they have difficulty taking into account what their listener can reasonably be expected to know. For example, a speaker with ASD may start a conversation by saying, "WOW is my favorite game," without determining whether it is reasonable to expect that the listener will know that WOW refers to World of Warcraft. Difficulties in the use of presuppositonal knowledge can result in communication breakdowns and affect others' perceptions of the speaker and their willingness to engage in conversation with him. Presuppositional skills are closely related to the "theory of mind" skills that are thought to be impaired in individuals with ASD.

See Also

▶ Pragmatic Language
▶ Theory of Mind

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Pretend Play

▶ Play

Pretense

▶ Imagination

Prevalence

Lisa Croen
Autism Research Program, Kaiser Permanente Division of Research, Oakland, CA, USA

Synonyms

Period prevalence; Point prevalence

Definition

Prevalence is the percent of persons in a population with a certain condition. Prevalence combines both preexisting cases and incident cases together to form a numerator, which is then divided by the total population being studied. Like incidence, prevalence must be calculated for a specified time frame. If that time frame spans a broad range of time (i.e., a year, 10 years, etc.), then prevalence over that time frame is referred to as a "period prevalence." If the time frame is relatively short, then the prevalence measure is often called "point prevalence."

An example of when point prevalence would be measured would be visiting a clinic and counting the number of children with and without ASD on that day. Cases of ASD could be children who were diagnosed with ASD on that day, as well as children who had been previously diagnosed. Point prevalence is often compared to a photograph: data are collected all at once (or over a brief time period), and the majority of cases are preexisting cases, as there is little to no time for incident cases to occur. Period prevalence, on the other hand, has a broader time frame for measurement of preexisting and new cases, which may allow more new cases of disease to develop. An example of period prevalence could involve following the children in the prior example for a year. Those who were diagnosed with ASD within that year would be combined with children with prior ASD diagnoses to form a numerator, and the denominator would be the total number of children being followed in the cohort.

See Also

▶ Incidence

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Preverbal Communication

Andrea McDuffie
M.I.N.D. Institute, Sacramento, CA, USA

Synonyms

Early social communication; Prelinguistic communication

Definition

The term "preverbal communication" describes a group of social communication behaviors that are used to send an intentional, or purposeful, message to a communicative partner. Rather than being verbal in form (i.e., composed of words or word combinations), preverbal communication acts consist of some combination of eye gaze, gesture, and/or vocalization. The core feature of a preverbal communication act is that the child purposefully directs this behavior toward a communicative partner. Preverbal communication acts can take the form of conventional gestures such as showing, giving, open-handed reaching, pointing, nodding or shaking the head, and waving. Leading the adult by the hand toward a desired item also is a common preverbal communication strategy observed in children with autism. The most common pragmatic functions of preverbal communication acts are commenting and requesting.

See Also

- ▶ RJA/IJA (Initiating/Responding to Joint Attention)

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Primacy Effects

Rhea Paul[1] and Deborah Weiss[2]
[1]Department of Speech-Language Pathology, College of Health Professions, Sacred Heart University, Fairfield, CT, USA
[2]Department of Communication Disorders, Southern Connecticut State University, New Haven, CT, USA

Synonyms

Cognitive bias; Recency effect; Serial position effect

Definition

Primacy effect is the tendency to remember the first few things presented when given a list of items to recall. An individual will also have a tendency to assume that those things presented at the beginning of a list are of greater importance than those presented in the middle of end of the list. The first item or first few items may be transferred to long-term memory by the time of recall, while items at the end of the list are still in short-term memory. This has implications for learning, memorizing information, and making selections.

This effect was first described by Asch (1946) when he requested that participants judge a person based upon a list of descriptive attributes. Two lists, containing identical positive and negative descriptors, were presented. In one instance, the positive descriptors were presented at the beginning of the list, and in the other instance, the negative descriptors were presented at the beginning of the list. Those participants who were presented with the list of positive descriptors first rated the person more highly than those participants who were presented with the list of negative descriptors first.

See Also

- ▶ Recency Effect
- ▶ Short-Term Memory

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Primary Motor Cortex

► Precentral Gyrus

Primary Sensory Areas

Susan Y. Bookheimer
Department of Psychiatry and Biobehavioral Sciences, UCLA School of Medicine, Los Angeles, CA, USA

Synonyms

Auditory cortex; Somatosensory cortex; Visual cortex

Definition

Areas of the cerebral cortex that receive the first signals from sensory receptors are called primary sensory areas. These areas are separate for each sensory modality, but the major primary sensory regions are those for vision, hearing, and sensation.

Vision: Primary visual cortex lies in the lingual gyrus of the occipital lobe on both sides of the calcarine sulcus. Histologically termed Brodmann's area 17, primary visual cortex is organized topographically, such that each part of the cortex represents a specific part of one's visual field.

Hearing: Primary auditory cortex lies along the upper bank of the temporal lobe in the transverse temporal gyri, also termed Heschl's gyrus. Histologically, the neurons comprising primary auditory cortex (A1) are labeled Brodmann's areas 41 and 42. Auditory information from both ears is processed in both the right and left hemispheres, and the organization is tonotopic: Different areas of cortex respond preferentially to different sound frequencies.

Sensation: The brain region that processes tactile sensations is called primary somatosensory cortex. Located on the postcentral gyrus in the parietal lobe just behind motor cortex in Brodmann's areas 2, 1, and 3, the "sensory strip" has a topographic representation in the form of a homunculus, with exaggerated representations of sensitive areas such as the hands, lips, tongue, and genitals.

See Also

► Auditory Cortex
► Visual Cortex

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Primary Visual Cortex

► Visual Cortex

Primate Prosocial Behaviors

Alicia Melis[1] and Felix Warneken[2]
[1]Department of Developmental and Comparative Psychology, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany
[2]Department of Psychology, Harvard University, Cambridge, MA, USA

Definition

Cooperation: Umbrella term for social interactions among conspecifics which provide a benefit

to another individual (recipient) or to both the actor and the recipient. Cooperative behaviors thus comprise both altruistic and mutualistic interactions (Melis & Semmann, 2010).

Altruistic or investing behaviors: Social behaviors in which only the recipient obtains immediate benefits, and actors' motivation is to intervene toward the recipient's goal or need (Warneken & Melis, 2012).

Collaborative behaviors: Mutually beneficial behaviors in which two or more individuals coordinate their actions to produce outcomes from which both individuals benefit immediately, such as obtaining a common resource or producing an effect that one individual would not be able to produce on her or his own (Warneken & Melis, 2012).

Historical Background

Human cooperative behavior exceeds that of all other species with regard to the scale and range of cooperative activities. Specifically, how did humans become so collaborative and skilled at maintaining cooperation in large groups of unrelated individuals? Which cooperation skills do we share with other species and which are unique to humans? Comparative studies of humans and chimpanzees as well as bonobos as our two closest living primate relatives can help us to identify those cooperative skills that already characterized the last common ancestor and those derived skills unique to the human lineage.

For a long time, natural observations have accumulated evidence that nonhuman primates behave cooperatively across many different contexts such as food sharing, allo-maternal care, territorial and predator defense, grooming, coalitionary support and aggression, and cooperative hunting (Kappeler & van Schaik, 2006). However, it is only in the last decade that experimental studies have started to investigate the psychological mechanisms that underlie these cooperative behaviors.

Here, we will focus mainly on the experimental work conducted with chimpanzees and bonobos, since they are our closest living evolutionary relatives, and a significant body of empirical evidence has accumulated in recent years, occasionally even allowing direct comparisons between humans and mainly chimpanzees.

Current Knowledge

We will first summarize the available evidence for altruistic behaviors in chimpanzees, focusing on both food-sharing behavior and instrumental helping. Altruistic behaviors are particularly interesting from a motivational point of view, since individuals act on behalf of others, without obtaining any immediate benefit from it, and potentially incurring serious costs. Although altruistic behaviors in humans are often maintained via reciprocation, there is no good evidence suggesting that nonhuman primates understand the long-term benefits of alternating favors or that they engage in altruistic behavior motivated by the prospect of a future selfish reward. From a cognitive point of view, altruistic behaviors require that individuals attend to and can infer what others need or desire.

Second, we will summarize the current knowledge on chimpanzees' and bonobos' ability to collaboratively solve problems. Collaborative behaviors are from a motivational perspective easier to explain, since individuals should be generally selfishly motivated to collaborate (unless they can free-ride profiting from the work of others without making any effort themselves, as in large-scale forms of cooperation). The challenge of collaborative behaviors is instead cognitive, since individuals need to understand how the different roles are interrelated with each other and how best to coordinate their behavior to that of the partner(s) in order to achieve the joint goal.

Altruistic Behaviors in Chimpanzees

Natural observations show that chimpanzees occasionally act on behalf of others. Interestingly, the beneficiaries of these helping acts are not just the helper's relatives, as is mostly the case among other nonhuman primates, but also nonrelatives (Langergraber, Mitani, & Vigilant, 2007). Several anecdotal reports have shown that

chimpanzees occasionally assist others, as is the case of the chimpanzee who rescued another nonrelated female from drowning in the moat of their enclosure (Fouts & Mills, 1997) or the reported cases of adoptions by chimpanzee males (Boesch, Bolé, Eckhardt, & Boesch, 2010). In addition, there is evidence that chimpanzees regularly engage in behaviors such as food sharing, coalitionary support, and consolation (e.g., Boesch & Boesch-Achermann, 2000; de Waal & Aureli, 1996; Muller & Mitani, 2005). However, the difficulty with many of these observations is that it is not always possible to rule out a selfish motivation behind actors' actions, since often these behaviors also lead to immediate benefits for the actors. For example, food-sharing behavior has also been explained by the "harassment" or "sharing-under-pressure" hypothesis (Gilby, 2006). According to this hypothesis, chimpanzees share meat after group hunts not out of a concern for the welfare of others and to fulfill the others' needs and desires, but they share under duress. That is, beggars' insisting behavior interferes with the possessor's ability to feed and/or increases the risk that the possessor will get injured if beggars become increasingly aggressive. Therefore, individuals are better off if they give a piece to the beggars and can then continue feeding alone.

Experimental studies that present chimpanzees with situations in which subjects can potentially share resources and help others – at the same time that helpers' selfish gains can be ruled out – are starting to reveal chimpanzees' ability and propensity to act on behalf of others, as well as the circumstances under which these tendencies are expressed.

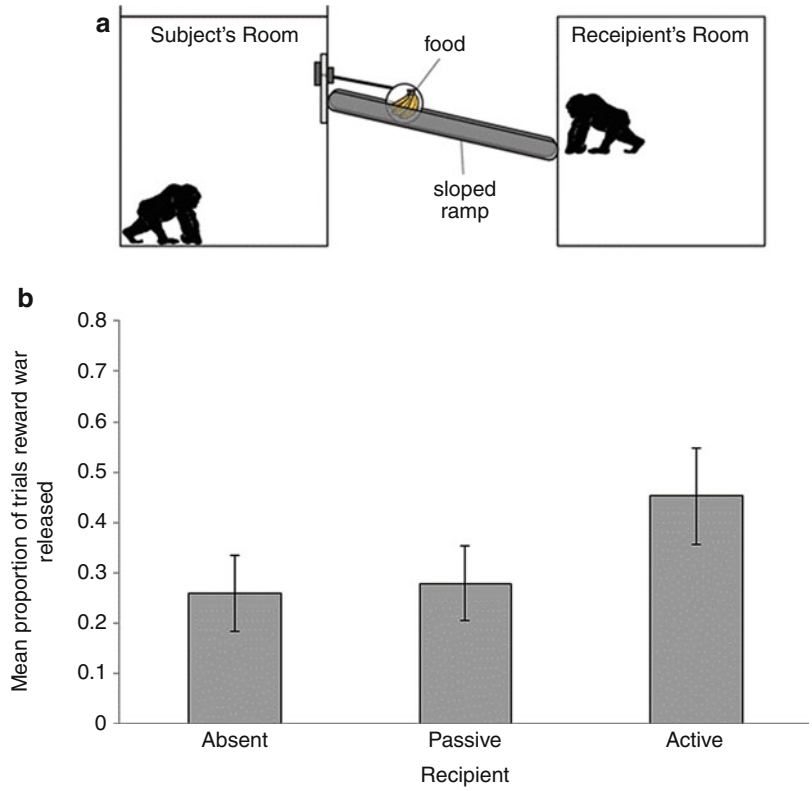
Food Sharing in Chimpanzees

Food sharing is an important aspect in the social life of chimpanzees. It occurs regularly and more often than among other nonhuman primate species (with the exception of the Callitrichidae, one family of New World monkeys). Characteristic of chimpanzee food sharing (in particular meat sharing after hunting monkeys or other mammals) is that it occurs not only among mother-offspring dyads but also between unrelated individuals of different age and sex classes. Typically, chimpanzee food sharing is mostly "passive": food possessors tolerate beggars taking food from them. In general, very few instances of active sharing are observed, not even among mother-offspring pairs (Boesch & Boesch, 1989; Ueno & Matsuzawa, 2004). This suggests the possibility that food donors share to avoid being harassed by the beggars (Gilby, 2006) and are not truly motivated to share food with others.

Several experimental studies investigating chimpanzees' propensity to provide food rewards to conspecifics have come to the same conclusion. The main method employed in these studies was to let chimpanzees choose between an option that would deliver a food piece to themselves and another food piece to a conspecific (mutualistic option) or an option that would deliver food only to themselves (selfish option). In all these studies chimpanzees chose randomly between the two options, even if the mutualistic choice would come at no cost to themselves. As chimpanzees did not deliver food to their partner, the general conclusion from these studies was that chimpanzees are indifferent to the welfare of their partners (Jensen, Hare, Call, & Tomasello, 2006; Silk et al., 2005; Vonk et al., 2008; Yamamoto & Tanaka, 2010).

However, in a recent study chimpanzees did actively provide food to others (Melis et al., 2011). In this experimental setup, rather than choosing between a mutualistic and a selfish outcome, chimpanzees could help a conspecific obtain food that was out of reach by letting it slide down a ramp toward the recipient (see Fig. 1). The potential helper could never obtain the reward herself. Results showed that subjects released the food when the partner was actively communicating his goal by trying to get at the food or getting the helper's attention. This suggests that as long as partners actively signal their goals and/or desires, and the altruistic act does not interfere with the actor's selfish goals, there are situations in which chimpanzees are willing to provide food to others.

Importantly, active provision of food seems to occur only if the opportunity to monopolize



Primate Prosocial Behaviors,
Fig. 1 Experimental setup and main results of Melis et al. (2011): (**a**) subjects can help a conspecific by releasing a peg that stops a bag with food from sliding down the ramp; (**b**) subjects released the bag significantly more often when the recipient communicated his goal ("active") than when he was passive or was not in the room

resources is removed. These results thus do not challenge the conclusion that our nearest living primate relatives are not particularly inclined to actively share resources with others when they could have it for themselves (e.g., Warneken & Tomasello, 2009).

Instrumental Helping in Chimpanzees

A series of recent experimental studies have shown that under certain circumstances chimpanzees act on others' behalf assisting them to achieve their goals. This has been called "instrumental" or "targeted" helping (Warneken & Tomasello, 2006). Warneken and Tomasello (2006) found that human-raised chimpanzees helped their human caregiver by handing her objects she was unsuccessfully reaching for even in the absence of an external reward. Moreover, a further study by Warneken, Hare, Melis, Hanus, & Tomasello, 2007, showed that a group of semi-free ranging chimpanzees also helped by handing the out-of-reach object to a human who had not interacted with them before the experiment. The chimpanzees did so irrespective of being rewarded and when they had to actively climb toward the out-of-reach object (Warneken et al., 2007, Experiment 2). This shows that chimpanzees are willing and able to help human strangers obtain objects, even when helping is made effortful and they receive no immediate benefit for themselves.

However, the most ecologically valid question is whether chimpanzees would help other chimpanzees. This has now been demonstrated in three additional experimental paradigms. First, Warneken et al. (2007, Experiment 3, Melis, Hare, & Tomasello, 2008) created a novel situation in which chimpanzees could help an unrelated conspecific to enter a room with food by releasing a chain that was blocking the door. Chimpanzees released the chain significantly more often when the recipient was unsuccessfully trying to enter the room, than in control conditions in which releasing the chain would either not help the recipient (because he was trying to go somewhere else) or no recipient

was present. Probably, recipients' unsuccessful attempts to open the door provided the subjects with the necessary cues to help them detect the recipients' goal.

In a second paradigm by Yamamoto and colleagues (2009), chimpanzees altruistically helped a conspecific partner by transferring a tool the other needed to access food. This occurred almost exclusively in situations preceded by recipients' communicative cues, such as reaching for the tool (e.g., arm poking) or getting the potential helper's attention (e.g., clapping hands, looking at helper). Chimpanzees virtually never handed over the tool proactively without such a cue, providing further evidence for the notion that recipient cues are critical to elicit helping.

In a third paradigm (Melis et al., 2011), the subject could release a bag with a reward so that it would slide down a ramp toward a recipient. Chimpanzees released the bag more often when the recipient was actively trying to access the reward (e.g., by pulling a rope attached to the bag) or communicate toward the potential helper than when the recipient remained passive. Thus, the main factor predicting helping was again the communicative cues (intentional or not) of the recipient.

This series of studies show that under certain circumstances, chimpanzees act on behalf of others by helping them to achieve their goals, even if it involves accessing food. However, as in the case of food sharing, they seem to engage in instrumental helping in a (re)active rather than proactive way (Melis, Warneken, & Hare, 2010; Warneken & Tomasello, 2008). That is, in all these cases helping was preceded by the recipients' cues or communicative signals toward their goals. One possible explanation is that they might lack some cognitive skills necessary to infer what others need or desire in the absence of such communicative signals. This hypothesis finds further support in the results of comparable studies with children.

Specifically, when Brownell and colleagues (Brownell, Svetlova, & Nichols, 2009) adapted the apparatus designed by Silk et al. (2005) for children, they found that 18-month-old children (like chimpanzees) chose randomly between a purely selfish and a mutualistic option. Interestingly, 25-month-old children chose the mutualistic option that rewarded both themselves and the recipient, but only in a condition in which the recipient had verbalized her desire for the food. This suggests that in certain situations explicit communication from the recipient is critical to elicit sharing behaviors, and that a child's failure might not be necessarily due to a lack of motivation, but due to the lack of social-cognitive skills.

Further evidence for the role of social-cognitive skills in helping others comes from three other studies. Although 14-month-old children already show spontaneous, unrewarded helping behavior in simple situations such as handing over out-of-reach objects, they do not help in other type of tasks which might be more complex in terms of the goal-structure and type of intervention necessary to help fulfill the other person's goals and needs. However, throughout their second year of life and after their second birthday, children become increasingly skilled at inferring what others want or need and intervene in a wider range of situations (Warneken & Tomasello, 2006, 2007; Svetlova, Nichols, & Brownell, 2010). Therefore, chimpanzees, similar to human children younger than two, might be constrained in helping contexts not due to a lack of motivation to act on the others' behalf but due to an inability to infer the others' needs and desires in the absence of very salient cues.

Collaborative Interactions

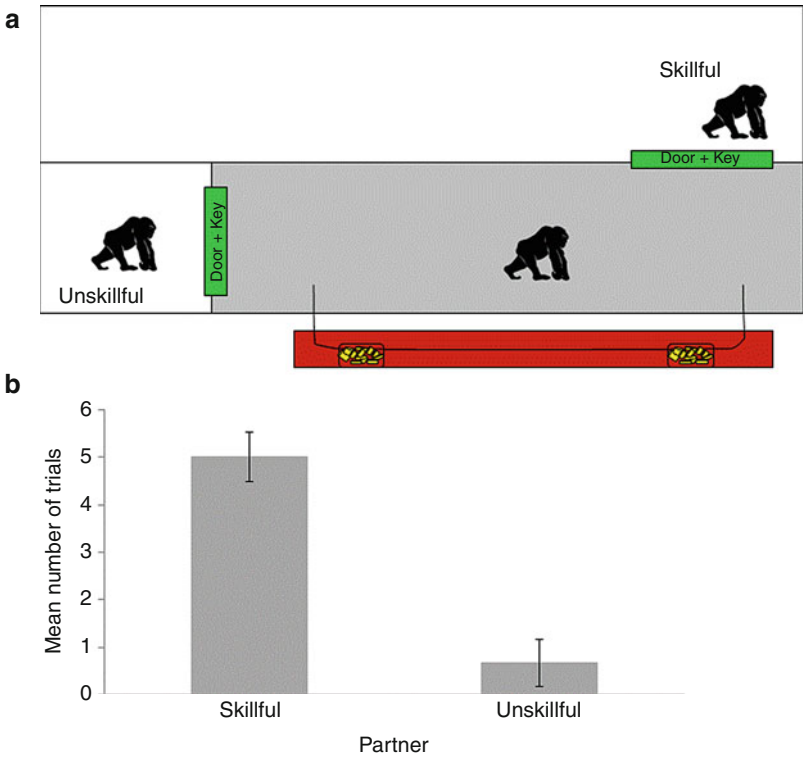
In this entry, we review cooperative behavior in which two or more individuals coordinate their behavior to produce outcomes from which all individuals can benefit. Chimpanzees coalitionary support in inter- and intragroup aggressive encounters or cooperative hunts are only some of the examples in which individuals work together to achieve something that is mutually beneficial (Muller & Mitani, 2005; Boesch & Boesch, 1989). Thus, the motivational basis of collaboration can be totally selfish: agents should be willing to collaborate if the only possibility to achieve an otherwise unobtainable goal is to work together. However, from a cognitive perspective, the question arises to what extent individuals are

able to identify the opportunity to combine efforts with a partner, using different behavioral and communicative means to guarantee successful coordinated actions. Furthermore, in the case of group-level collaboration, temptations for defection arise, and thus cognitive capacities to select trustworthy partners and avoid cheaters are key to maintain collaboration. Thus, differences in the cognitive skills across species might in part explain the differences observed in the flexibility with which species engage in mutualistic collaboration.

Pioneering experiments on chimpanzees found only very limited collaboration skills. Chimpanzees mostly failed to retrieve food rewards when collaboration was required (Crawford, 1937; Chalmeau, 1994; Povinelli & O'Neill, 2000; see Melis et al., 2010 for more details on these initial studies). One interpretation of these results was that cognitive constraints prevented individuals from coordinating actions with the partner (e.g., Povinelli & O'Neill, 2000). However, research conducted with other primate species suggested that successful cooperation might not only require a certain level of social cognition, but also tolerance between potential cooperative partners (e.g., Tonkean macaques: Petit, Desportes, & Thierry, 1992; capuchin monkeys: de Waal & Davis, 2003). Furthermore, a study by Chalmeau and colleagues showed that the cooperative behavior of their chimpanzees was limited by social constraints on the subordinates (Chalmeau, 1994). Specifically, the most dominant individual monopolized the apparatus, thereby preventing others from potentially cooperating. This suggested that in cooperative problem-solving experiments, chimpanzees treated the situation as a competitive one, and that low levels of social tolerance could be affecting chimpanzees' ability to cooperate with others – especially in food retrieval contexts.

Building upon these findings, Melis and colleagues (Melis, Hare, & Tomasello, 2006a) systematically varied tolerance levels by pairing individuals either with a low-tolerance or a high-tolerance partner. Pairs of chimpanzees were presented with an out-of-reach baited tray, which required that they both pull simultaneously (see Fig. 2a). Strikingly, when subjects were paired with partners they could not share food with; they never succeeded in pulling the tray. This was even the case when the food rewards on the tray were in two separated dishes and thus each individual had a fair chance to obtain food. However, all subjects immediately succeeded when they were paired with a tolerant partner they could share food and co-feed with. However, when food items were clumped in one position and could thus be easily monopolized, chimpanzee cooperation started falling apart. Interestingly, this does not appear to be the case with bonobos, who succeed in the same pulling task equally often whether the rewards are clumped in one location or dispersed (Melis et al., 2006a; Hare, Melis, Woods, Hastings, & Wrangham, 2007). When the same study was conducted with 3-year-old human peers, results showed that peers collaborate and share at very high levels even when rewards are clumped, suggesting that tolerance constraints in children are not as severe as among chimpanzees (Warneken, Lohse, Melis, & Tomasello, 2011). The results of these studies suggest that we differ from chimpanzees but share with bonobos a more social tolerant nature over food (see also Hare & Kwetuenda, 2010).

Taken together, these studies show that under the right circumstances, chimpanzees are able to work together toward mutualistic outcomes. But what level of understanding do chimpanzees bring to the situation? In other words, do individuals intentionally coordinate their actions with those of their partner or is success the by-product of uncoordinated individual efforts? In Melis, Hare and Tomasello (2006b) most individuals learned within a few trials to wait for each other in the plank-pull task, delaying their own pulling of the rope until the partner was in position. The task required true synchronization, because otherwise the rope slipped out of the apparatus. In addition, in a more difficult version of the test, individuals could choose to recruit a partner by opening a door for the other to enter the testing area. Subjects recruited the partner significantly more often when the task required cooperation than when the task could be solved individually,



Primate Prosocial Behaviors,

Fig. 2 Experimental setup and results of Experiment 2 of Melis et al. (2006b): (**a**) subjects were given the choice between recruiting a skillful and an unskillful collaborative partner. Subjects needed a partner to pull within reach the baited tray. (**b**) Subjects preferentially recruited the skillful partner

showing an understanding of the role of their partner to succeed. Furthermore, when given the choice between two different collaborative partners, they preferentially recruited the more skillful one (See Fig. 2). Taken together, these results demonstrate that chimpanzee cooperation is not just the by-product of independent individual actions that happen to converge, but that individuals do intentionally coordinate their behavior with that of a partner and choose collaboration as a means to reach goals they cannot achieve individually.

Tomasello, Carpenter, Call, Behne and Moll (2005) proposed that human collaboration differs fundamentally from chimpanzee collaboration because the former is based upon shared intentions. Shared intentionality is characterized not only by cognitive skills that allow individuals to coordinate actions in pursuit of the shared goal, but by a unique motivation and commitment to collaborate with each other in pursuit of that goal. Studies with children have operationalized this motivation and commitment to collaborate in different ways. For example, if among two collaborating partners one individual stops performing her role, individuals will try to communicatively reengage the partner (Ross & Lollis, 1987; Warneken, Chen, & Tomasello, 2006). Furthermore, children are more likely to reengage the partner if she has previously expressed the commitment to collaborate ("Let's play together"), which suggests that they treat the other person as an agent with intentions to collaborate or not, and not just as a social tool (Gräfenhain, Behne, Carpenter, & Tomasello, 2009). Second, Hamann and colleagues (2012) have found that children are not only committed to engage in a collaborative task until one individual is successful, but that there is actually a mutual commitment to ensure that the partner also reaches her goal. In this study pairs of children worked jointly lifting a bar so that each kid could access her own reward. When one of the kids was able to access her reward before the second one could access hers, 3-year-olds (but not 2-year-olds) were more likely to provide

support so that the partner could also access hers, and they did this more than in a control condition without prior collaboration. This indicates that 3-year-olds appreciate the commitment for mutual support that characterizes collaboration. Last but not least, children seem to enjoy the collaborative activity in and of itself since they insist on the social nature of the game, reengaging a social partner even when the other person's involvement is not necessary for the child to succeed with the game (Warneken, Gräfenhain, & Tomasello, 2012).

Recent studies with chimpanzees do not seem to suggest that chimpanzees' collaborative interactions are based upon joint intentions. Rather, the data so far is rather consistent with the hypothesis that chimpanzees view their partner as a social tool to reach their own individual goals. Specifically, one study by Warneken et al. (2006) used an "interruption method" with human children and chimpanzees: a human experimenter who had previously worked successfully on a mutualistic task stopped playing her role during certain predetermined interruption periods. Chimpanzees consistently attempted to solve the task by their own means or disengaged completely from the task, and never produced any communicative signals to influence their partner's behavior. However, in the same study children regularly employed different communicative means to reengage the partner. An experiment with conspecific dyads provided similar results, as subjects did not communicate with a recalcitrant conspecific partner (Hirata & Fuwa, 2007).

Second, Greenberg and colleagues, using a method similar to Hamann, Warneken and Tomasello (2012), investigated whether chimpanzees appreciate the commitment for mutual support that characterizes collaboration (Greenberg, Hamann, Warneken, & Tomasello, 2010). This study investigated whether partners in a collaborative activity are mutually committed to ensure that both partners succeed in obtaining their goal. Specifically, in a variation of the plank-pull task, two chimpanzees had to pull together to access food rewards. In a collaborative condition, both chimpanzees pulled a board with two rewards, but one "lucky" individual was able to access the reward before the partner could access his. In a non-collaboration condition, one individual could retrieve the reward without prior collaboration ("lucky"), whereas the "unlucky" chimpanzee needed the other's help to pull the board to the end. Interestingly, results showed that the "lucky" individual helped the "unlucky" individual in approximately a third of trials by jointly pulling the board with her toward the end, even though she had already accessed hers and she would not receive any further reward for pulling to the end. However, this help was provided equally often in both the collaborative and the non-collaborative condition. Thus, chimpanzees were willing to help the other chimpanzee, but in contrast to human children, collaboration did not seem to enhance helping.

Last but not least, even if chimpanzees are willing and able to join efforts when the situation requires it, they do not seem particularly motivated to act together with a partner unless this is the only way to access their goal. In another study which also used the plank-pull task chimpanzees were given the choice between working either individually or collaboratively with a tolerant partner (with both options resulting in equal payoffs for the subjects). Chimpanzees preferably chose the nonsocial option and only shifted their preference to the social-collaborative option when the payoffs of this latter option were higher. This shows that chimpanzees are strategic and cognizant of their collaborative options, but do not seem to be particularly inclined to collaborate with others (Bullinger, Melis, & Tomasello, 2011).

Taken together, the results from these different studies suggest that chimpanzees are able to engage in quite sophisticated mutualistic collaborative activities, including an understanding of when a partner is needed and which partner might best be suited to solve a mutualistic task. However, the current evidence supports the hypothesis that they view their partner as a social tool rather than forming "joint" goals with him and developing joint intentions and a commitment to pursue that goal.

Future Directions

- What enforcing mechanisms sustain altruistic and collaborative behaviors in nonhuman apes?
- To what extent do empathy and sympathy play a role in the observed altruistic behaviors of chimpanzees?
- What are the similarities and differences in the cooperative behaviors of chimpanzees and bonobos as our two closest living primate relatives?

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Primitive Reflexes

Annelies de Bildt[1], George M. Anderson[2] and Ruud Minderaa[3]
[1]Child and Adolescent Psychiatry, University Medical Center Groningen, Groningen, The Netherlands
[2]Laboratory of Developmental Neurochemistry, Yale Child Study Center, Yale University, New Haven, CT, USA
[3]Department of Psychiatry, University of Groningen, University Medical Center Groningen, Accare, Groningen, The Netherlands

Synonyms

Innate reflexes

Definition

Primitive reflexes are patterns of movement that are evoked by specific sensory input. They are complex, automatic movements controlled by the brainstem that can be seen as early as the 25th week of gestation. The primitive reflexes are considered a normal part of infant movement (Zafeiriou, 2004). The primitive reflexes include the Moro (a distinctive startle response), the walking/stepping, the rooting, the sucking, the tonic neck (arm straightening in response to turning of the head), the palmar grasp, the plantar or Babinski (toe curling when the sole of the foot is stimulated), the Galant (sideward flexing of the back toward stimulation), the swimming, and the

Babkin (head and facial responses to pressure to both palms) reflexes. During the first year of life, the reflexes typically disappear or are more difficult to elicit and their persistence or appearance after infancy is thought to be due to reduced inhibition of brainstem reflexes by the cortex and subcortical regions. Primitive reflexes in older children and adults have been associated with severe neurological problems including cerebral palsy, acquired brain damage, and stroke (Go et al., 2008).

Primitive reflexes, including the snout, sucking, grasp, and rooting reflexes, have been studied in children and young adults with autism (Minderaa et al., 1985; De Bildt et al., 2012). Two thirds of the individuals with autism and none of the control subjects displayed the visual rooting reflex (VRR) to a waving reflex hammer. Neurologists and developmentalists have thoroughly studied the rooting reflexes (Ingram, 1962), and they are defined as an orientation toward touch in the area around the mouth region or toward visual stimulation near the face (Schott & Rossor, 2003). Although termed a primitive reflex, the VRR has not been described in infants. Rather, most prior reports of the VRR have to do with assessing its presence in adults with various types of neurological dysfunction (Turner & Schon, 2006). Further research is needed to characterize more completely the presence and persistence of primitive reflexes in autism and related disorders.

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Princeton Child Development Institute (PCDI)

Susan Hepburn
Department of Psychiatry & Pediatrics, JFK Partners, University of Colorado at Denver, Aurora, CO, USA

Definition

The Princeton Child Development Institute (PCDI) is a research-based intervention program for persons with autism of all ages. Located in Princeton, New Jersey, the PCDI is a private, nonprofit organization which collaborates with the New Jersey Department of Education and the Division of Developmental Disabilities to provide a variety of programs, including early intervention, accredited preschool- and school-aged programs, residential services, and adult skill-building programs. Training, dissemination, outreach, and intervention science are integrated within the professional activities of PCDI. Faculty of the institute maintain academic affiliations with Queens College of the City University of New York, the University of Kansas, and the University of North Texas, enabling PCDI to serve as a training site for professionals in the field of developmental disabilities and intervention science.

Historical Background

The PCDI was founded in 1970 by Peggy W. Pulleyn and Pamela Machold. Both women were family members of a young boy with autism and were frustrated by the lack of evidence-based

intervention available in their community. Committed to providing educational programs that were based in applied behavior analysis, the institute established the first community-based program to serve children with autism in the state of New Jersey. In 1975, two leaders in the field of applied behavior analysis – Patricia J. Krantz, Ph.D. and Lynn E. McClannahan, Ph.D. – became codirectors of the Institute and worked to expand its mission to include parent support and education, home-based intervention, and unique residential programs with a "family-like" atmosphere for young people with autism. Under the current leadership of Edward C. Fenske, Ed.S. and Gregory MacDuff, Ph.D., programs based on the PCDI model are growing both nationally and internationally.

Rationale or Underlying Theory

The PCDI provides interventions that are based on the principles of applied behavior analysis (ABA). Data-based instruction, systematic teaching approaches, opportunities for frequent practice of new skills, and active engagement of the learner in highly motivating learning opportunities are the cornerstones of this educational approach. Teaching is dynamic, with close monitoring of the learner's behaviors so that quick adaptation of teaching techniques, settings, prompts, and reinforcement schedules encourages continual educational progress. A family-focused approach to care is foundational to practice and outreach efforts are directed towards community awareness and integration for persons with autism.

Goals and Objectives

The mission statement of the PCDI (as stated in their website at www.pcdi.org/AboutUs/index.asp, accessed February 21, 2011) is: "The mission of the Princeton Child Development Institute is to provide effective science-based intervention for children and adults with autism and, through research and dissemination, to extend treatment resources to people with autism, both nationally and internationally."

Treatment Participants

Individuals with autism across the age range (and their family members) participate in services provided by the PCDI. Toddlers (i.e., children younger than 2 years of age) can access home-based and/or center-based services. Preschool-aged children and those in elementary and secondary schools receive educational programming through a collaboration with the New Jersey Department of Education. Adults can participate in supported employment and life skills educational programs provided by PCDI and funded by the New Jersey Division of Developmental Disabilities. PCDI currently operates the Family Focus Residential Programs, which provide family-style group home supports to persons with autism of all ages. Parent and Sibling Support Programs are also offered to participating families.

Treatment Procedures

Interventions being implemented and studied at the PCDI are based in applied behavior analysis. Publications by the lead faculty are focused upon developing positive behavioral routines, providing visual and physical structure to encourage independence and success, systematically fading supports to promote mastery, and actively planning for generalization of skills across settings, tasks, and people. Positive behavior supports, direct instruction, naturalistic instruction, and data-based decision-making are all practiced. Programming is individualized to fit the needs of a particular student and family.

Efficacy Information

Several interventions practiced at PCDI are listed as meeting the criteria for evidence-based practice by the National Professional Development Center on Autism Spectrum Disorders, which is funded by the Department of Education to investigate and describe evidence-based procedures (see http://autismpdc.fpg.unc.edu).

The PCDI has been recognized for significant contributions to the field by the Journal of Applied Behavior Analysis, Senate of the State of New Jersey (1988, for commendable service to persons with autism), National Teaching-Family Association (1989, Outstanding Contributions in Education), Division 25 of the American Psychological Association (Fred S. Keller Award for Distinguished Contributions to Behavioral Education, 1992), and the Association for Behavior Analysis (1999, Award for Enduring Programmatic Contributions in Behavior Analysis).

Qualifications of Treatment Providers

Treatment providers are well trained in applied behavior analysis and hold degrees in education, speech and communication sciences, and the behavioral sciences. Faculty are affiliated with several universities, and training opportunities are available for qualified professionals.

See Also

- ▶ Applied Behavior Analysis
- ▶ Visual Supports

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Private Speech

Brynn Thomas
The Neurodevelopmental Disabilities Laboratory, Laboratory for Understanding Neurodevelopment, Northwestern University, and the University of Notre Dame, Chicago, IL, USA

Synonyms

Self-talk; Speech-for-the-self

Definition

Private speech refers to a group of vocalized utterances, typically seen in children from 2 to 7 years old, used as a form of self-regulation. Eventually, these utterances, which are intended for oneself and not others, are internalized and become inner speech. Children with autism use private speech as a tool for behavioral and cognitive self-regulation as well as thinking and self-organization.

See Also

- ▶ Expressive Language
- ▶ Information Processing Speed
- ▶ Verbal Communication

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Problem Behavior

- ▶ Conduct Disorder

Problem Behaviors

- ▶ Maladaptive Behavior

Procedural Adherence

- ▶ Procedural Fidelity

Procedural Fidelity

Whitney J. Detar
Gevirtz Graduate School of Education,
The University of California Center for Special Education, Disabilities, & Devel, Santa Barbara, CA, USA

Synonyms

Fidelity of implementation; Independent variable measurement; Procedural adherence; Procedural fidelity; Procedural integrity; Procedural reliability

Definition

Specific term for monitoring, collecting, and documenting data on the independent variable so that it results in a measure of treatment integrity. It provides individuals with information about the conditions that need to be met for the treatment to produce reliable effects. Typically, procedures are provided in written format, such as a manual. It is critical that procedures are assessed for procedural fidelity for consistency and standardization in replication as well as reducing the possibility that a third variable is responsible for the findings. Furthermore, procedural fidelity data can provide practitioners with useful information regarding implementation of research-based interventions.

See Also

► Treatment Fidelity

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Procedural Integrity

► Procedural Fidelity

Procedural Memory

Joshua Ewen and Stewart Mostofsky
Kennedy Krieger Institute, Baltimore, MD, USA

Definition

Procedural learning refers to the process by which skills are acquired implicitly (without conscious recall) through repeated exposure to and practice of a task (Squire, 1986).

Historical Background

The discovery of the disassociation between memory that could be expressed verbally and accessed consciously (i.e., declarative memory) and experience-based brain adaptation that occurred implicitly (i.e., procedural memory) developed principally from the study of amnestic patients in the 1970s (Squire, 1986). As discussed in Current Knowledge, in the intervening decades, a number of paradigms have been developed to assess various manifestations of procedural learning. The number of studies explicitly investigating procedural learning in autism has increased over the last few years.

Current Knowledge

Introduction

Procedural learning forms the basis for the development of many cognitive and behavioral skills and is understood to result from plasticity in action-oriented brain systems (Gidley Larson & Mostofsky, 2006). Motor/premotor circuits in particular have been shown to play a role in the development of many types of skills via procedural learning. Motor skill development is the

focus of much procedural learning research, both because motor learning represents the "classic" understanding of procedural learning and because motor responses can be measured reliably. Nevertheless, there is also strong evidence that demonstrates the role of procedural learning in communicative (Ullman, 2004) and social skill development (Lieberman, 2000).

Autism is characterized by impairments in a number of skilled behaviors necessary for effective social and communicative functioning. Nearly all individuals with autism show substantial delays in adaptive functioning, even in the face of normal general intelligence. Additionally, clinical experience reveals that many children with autism show relative strength in ability to memorize facts and "scripts" (i.e., through separate, declarative learning systems), yet they have difficulty implementing experience-dependent, contextually based (i.e., procedurally based) strategies to deal with social situations and activities of daily living. One potential source of this functional disassociation is a cognitive disassociation between impaired procedural learning and spared (or even superior) declarative learning in autism. The discrepancy between intelligence and adaptive functioning suggests that autism may be specifically characterized by problems with learning "how to" engage in a wide range of skills necessary for social, communicative, and motor functioning, namely, impairments in procedural learning.

Given known skilled motor deficits in autism as well as the fact that much of motor skill development is associated with procedural learning, the study of motor impairment in autism may be critical to understanding the procedural learning basis of the autistic phenotype. Substantial and accumulating evidence demonstrates that a strong preponderance of children with autism display impairments in motor function, with particular impairments in the performance of *skilled* motor gestures (Dziuk et al., 2007; Mostofsky et al., 2006). As autism is a developmental disability, it follows that the impaired performance of skilled motor gestures results from impairments in the procedural learning of those motor skills (Gidley Larson & Mostofsky, 2006).

These alterations in the development of motor, social, and communicative skills make the examination of procedural learning a desirable target of research. Several investigators have begun to examine procedural learning in autism. Although a variety of tasks used for the study of procedural learning have failed to show group differences between individuals with autism and controls, approaches that focus specifically on motor learning have shown robust effects. A picture is emerging that demonstrates the role of altered skill learning in the autism phenotype.

Procedural Learning: Phenomenology

The concept of procedural learning refers to brain adaptation that is responsive to repeated exposure to and practice of a task and occurs without the individual's awareness (Squire, 1986). This is sometimes referred to as "learning how," whereas declarative learning, which consists of the acquisition of knowledge that occurs with awareness and can often be expressed linguistically, is sometimes referred to as "learning what." When considering the complex relationship between procedural and declarative learning, it is important to consider that "procedures" that can be expressed by the individual as semantic concepts (i.e., "first do this, then do that") exist in the brain as products of *declarative* learning rather than procedural learning. This consideration is particularly critical when studying tasks that purport to examine procedural learning, as reliance on declarative mechanisms may produce a significant confusion.

There is a complex literature on declarative learning in autism, some of which suggests normal or even superior skills. Romero-Munguía has proposed the not-yet-validated "mnestic imbalance" theory of autism, in which it is the discrepancy between procedural learning deficits and spared declarative learning skill that produces the core features of autism (Romero-Munguia, 2008). Specifically, the theory suggests that core impairments in behavioral flexibility are caused by deficits in the development of automatic actions and in prototype formation, which subsequently leads to impaired social and communicative skills. A preserved or even superior declarative memory

allows for preferred activities, such as memorizing encyclopedias. Although there is not much experimental evidence yet to accept or reject this hypothesis, the underlying rationale suggests ways in which altered procedural learning could result in the core features of autism.

Motor Deficits in Autism: A Key to Recognizing Procedural Learning Impairments

Evidence that impairment in procedural learning may be affected in autism comes from the study of the motor system. Motor deficits have been recognized since Kanner's initial description of autism (Kanner, 1943) and have been the focus of increased investigation over the past few decades. While abnormalities of basic motor control have been reported (Jansiewicz et al., 2006; Rinehart et al., 2006), it is impairment in performance of *learned*, complex motor skills which has been most consistently described (Dowell, Mahone, & Mostofsky, 2009; Dziuk et al., 2007; MacNeil & Mostofsky, 2012; Mostofsky et al., 2006). Parents often report that their children with autism showed normal acquisition of early basic motor milestones such as sitting up and walking, but then showed delays in the acquisition of complex motor skills that rely on intact mechanisms of procedural learning. Impaired performance of complex motor skills appears to be specific to autism, even when compared with conditions such as attention deficit/hyperactivity disorder (ADHD), in which there is known impairment of basic motor control (MacNeil & Mostofsky, 2012; Mostofsky et al., 2010).

It is further possible that impaired procedural learning is directly relevant to impaired development of social and communicative skills in autism. On a theoretical level, but one that is informed by experimental data from healthy subjects and a range of clinical groups, it is thought that procedural learning mechanisms are critical for both language development (Ullman, 2004) and development of social competency (Lieberman, 2000). In research specific to autism, it has been demonstrated that there is a correlation between degree of impairment in complex motor function and degree of impairment in core social and communicative skills (Dziuk et al., 2007). The acquisition of social and communicative skills by procedural learning mechanisms may be further impaired in autism by deficiencies of the systems which are believed to generate the inputs and feedback for the learning of these skills. Specifically, "embodied cognitive science" suggests that social and communicative skills are acquired at least in part through an individual's ability to implicitly model another's actions in order to understand intent and emotional state (Klin, Jones, Schultz, & Volkmar, 2003); these skills are known as theory of mind, which is impaired in autism (Baron-Cohen, Leslie, & Frith, 1985; Williams, 2008). This intention understanding has been linked to the so-called mirror neuron system (MNS) (Williams, 2008).

Neurobiology of Procedural Learning

Procedural learning depends on frontal (motor and premotor)-parietal circuits important to establishing sensory-motor representations, as well as input from the basal ganglia and cerebellum, which provide reward-based and error-based feedback, respectively, both of which are critical to skill-based learning (Keele, Ivry, Mayr, Hazeltine, & Heuer, 2003; Shadmehr & Krakauer, 2008). There is considerable evidence that frontal-parietal connectivity (and therefore frontal-parietal network function) is decreased in autism (Just, Cherkassky, Keller, Kana, & Minshew, 2007; Mostofsky & Ewen, 2011). Connections between premotor and posterior parietal cortex are implicated not only in procedural learning but also in the subsequent expression of previously learned skilled gestures (i.e., praxis) (Geschwind, 1965; Wheaton & Hallett, 2007) and in the imitation of both meaningful and novel gestures (described as comprising a "mirror neuron system") (Iacoboni & Mazziotta, 2007). The topographical overlap among circuitry involved in procedural learning, praxis, and motor imitation suggests that examination of procedural learning is key to understanding the developmental basis for well-documented autism-associated impairments in imitation and praxis (Dziuk et al., 2007; Mostofsky et al., 2006; Williams, 2008).

Socialization and communication are largely dependent on both the execution of these skilled actions as well as the ability to interpret these actions when performed by others. Procedural learning may thereby also be important to understanding the processes by which the core features of the autism phenotype develop.

Direct Examination of Procedural Learning in Autism

There have been direct experimental investigations of procedural learning in autism using a range of approaches. The concept of procedural learning encompasses a number of different capabilities, and the cognitive and neurobiological similarities and differences of these capabilities have not been fully resolved. There are experimental paradigms commonly used to examine many aspects of procedural learning, including motor adaption and sequence learning as well as category learning. The SRTT is perhaps the most commonly used experimental task for assessing implicit sequence learning (Robertson, 2007). To perform the SRTT, the participant observes a screen that displays a sequence of stimuli and then presses the corresponding buttons in order. Reaction time and error rates are recorded. The stimuli are presented with a pattern imbedded in the order of presentation, so implicit learning of the pattern results in a progressive decrease in reaction time, as well as error rate. One early study of the SRTT in autism (Mostofsky, Goldberg, Landa, & Denckla, 2000) showed a typical pattern of progressively decreasing response times in control children but a stable pattern of response times in children with high-functioning autism, suggesting impaired implicit sequence learning in autism. In several training periods that occurred over a 6-week period, Gordon and Stark (2007) demonstrated a decreased learning effect using the SRTT in children with low-functioning autism. On the other hand, there have been a number of studies which have found no difference between children with autism and controls (Barnes et al., 2008; Brown, Aczel, Jimenez, Kaufman, & Grant, 2010; Muller, Cauich, Rubio, Mizuno, & Courchesne, 2004; Nemeth et al., 2010; Travers, Klinger, Mussey, & Klinger, 2010). It is likely that methodological concerns are responsible for the differing conclusions. A criticism of the SRTT approach is that it may measure sequence learning rather than motor learning (Robertson, 2007) and therefore may not tax the systems that are altered in autism.

Two examinations of a contextual cueing task also showed no group differences (Barnes et al., 2008; Brown et al., 2010). Contextual cueing is a visual search task, where implicit patterns of distractors give a "hint" as to whether the target is present. An artificial grammar task, in which strings of letters with an implicit "grammatical" pattern are memorized, failed to show group differences (Brown et al., 2010). Similarly, a probabilistic classification learning task, where aspects of the stimuli (in this case, the clothing of a cartoon character) had a probabilistic relationship to the correct classification of the character, showed no differences by diagnosis (Brown et al.).

Approaches to Examining Motor Learning in Autism

Perhaps the greatest insights into the association between procedural learning and the autism phenotype have come from examination of motor learning. Recent theoretical perspectives of motor learning specify "internal models" as motor programs that encode discrete motor actions (Iacoboni & Mazziotta, 2007; Mostofsky & Ewen, 2011; Shadmehr & Krakauer, 2008). As described, the formation of internal models of action is critical to learning skilled movements, as well as to learning to interpret others' movements. Children with autism display impairments in both these domains, with well-documented difficulty in performing skilled actions (i.e., dyspraxia), as well as with recognizing and correctly identifying those actions when performed by others (Baron-Cohen et al., 1985; Dowell et al., 2009). This suggests that anomalous formation of internal models of action may be important to understanding the patterns of motor and social deficits associated with autism. Consistent with this, children with autism show a strong association between the severity of dyspraxia and the severity of core impairments

in social and communicative behavior (Dziuk et al., 2007).

Investigators have begun to examine patterns of action model formation in autism, initially focusing on tasks that test motor adaption, or the ability to learn a novel pattern of movement based in response to a discrete sensory perturbation. In a particularly revealing study, Haswell, Izawa, Dowell, Mostofsky, and Shadmehr (2009) used a motor adaptation task in which participants used a joy stick to move a cursor on a computer screen situated horizontally in front of them so that it obscured the joy stick from their view. In a series of trials, participants used the joy stick to make a reaching motion, extending their arm toward a target. During most trials, a force perpendicular to the participant-controlled direction of movement was applied to the joy stick so that participants had to learn to adapt their arm motion in order to hit the target. After this learning phase of the task, the screen and controller were moved. The relationship of the controller movement to the cursor movement was changed in one of two ways. In the first, the coordinate system relative to the visual input (Cartesian coordinate) was maintained; in the second, the coordinate system relative to proprioceptive input (joint position) was maintained. The findings revealed that, as compared with control subjects, children with autism spectrum disorders showed markedly increased generalization when the proprioceptive coordinate system was maintained and showed decreased generalization (persistence of motor adaptation) when the visual coordinate system was maintained. Furthermore, the strength of increased reliance on proprioceptive input robustly correlated with impairments in imitation, praxis, and social competence, suggesting that alterations of motor adaptation may share a neurobiological basis with the core symptoms of autism (Haswell et al. 2009). Moreover, these alterations of patterns of motor adaptation generalization were specific to autism and were not seen in children with ADHD (Izawa et al., 2012).

The findings from these studies of motor adaptation suggest that when learning a novel action, children with autism show a bias toward relying on proprioceptive input from their own "internal" world rather than visual input from the external world around them. Indeed, previous investigators had suggested that children with autism respond more effectively to proprioceptive rather than visual input (Masterton & Biederman, 1983). Furthermore, these observations are in keeping with recent influential connectivity theories (Horwitz, Rumsey, Grady, & Rapoport, 1988; Mostofsky & Ewen, 2011), in which autism is postulated to be associated with an overgrowth of short-range connections (including those between primary somatosensory and motor cortices that encode proprioceptive feedback) and an undergrowth of longer-range connections (including those between inferior parietal and premotor cortices that encode visual feedback).

The correlation between motor learning ability and social/communicative competence (Dziuk et al., 2007; Dowell et al., 2009; Haswell et al., 2009; Izawa et al., 2012), as well as the fact that similar frontal-parietal networks are understood to underlie both types of skill, suggests that the brain systems necessary to acquiring and maintaining motor skills (praxis) may parallel (and perhaps overlap) those systems necessary to acquiring and maintaining social/communicative skills. In this light, autism could be viewed as a "developmental dyspraxia" of social and communicative function (Mostofsky & Ewen, 2011), such that anomalous patterns of internal action model formation contribute to both impaired development of motor/social/communicative skills, as well as impaired ability to understand these actions when performed by others.

Summary

In summary, there is a compelling theoretical basis, both neurobiological and cognitive/behavioral, to suggest that impairments of procedural learning are both present in autism and causally related to the core symptoms. Evidence to date using standard paradigms has, to a large degree, failed to demonstrate these impairments. Novel approaches that target specific known deficits in autism, however, may hold the key to relating alterations of procedural learning to the

autism phenotype. This course of investigation could lead to crucial insights into the brain basis of autism and provide a foundation for advancing therapeutic strategies targeting autism-associated difficulties with social, communicative, and motor skills.

Future Directions

Findings generated from studies of procedural learning could lay the foundation for novel approaches for therapeutic interventions targeting improvements in motor, social, and communicative skills. This approach has the potential to provide crucial advances, as current therapeutic techniques (e.g., speech-language therapy, behavioral therapy, educational interventions) often depend on procedural skill learning. One approach under investigation involves "playing to the strength" of children with autism by teaching skills such as handwriting or sign language to children with autism using increased haptic (proprioceptive) input rather than the typical approach that relies on imitating others' actions (Feder & Majnemer, 2007). This approach of increasing proprioceptive input may help children with autism improve specific motor skills; however, it is unlikely to help these children learn social skills given that social interaction involves modeling others' visually observed behavior. It will therefore be crucial to also explore both behavioral and electrophysiologic methods for enhancing visual-motor connectivity in children with autism.

See Also

- Apraxia
- Behavior Therapy
- Cerebellum
- Declarative Memory
- Developmental Coordination Disorder
- Dysgraphia
- Dyspraxia
- Grammar
- Language Acquisition
- Language Interventions
- Mirror Neuron System
- Motor Control
- Motor Planning
- Parietal Lobe

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Procedural Reliability

► Procedural Fidelity

Procedural Safeguards

Debra Dunn
The Center for Autism Research, The Children's Hospital of Philadelphia, Philadelphia, PA, USA

Synonyms

Parent protections

Definition

Procedural Safeguards are protections afforded by the Individuals with Disabilities Education Improvement Act of 2004 (IDEIA) to each student with a disability and to his or her parents to ensure that the student receives a free and appropriate public education. The Procedural Safeguards ensure that parents (or the student if the student has reached the age of majority within the state) are notified of their rights to and the procedures for disagreeing with the special education process.

The safeguards afforded parents: the rights to examine all of the student's records, to participate in meetings regarding the identification, evaluation, and placement of the student, to consent to evaluations and the provision of special education services, to obtain an independent educational evaluation when needed, and to present and resolve a complaint. The Procedural Safeguards also grant parents the right to written notice within a reasonable time frame when the local education agency (typically the school) wants to evaluate a student, determine whether a student is eligible for special education services, change a student's evaluation, educational placement, or individualized education program (IEP), or refuse a parent's request to evaluate a student or change a student's IEP or placement. While some changes in placement are obvious (for example, a change from a regular education classroom placement to an autism support classroom), the IDEIA specifies certain less common situations that may constitute a change of placement, including removal to an alternate educational setting due to violations of a code of student conduct.

To help educate parents about their rights, schools must provide parents with a procedural safeguards notice at least once a year. Additional notices must be provided whenever a student is referred for an initial evaluation, when a parent requests a new evaluation, at the time a due process complaint is filed, or whenever a parent requests a copy. The notice must detail the process by which a parent may present and resolve complaints related to the special education process, including the option of voluntary mediation. Because states are at liberty to develop ways to implement the IDEIA, the procedural safeguards notices vary from state to state. The actual protections contained within the notice, however, may not confer fewer rights to parents and students than what is provided for by the IDEIA.

See Also

- Due Process
- Individuals with Disabilities Education Act (IDEA)

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Processing Speed Index

Timothy Soto
Clinical Psychology, University of Massachusetts Boston, Boston, MA, USA

Synonyms

Processing speed quotient

Definition

Processing speed refers to the speed of cognitive processes and response output. The Processing Speed Index (PSI) is one of four indices that make up the full scale intelligence quotient (FSIQ) derived from The Wechsler Adult Intelligence Scale-4th edition (WAIS-IV) and The Wechsler Intelligence Scale for Children-4th edition (WISC-IV), primary standardized clinical instruments used to measure intelligence. The tasks included in the scales that comprise the PSI, (Coding, Symbol Search), are timed and require attending to visual material, visual perception and organization, visual scanning, and hand-eye coordination. Performance on the Coding subtest also requires paired associative learning. Anxiety and fine motor problems may interfere with performance on the PSI. Coding, in particular, which requires copying simple shapes, may be affected by motor output problems. This tends to be an area of relative weakness for children with ASD (Calhoun & Mayes, 2005).

See Also

- ▶ Attention
- ▶ Processing Speed Quotient
- ▶ Wechsler Adult Intelligence Scale
- ▶ WISC-IV

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Processing Speed Quotient

Timothy Soto
Clinical Psychology, University of Massachusetts Boston, Boston, MA, USA

Synonyms

Processing speed index

Definition

The Processing Speed Quotient is one of the four indices of the Wechsler Preschool and Primary Scale of Intelligence-Third Edition (WPPSI-III). The other three are Verbal, Performance, and Full Scale Intelligence Quotients. The Processing Speed Quotient measures mental and visual-motor processing speed and accuracy for individuals aged 4 through 7 years. The Processing Speed Quotient is made of two subtests: Symbol Search and Coding and provides an estimate of a child's ability to quickly and correctly scan, sequence, and discriminate simple visual information. This tends to be an area of relative weakness for children with ASD (Calhoun & Mayes, 2005).

See Also

- ▶ Processing Speed Index
- ▶ Wechsler Preschool and Primary Scale of Intelligence

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Profile of Intelligences

Sara Kaplan-Levy and Shirley Poyau
Clinical Psychology, University of Massachusetts, Boston, Boston, MA, USA

Definition

A profile of intelligence is a way of presenting multiple scores earned on a cognitive assessment in relation to one another. The scores may include specific subtests, composite indices, and a full-scale intelligence quotient score (FSIQ). The profile of intelligence also depicts the scatter, or the pattern, of scores on a cognitive assessment.

Historical Background

In the past, psychologists analyzed profiles of intelligence to diagnose individuals with particular learning styles or disabilities. However, these diagnoses were not always clinically or psychometrically sound, as subtest scores are not as reliable as index scores, and the subscales of cognitive assessments often assess intersecting cognitive abilities (Sattler & Ryan, 2009). Due in part to concerns about relying on limited data, the American Psychological Association [APA] (2002) stated that psychologists should not make diagnoses based on data from a single test, though they recognize that a profile of intelligence scores can provide practitioners with a great deal of information about an individual's distribution of cognitive abilities, or relative strengths and weaknesses.

Current Knowledge

Today, psychologists use profiles of intelligence to create hypotheses about an individual's cognitive strengths and weaknesses, which they can examine further with additional cognitive evaluations and qualitative interviews. Specific assessments often used with individuals with Autism Spectrum Disorders (ASD) include the Wechsler Preschool and Primary Scale of Intelligence – Third Edition (▶ WPPSI-III; Wechsler, 2002) for children 2 years 6 months to 7 years 3 months old, the Wechsler Intelligence Scale for Children-Fourth Edition (▶ WISC-IV; Wechsler, 2003) for children 6–16 years old, and the Wechsler Adult Intelligence Scale-Fourth Edition (▶ WAIS-IV; Wechsler, 1997) for individuals 16–90 years old. The Mullen Scales of Early Learning (Mullen, 1995) are also used with very young children.

The WPPSI-III consists of seven core subtests, a composite of which creates the FSIQ. The seven core subtests are Information (test of ability to retain and retrieve knowledge), Vocabulary (test of verbal knowledge), Word Reasoning (test of verbal comprehension and reasoning ability), Block Design (test of visual perception and organization), Matrix Reasoning (test of visual information processing), Picture Concepts (test of abstract reasoning ability), and Coding (test of visual perception and short-term memory). The Verbal IQ score (VIQ) is the composite of Information, Vocabulary, and Word Reasoning

scores. The Performance IQ score (PIQ) is the composite of Block Design, Matrix Reasoning, and Picture Concepts. The Processing Speed Quotient (PSQ) is based solely on the Coding score.

The WISC-IV consists of ten core subtests that are used to calculate the VIQ, PIQ, and FSIQ. The ten core subtests are Similarities (test of abstract reasoning), Vocabulary (test of verbal knowledge), Comprehension (test of general principles and social situations), Block Design (test of visual perception and organization), Picture Concepts (test of abstract reasoning ability), Matrix Reasoning (test of visual information processing), Digit Span (test of working memory), Letter-Number Sequencing (test of mental manipulation and short-term memory), Coding (test of visual perception and short-term memory), and Symbol Search (test of processing and psychomotor speeds and visual short-term memory). Scores on the WISC-IV subtests create four composite index scores: Verbal Comprehension Index (VCI), Perceptual Reasoning Index (PRI), Working Memory Index (WMI), and Processing Speed Index (PSI). VCI is a composite score of Similarities, Vocabulary, and Comprehension; PRI is a composite score of Block Design, Picture Concepts, and Matrix Reasoning; WMI is a composite score of Digit Span and Letter-Number Sequencing; and PSI is a composite score of Symbol Search and Coding.

The WAIS-IV consists of ten core subtests that are used to calculate the VIQ, PIQ, and FSIQ. Nine of the subtests are similar to those previously described in the WISC-IV, but the WAIS-IV also includes Arithmetic (test of working memory and numeric reasoning). Similar to the WISC-IV, scores on the WAIS-IV create four composite index scores: Verbal Comprehension Index (VCI), Perceptual Reasoning Index (PRI), Working Memory Index (WMI), and Processing Speed Index (PSI). VCI is a composite score of Similarities, Vocabulary, Information, and Comprehension; PRI is a composite score of Block Design and Matrix Reasoning; WMI is a composite score of Digit Span and Arithmetic; and PSI is a composite score of Symbol Search and Coding.

Clinical Uses: Practitioners can assess an individual's cognitive strengths and weaknesses by conducting ipsative (i.e., intra-individual) comparisons of an individual's scores or by conducting comparisons to standardized scores (i.e., inter-individual). By taking the difference between index scores, scaled subtest scores, subtests of scaled subtest scores within a broader composite score, and the individual's respective average scores (i.e., ipsative comparisons), practitioners can learn which cognitive skills pose relative difficulty or relative areas of strength for the individual. Considering an individual's scores among those of a standardized group, practitioners can decipher which cognitive skills pose difficulty or areas of strength for this particular individual with respect to the norm group.

By doing thorough profile analyses, and comparing the spread of a person's profile of intelligence to that of a standardized group, practitioners determine the frequency with which such variability of scores occurs. Knowing how often certain significant differences in index or scaled subtest scores occur in a standardized population, practitioners can begin to create hypotheses about an individual's specific abilities and areas of struggle. For example, if a person earned a PRI score significantly greater than his/her VCI score, practitioners might wonder if the individual's visual-spatial processing and visual-discrimination processing are more developed than his/her verbal processing or auditory-vocal processing. A significant difference between these two index scores could also be a sign of more developed nonverbal problem-solving skills than verbal retrieval of information skills. Although these discrepancies do not establish the presence of a cognitive disability, they do indicate a possible disparity in a person's cognitive abilities and identify cognitive skills that should be further evaluated.

Similarly, significant differences between an individual's scaled subtest scores, especially if they are uncommon in the standardized group, could signify particular cognitive abilities or difficulties. Moreover, comparing scaled scores of two subtests within the same index could

reveal important information about the way in which an individual processes information or completes tasks. For example, Vocabulary and Similarities are both subtests of the VCI that measure abstract thinking ability. A significantly greater Vocabulary score than Similarities score might reveal that the individual's knowledge of words is greater than his/her ability to categorize and vice versa if the Similarities score were significantly greater than the Vocabulary score. Again, finding significant differences in scaled subtest scores that are rarely seen within the standardized group is not enough evidence to make declarative statements about a person's cognitive limitations. However, such discrepancies encourage a practitioner to direct attention to these particular cognitive skills, to assess further to determine if a problem exists.

Although it provides little information about variability across subtests, practitioners might also find it helpful to examine the difference between an individual's highest and lowest scaled subtest scores. A significant range that is rarely found within the standardized group might be an indication of a specific cognitive aptitude or a particular cognitive deficit.

Lastly, analyzing profiles of intelligence in this in-depth manner is essential for determining if the FSIQ is an accurate depiction of a person's overall intelligence. If, in fact, there is a great deal of scatter between scaled subtest scores, then the FSIQ is not interpretable. When examining a profile of intelligence with significant variability, practitioners should administer further cognitive assessments to determine whether the assessment revealed a genuine portrayal of a person's cognitive abilities and to gather information about those cognitive tasks that caused the examinee particular difficulty.

It is critical that practitioners analyze profiles of intelligence after performing cognitive assessments because the pattern of scores provides substantial information about an individual's specific cognitive abilities (e.g., indices, subtests) and areas of struggle; this knowledge allows practitioners to assess more deeply a person's particular areas of, and possible reasons for, difficulty. Practitioners can then synthesize all of the information they have gathered through cognitive assessments with knowledge about the individual that has been collected via medical history and in-person interviews to create personalized suggestions for ways to improve or manage certain cognitive weaknesses. This thorough examination and comprehension of a person's cognitive abilities is essential because, if aid is needed, it allows for the development of individualized plans for support.

Clinical Uses for Individuals with Autism Spectrum Disorders

Practitioners have used profile analysis to determine profiles of intelligence that can be observed among groups of individuals with ASD; researchers have claimed that across the life span, individuals with ASD diagnoses had similar Wechsler Intelligence Scale profiles that were characterized by a lower VIQ than PIQ. Comprehension was often the lowest subtest score and Digit Span was the highest subtest score on the VIQ composite, while Coding/Digit Symbol was the lowest subtest score and Block Design was the highest subtest score on the PIQ composite (Yirmiya & Sigman, 1991). Furthermore, researchers distinguished between individuals with high functioning autism (HFA) and Asperger's Syndrome (AS) using profiles of intelligence: researchers found that individuals with AS had higher VIQ than PIQ, whereas those with HFA were more likely to have a profile similar to those with ASD, with a VIQ lower than their PIQ. Siegel, Minshew, and Goldstein (1996), however, reported on findings from 16 studies of people with ASD and found that while this profile was common among people with ASD, many participants across studies had intelligence profiles that revealed higher VIQ than PIQ. Moreover, the profile of intelligence suggested to be associated with ASD has also been observed among individuals without ASD as well as individuals with language disorders. Siegel et al. continued to suggest that although certain aspects of a profile of intelligence might

be common among individuals with ASD, profiles of intelligence are dependent upon an individual's particular abilities, not his/her ASD diagnosis.

Future Directions

As tests are increasingly co-normed, it will be easier to compare scores not only within a single cognitive tool, but across instruments and domains (e.g., intellectual functioning and memory capacities).

See Also

- ▶ Picture Arrangement
- ▶ Processing Speed Index
- ▶ Psychological Assessment
- ▶ Verbal Comprehension Index
- ▶ Wechsler Memory Scale (All Versions)
- ▶ Wechsler Test of Adult Reading
- ▶ WISC-IV

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Profiling Elements of Prosody in Speech-Communication (PEPS-C)

Sue Peppé
High Appin, Tynron, Thornhill, UK

Synonyms

PEPS-C

Definition

Profiling Elements of Prosody in Speech-Communication (PEPS-C) is a semiautomated test battery for assessing receptive and expressive prosody skills. It has been used in several studies of the speech and understanding of children with high-functioning autism/Asperger's syndrome (see section "References and Readings"). It is intended for use by clinicians and researchers in assessing prosody in any conditions in both children and adults. A demonstration of the test can be found on www.peps-c.com.

PEPS-C comprises 12 tasks, addressing receptive and expressive skills in parallel. The tasks are at two levels, examining prosodic function and prosodic form, respectively. PEPS-C defines four main linguistic functions conveyed by prosody, with a receptive and an expressive task for each:

1. Turn end: indicating whether an utterance requires an answer or not (question/statement)
2. Affect: indicating mood/emotions/opinions – in this test, signaling liking or reservation with respect to food items
3. Chunking: prosodic phrase boundaries indicating how speech can be verbally "chunked," as in the difference between "fruit, salad, and milk" and "fruit salad and milk"
4. Contrastive stress or focus: emphasizing one word in an utterance to focus attention on it, e.g., "white COW" as opposed to "WHITE cow"

Prosodic form processing requires noncognitive skills. The tasks are:

– Two auditory discrimination tasks, essentially same/different tasks. Stimuli exemplify the prosodic variations that convey the different meanings used in the receptive prosodic function tasks.
– Two imitation tasks requiring the production of the types of prosodic variation needed for completing the expressive function tasks.

The assessment of skills at two levels helps to determine the level at which a client has a problem with prosody, thus enabling better targeting of intervention. The test is not standardized, but a limited amount of normative data is available.

See Also

► Paralinguistic Communication Assessment
► Prosody

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Profound Hearing Impairment

► Deafness

Projective Testing

Thomas P. Hogan and Christie P. Karpiak
Department of Psychology, University of Scranton, Scranton, PA, USA

Synonyms

RIT; Rorschach Inkblot test

Abbreviations

ASD	Autism spectrum disorders
CAT	Children's apperception test
CS	(Exner's) Comprehensive system
DAP	Draw a person
DAP: SPED	Draw-a-person: screening procedure for emotional disturbance
HFD	Human figure drawing
HTP	House-tree-person test
KFD	Kinetic family drawing
RISB	Rotter's incomplete sentence blank
SAT	Senior apperception test
TAT	Thematic apperception test

Description

Nature of Projective Tests

Projective tests, also commonly called projective techniques, encompass a class of psychological measures characterized by two key features. First, they present a relatively unstructured or ambiguous stimulus (e.g., an inkblot) to which a person responds. Second, they allow for great latitude in the person's response. Projective tests are contrasted with objective or structured measures which present a simple, clear stimulus (e.g., a statement such as "I often feel strange")

accompanied by a selected-response method of responding (e.g., Yes/No).

The rationale underlying use of a projective technique is the "projective hypothesis" which asserts that when faced with an ambiguous stimulus and given great freedom in responding, an individual's personality dynamics will determine the response, and, therefore, the projective technique may reveal dynamics not detected by objective measures.

Extent of Use

Surveys show that projective techniques are very widely used in clinical assessment. This has been true over a long period of time and across many subfields including clinical, counseling, school, and forensic psychology and neuropsychology (Hogan, 2005). In several surveys identifying the most widely used psychological tests, various projective techniques usually garner four or five of the top ten spots. Doctoral work in clinical psychology also typically requires training in use of projective techniques such as the Rorschach. Some uses of projective techniques involve formal scoring, as described later. However, some uses are informal, serving an "ice-breaker" function: presentation of a nonthreatening stimulus to facilitate initial discussion and establishing rapport with a client without formal scoring.

Indicators for Use of Projective Techniques

Certain circumstances may suggest that use of projective techniques is particularly appropriate. First, most projective techniques require little or no literacy skills and, therefore, may be useful with persons of low educational level. Second, projective techniques, with their ambiguous stimuli, are less susceptible to faking (good or bad) than more objective measures. Third, projective techniques may be especially useful for hypothesis generation when the clinician has little initial notion regarding the source of a person's difficulty.

The following sections describe the most widely used projective techniques (Hogan, 2005), including basic description of the techniques and their typical applications.

Rorschach

The Rorschach inkblot test (RIT) is clearly the most widely used projective technique. The standard version of the RIT consists of ten bilaterally symmetrical inkblots, five with mixtures of black and various shades of gray, two with black and gray with splotches of red, and three with mixtures of pastels. Each inkblot appears in the middle of a rigid piece of cardboard measuring about 6 × 9 in.

Based on appearance of inkblots in the popular media, some people may think that administration and interpretation of the inkblots is a simple, intuitive matter: Show an inkblot, get a response, and, presto, you know a person's innermost thoughts and feelings. That is certainly not the case with formal use of the Rorschach in contemporary clinical practice. Following Hermann Rorschach's (1921) publication of these inkblots, several systems for administering, scoring, and interpreting the RIT emerged. In the early 1970s, John Exner began the development of the Comprehensive System (CS) for administration and scoring the RIT, selecting what he judged the best and most promising features of previous systems. The CS is now the industry standard for formal use of the RIT. Exner's three volumes (Exner, 2003; Exner & Erdberg, 2005; Exner & Weiner, 1995) serve, in effect, as the test manual for the RIT-CS.

Administration of the RIT-CS involves two phases. First, in the response phase, the examiner hands one of the inkblot cards to the client and asks "What might this be?" If necessary, the examiner encourages responses with statements such as "Most people see more than one thing." The examiner records responses verbatim, as nearly as feasible. The examiner presents each card in turn with the latter directions. Then, in the inquiry phase, the examiner reintroduces each card, reminds the client of his or her response(s), and asks for elaboration on the responses, saying, for example, "Show me where you saw ___." The examiner also records these responses verbatim.

Scoring the RIT-CS involves, first, application of an elaborate set of codes to the responses and, second, conversion of these codes into a host of ratios, percentages, and derivations. Codes occur

in several major categories, for example, location, form quality, and determinants. The codes within the location category tell, for example, whether the response was to the entire blot (W), a common detail (D), an unusual detail (Dd), or to a space (S) rather than to the inkblot itself. Determinants deal with what features of the blot determined the response, for example, an animal figure, human figure, or movement. The host of coded responses are then converted into a variety of derivations (e.g., ideation, affect) and "constellations" (e.g., depression index, coping deficit index), eventuating in the structural summary, which serves as the primary basis for interpretation in the RIT-CS. Interpreting the structural summary requires advanced training. Computer programs aid in development of the structural summary after the initial coding and computer-generated narrative reports are also available to aid interpretation.

More so than for other categories of psychological assessments, exceptional controversy surrounds the use of projective techniques, with particularly vigorous debate centered on the Rorschach. Some authorities believe even the better known projectives, to say nothing of clearly discredited techniques, generally lack acceptable psychometric quality. Other authorities maintain that selected projective techniques, properly administered and interpreted, compare favorably with widely used measures of mental ability and objective measures of personality traits. See Krishnamurthy, Archer, and Groth-Marnat (2011) for a summary of the arguments pro and con.

Thematic Apperception Test and Other Storytelling Techniques

Another widely used projective technique is the *Thematic Apperception Test* (TAT). The TAT consists of 30 cards, 9 × 12 in., each containing a photo deliberately selected to present an ambiguous situation; one card is entirely blank. Directions vary but generally ask the respondent to tell a story, including what is happening, what led up to the situation, and what the outcome may be. Not all cards are used with all respondents; some are meant only for boys, others only for men, others for girls, and others for women. Some examiners may select their own subsets of cards. In clinical practice, clients usually respond orally. Research applications, with literate respondents, often employ a written response.

The TAT was developed by Murray (1943) to help measure his personality theory based on sets of psychological needs (e.g., affiliation, achievement) and presses (environmental forces). In contemporary practice, Bellak (Bellak & Abrams, 1997) provides the most influential work on the TAT. Bellak has attempted to do for the TAT what Exner did for the Rorschach: systematize the scoring, provide scoring codes, and conduct psychometric research.

The TAT has two offshoots: the *Children's Apperception Test* (CAT) and *Senior Apperception Test* (SAT, not to be confused with the SAT used for college admissions), both similar to the TAT in purpose and general structure but using pictures more appropriate for their respective target groups. Bellak's work covers the CAT and SAT as well as the TAT.

Research with the TAT shows that it has some limited utility in measuring a few of the traits originally postulated by Murray, for example, achievement motivation, need for affiliation, and aggression. However, its use in ordinary clinical practice has declined in recent years primarily due to unsystematic administration and scoring procedures and a lack of rigorous psychometric work (Dana, 1996).

Another storytelling projective technique is the *Roberts-2* (Roberts & Gruber, 2005), a revision of the *Roberts Apperception Test for Children*, intended for ages 6–18. Like the prototype TAT, the test presents a series of pictures and asks the respondent to create a story with a beginning, middle, and end, and with specific reference to feelings evoked by the picture. The test aims to measure what it refers to as social understanding. It applies a set of codes for responses in a manner similar to that described earlier for the RIT-CS. Application of the codes results in 18 developmental/adaptive scales (e.g., Limit Setting, Constructive Resolution) and 10 clinical scales (e.g., Aggression, ▶ Maladaptive Outcome). Although the

manual claims the test is not a projective technique, it clearly is projective by any conventional definition. An accompanying "casebook" provides one case of a child with autism and one with Asperger's disorder, as well as a host of other types of cases. However, the manual presents no normative information for autism or other developmental disorders. The manual provides data for a general standardization sample and for a sample of undifferentiated referred clinical cases. Normative information for groups of cases such as those included in the casebook would enhance usefulness of the *Roberts-2*, particularly for research on social understanding in children with autistic spectrum disorders.

Sentence Completion Tests

The sentence completion technique presents the respondent with a few words in a sentence stem (e.g., I feel ... or Most people ...), and the respondent completes the sentence in his or her own words. The sentence completion technique is the only widely used projective technique that requires writing; it, therefore, depends on some degree of literacy and is not typically used below the high school level.

Numerous specific sentence completion tests are available. The most widely used is *Rotter's Incomplete Sentences Blank* (RISB; Rotter, Lah, & Rafferty, 1992). It consists of 40 incomplete sentences. There are three forms: high school, college, and adult. RISB attempts to measure only one psychological construct: maladjustment. The RISB manual provides specific guidance for rating each completed sentence on a seven-point scale for the degree of adjustment/maladjustment reflected in the wording. These ratings on individual sentences then sum to a total maladjustment score.

Human Figure Drawings

Human figure drawings (HFD), also known as draw-a-person (DAP) tests, encompass a generalized technique as well as several specific tests. As a general technique, the procedure usually calls for the respondent, first, to "draw a picture of yourself," followed by "draw a picture of a person of the opposite sex," and may also include "draw a picture of your mother (or some other named person)."

Many clinicians "score" the drawings in only the most impressionistic manner. Alternatively, a variety of specific scoring systems have been proposed. The earliest use of the procedure aimed to provide a nonverbal measure of intelligence and the method still experiences some use for that purpose (Naglieri, 1988), although it is much more frequently used as a projective measure of personality. Machover (1949) offered a widely cited but largely discredited system for interpreting human figure drawings. Naglieri, McNeish, and Bardos (1991) developed the *Draw-a-Person: Screening Procedure for Emotional Disturbance* (DAP: SPED) as an objectively scored, psychometrically sound version of the technique. The DAP: SPED manual provides comparative data for several special education samples in the age range 10–12 years but with no apparent representation of autistic syndrome disorder (ASD) cases.

Other drawing-based techniques include *House-Tree-Person* test, with directions calling for, as suggested by the title, drawing a house, tree, and person and the *Kinetic Family Drawing*, with directions calling for drawing a picture of a family doing something.

Despite the widespread use of human figure drawings in clinical practice, they have not fared well in psychometric research. At best, they may reveal some aspects of gross ideational or emotional aberration, and they may serve the purpose of hypothesis generation for later follow-up or as an icebreaker.

Bender Visual-Motor Gestalt Test

The *Bender Visual-Motor Gestalt Test-II* (Brannigan & Decker, 2003) usually referred to simply as the Bender consists of a series of geometric configurations presented on individual cards (e.g., two intersecting wavy lines). Administration proceeds in two phases: copy and recall. First, the examiner presents each card in turn and asks the client to copy the figure. After all cards have been presented, the examiner asks the client to draw as many of the designs as the client can recall. Each response is scored on a five-point

scale from no resemblance to near-perfect resemblance to the original figure.

The Bender's original purpose and most frequent uses are for neuropsychological evaluation. However, some clinicians use it as a projective technique, scoring responses for "indicators" of ideational aberration or emotional disturbance.

Historical Background

Currently used projective techniques found original expression in Herman Rorschach's (1921) inkblots. Due to his untimely death the year after publication of the first set of inkblots, Rorschach did not have formal directions or scoring procedures. Within that void, five different systems for administering and scoring the inkblots developed, from 1937 to 1946, resulting in a chaotic situation (Aiken, 1999). Beginning in 1974, John Exner released his Comprehensive System for the Rorschach. Further developed in several succeeding volumes, Exner's system is now the industry standard for administration and scoring the Rorschach.

In a relatively brief period of approximately 25 years, from 1943 to 1970, original versions of nearly all of the currently used projective techniques emerged. Some have appeared in revised editions (e.g., Rotter's *Incomplete Sentence Blank*, *Roberts-2*), while others have remained unchanged (e.g., the *Thematic Apperception Test*).

Psychometric Data

The quality and quantity of psychometric data varies widely among different projective techniques and even for various scores derived from a single technique. Exner's Comprehensive System for the Rorschach yields a large number of scores. Some of these scores show reliabilities comparable to the best objective measures of personality traits, for example, test-retest reliabilities above .85 in both adult's and children's samples (Exner, 2003). Other scores yield low reliabilities. A similar picture emerges for the many scores obtained from *Roberts-2*: Some reliabilities above .80 and others well below this mark (Roberts & Gruber, 2005). In contrast, Rotter's *Incomplete Sentences Blank* yields a single score (adjustment) with very good interrater reliability and short-term stability, with adequate internal consistency (Rotter, Lah, & Rafferty, 1992).

To date, psychometric data for any of the widely used projective techniques is lacking for autism spectrum disorder samples. Therefore, using any of these techniques with ASD cases requires considerable caution.

Clinical Uses

Clinical Uses of Projective Techniques for Autism Spectrum Disorders

Psychological tests receive use for initial diagnosis of a condition, treatment planning, follow-up evaluation of treatment outcomes, and for research to better understand a condition. Projective techniques appear to have little relevance for initial diagnosis for ASD cases. Initial diagnosis typically occurs at an age below the functional range for projective techniques. Furthermore, several well-established objective tests and methods exist for evaluating communication skills and social relationships relevant to autism spectrum disorders (Bishop, Luyster, Richler, & Lord, 2008; Lord & Corsello, 2005). Projective techniques may be useful at older ages for treatment planning and follow-up evaluation, especially for comorbid conditions. However, any clinical use of projective measures with this population will require careful attention to the developmental level of the individual being assessed, and, in the absence of appropriate normative data for ASD samples, interpretations will necessarily be quite tentative.

Projective techniques may be of use for a variety of research purposes to develop broader understanding of the emotional and social lives of individuals with autism spectrum disorders. To date, uses of projective techniques with ASD cases have been characterized by isolated studies with quite limited samples. However,

some promising lines of research have developed. Emotion researchers have noted the importance of self-report information in understanding the emotional experiences of children and adolescents (Zeman, Klimes-Dougan, Cassano, & Adrian, 2007), and projective measures can help elicit such information. An example with high-functioning ASD is found in the work of Bauminger, Shulman, and Agam (2004), who studied loneliness, perceptions of friendships, and understanding of social interactions in school-aged children using, among other measures, thematic picture-based procedures with open-ended questioning. The Friendship Picture Recognition Interview (see Bauminger et al., 2004), described by the authors as a projective test, consists of a single color drawing of two children engaged in a close social interaction. Examiners ask all children a set of three questions, and, depending on response to the third question, some children are also asked a fourth. The authors provide the procedure for scoring responses along with some information about interrater agreement. Informative results have been obtained from this and the group's other picture-based measures, but there is no indication in the literature of use of the measures by other researchers. Kenworthy (2010) provides another example of the use of the storytelling method, specifically the *Roberts-2*, in this instance to track changes in social perception in an ASD case.

In a study on theory of mind, Beaumont and Newcombe (2006) noted that important information about high-functioning individuals' understanding of others' mental states can be obtained from measures that include spontaneous speech and narratives. That is, open-ended measures can add to the information obtained from more structured, objective measures. They included an "open-ended TAT narrative task" in a comparison of 20 individuals with high-functioning autism or Asperger's disorder and 20 controls matched on IQ, sex, and age. Six of Murray's TAT cards were used and the directions given to participants were the same as specified in the manual. Responses were not coded for traditional personality themes but for theory of mind constructs, using categories based on previous narrative studies with children by theory of mind researchers. Hypothesized differences were found between the ASD and control groups on "mental state causal statements." The results add interesting information about specific aspects of mental state understanding in this group.

Projective measures might also have utility for research on emotions and social perceptions in lower-functioning adolescents and adults. Dykens, Schwenk, Maxwell, and Myatt (2007) have called for research into the rich internal lives of individuals with intellectual disabilities (ID) and suggested "semi-projective" measures as a way to obtain self-reports from these individuals. They recently used sentence completion and three-wishes tasks to obtain information about emotions and aspirations from individuals with ID associated with genetic syndromes. Content analysis was utilized and high intraclass correlations reported. The measures might prove useful for similar purposes with individuals with ASD and ID.

Several studies have employed the Rorschach with ASD cases, in all instances using Exner's CS to report scores. Dykens, Volkmar, and Glick (1991) used the Rorschach to examine thought disorder in 11 high-functioning ASD cases and compared results with the CS schizophrenia reference norms. Ghaziuddin, Leininger, and Tsai (1995) also used the CS to compare 12 Asperger's syndrome cases with 8 high-functioning autism cases and found differences on a few of the structural summary variables. It should be noted that Exner's structural summary provides a score-labeled ALOG, which originally stood for autistic logic but was later renamed inappropriate logic, although the acronym ALOG was retained. One should not assume that ALOG relates to autism in any special way.

Holaday, Moak, and Shipley (2001) tested hypothesized differences in Rorschach protocols between 24 boys with Asperger's disorder, 24 with "other emotional or behavioral disorders," and the normative data. Several expected differences were found on social variables, and, importantly, the authors provided group means

from both of their sample groups for all of the variables in Exner's normative tables, with a stated goal of improving the Rorschach's potential utility for difficult differential diagnosis between Asperger's and other conditions.

Yalof (2006) found several scores in Exner's CS for the Rorschach useful in a detailed case study of a difficult differential diagnosis related to nonverbal learning disability and Asperger's syndrome. Yalof also reported using figure drawings and the TAT in this case study but appeared to use these two measures only impressionistically rather than in terms of formal scoring.

Several reports have considered the use of human figure drawings with ASD cases. Klin, Saulnier, Tsatsanis, and Volkmar (2005) suggested that informal use of drawings may have some use in understanding an autistic child's thinking. Lee and Hobson (2006) obtained intriguing differences between 14 autistic cases and 14 learning disability cases matched on age and verbal ability in certain characteristics of human figure drawings but not on house drawings. Lim and Slaughter (2008) also used human figure, house, and tree drawings to compare 29 Asperger's syndrome cases with 28 typically developing children, matched on gender, age, and nonverbal IQ, and found differences in the human figures but not on the house or tree drawings.

Research literature on use of projective techniques with autistic syndrome disorder cases is not large but it is growing, and it has suggested some possibly fruitful areas for further development. There is a particular need for normative studies of projective indexes with sizable groups of ASD cases. Such information may provide a useful adjunct to the currently established diagnostic instruments. Studies reviewed here also suggest that projectives may help to expand our understanding of the cognitive and social interaction features of ASD.

See Also

- ▶ Clinical Assessment
- ▶ Diagnostic Process
- ▶ Human Figure Drawing Tests
- ▶ Projective Tests of Personality
- ▶ Rorschach Inkblot Test

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Projective Tests

▶ Projective Tests of Personality

Projective Tests of Personality

Martha Bates Jura
Department of Psychiatry, UCLA/Geffen School of Medicine. Private Practice, West Los Angeles, Los Angeles, CA, USA

Synonyms

Projective Tests; Projectives

Abbreviations

AAC	Adolescent Apperception Cards
CAT	Children's Apperception Test
DAF	Draw-a-Family
DAM	Draw-a-Man
DAP	Draw-a-Person
HTP	House-Tree-Person
RATC	Roberts Apperception Test for Children
RAT-2	Roberts-2
SCT	Sentence Completion Test
TAT	Thematic Apperception Test
TEMAS	Tell-Me-A-Story

Description

Comment: This is only a partial list of the projective instruments that might be administered, and projectives are only one kind of personality test which might be utilized in psychological evaluation (Adams & Culbertson, 2009). And while the projective tests are described separately here, they are commonly given along with other psychological instruments to describe cognitive and processing skills as well as social and emotional functioning. In addition, psychological

testing is commonly supplemented by a good deal of other information, including different kinds of rating scales, in order to make diagnostic as well as descriptive comments. The projective tests are given to provide information to professionals and parents regarding the "inner workings" of complex patients, and to help them make diagnoses and design interventions in complicated cases, including autism.

Overview: There are times when parents and professionals ask "Why?" a child is responding as they do or "What?" is going on. Beyond asking for a label to be applied to their youngster, they are asking for a comprehensive description of their functioning and recommendations to make things better. In these cases, projectives may enhance the overall evaluation of an individual with autism.

- "Projective tests" refer to a range of psychological instruments focused on the assessment of personality and personal functioning. There is no real "right" answer. Instead, it is anticipated that the patients will "project" their own thoughts and feelings about themselves and life onto the external world. These projective tasks can include describing the inner life of an imaginary individual, completing a variety of sentences about life, telling stories about common and uncommon situations, and saying what amorphous inkblots look like.
- Although the focus of interpretation of the tests is often on personality issues, the projective tests provide opportunities to assess a range of interacting and overlapping cognitive/processing and social/emotional functions. It is anticipated that the answers on projectives will reveal something about the unique style and perspective of each client. While in general practice projective tests are often undertaken to help clarify psychiatric diagnosis, in the context of autism, they are more often performed to describe psychological and interpersonal functioning and to help individualize understanding and therefore intervention.
- Projective assessment can enrich the evaluation of an individual with autism, by focusing on the challenges they face from their own point of view and by helping professionals to be specific about intervention strategies. This allows mental health specialists to move beyond "making referrals" to professionals or even treatments; it helps parents and professionals to interact with patients and intervene around difficulties in a more fine-tuned way.
- While there is no set agenda or inquiry, questions about patients might include the following: Do they function better in some situations than others? What kinds of situations or stressors seem to throw them? Is the problem more with how they understand things or with how they regulate emotion? What should professionals be aware of as they try to intervene in clinical and treatment settings? What can caretakers do to support and teach them so that they can be more adaptive on an ongoing basis, including at home and in school? Or, does the data suggest some diagnosis in addition to (or other than) autism which the treatment team should be aware of?

Projective testing can provide insights around individuals with autism which can help caretakers care for them better.

Instruments: The projective instruments utilized can include the full range of projective tests used with children, adolescents, and adults. What is appropriate will depend on a number of developmental features, including the intellectual level and language facility of any patient. Because psychological evaluation around autism more commonly involves children and adolescents than adults, the following discussion reflects this fact. While the use of projective testing with individuals with possible autism is not routine, when it is done, it frequently involves a battery of tests that fairly, systematically assesses different ways/levels of organizing (structuring) information as they interact with different kinds of input (visual and auditory) and output (motor and verbal). While the psychologist is interested in how the patient conceptualizes their social relationships and experiences their emotional life, he or she is also interested in the cognitive and processing infrastructure (underpinnings) which facilitates

or impedes adaptive and appropriate social and emotional functioning (Jura & Humphrey, 2009). Particularly in the case of developmental disabilities, the psychologist considers whether responding on a task or item is developmentally appropriate, immature, or deviant. The psychologist assesses whether any disruption is associated with intellectual challenge, skills deficit, or personal difference. The range of tasks presented involves varying demands on graphic ability (including the ability to draw a person or perhaps write a response), but particularly language facility; this can include not only receptive and expressive functions in oral and written form but also pragmatic communication skills as they are depicted or evident during testing. In analyzing responding, the psychologist tries to parse out the various intellectual, processing, social, and emotional factors that might have influenced a client's unusual test protocol. In this analysis, the psychologist remains aware of not only client responding but also test demands. Further, the psychologist tracks client behavior as well as actual answers. Some tests/items go more smoothly than others. This gives the psychologist an opportunity to observe the client's response to facility in some situations, in contrast to cognitive or social challenge in others, and perhaps ensuing frustration. Below, the tests will be described in the order in which they might be administered (basically from most to least structured, with increasing ambiguity and leeway over the session/s). Included in the descriptions are comments about the test characteristics and their utility. While this battery of tests is most likely to be administered during the assessment of autism, the same instruments might be given to an individual who has been diagnosed with autism, but professionals feel the situation is particularly complex and in need of clarification. The interpretation of any projective results is based on the context of the assessment and any guidelines associated with each instrument, as well as the clinical experience of the examining psychologist. Based on the referral issues and goals of the assessment, the examiner may vary the test administration and therefore the analysis, in order to enhance the usefulness of the evaluation as a whole to any particular patient. What follows is a list of the types of projective instruments most often used in exploring autism.

Figure Drawings: On the *DAP*, the examiner asks the client to "Draw a person." There are variations on this direction which allow the rendering to be scored for general intellectual maturity ("Draw a picture of a man, and the very best picture you can.": *DAM*). There are other variations which potentially involve members of the family ("Draw a family": *DAF*) or people and objects ("Draw a house, a tree, and a person": *HTP*). The advantage of the simple DAP is that subsequent to asking the patient to draw the person, the examiner can then ask a number of questions about the individual's behavior, thoughts, and emotions, "as if" this were a real person. The psychologist subsequently notes whether the figure is well drawn or not, and possible cognitive and/or psychological reasons for a limited or disorganized presentation. The examiner also notes any personal themes that are hinted at in comments about how the figure might act, think, or feel and whether the client has the general capacity to imagine the internal life of another person.

Sentence Completion: On the *SCT*, the examiner asks the patient to complete a series of incomplete sentences. There are a number of variations on this, with different sets of sentences provided for different genders and ages. The client can be asked to hear or read each sentence (e.g., asking about family, fears, peers, or dreams) and then to respond by saying or writing their response. The administration/s allows for adjustments around level of development and purpose of evaluation and can provide opportunities for both oral and written language samples. The products can be assessed for formal expressive competence and thought coherence, as well as personal concerns. The examiner most commonly reviews the responses for patterns of responding which suggest the personal approach of the client toward the people around them (including parents and friends), as well as the particular hopes or conflicts which are evident around ordinary life activities.

Thematic Approaches: On the *TAT*, the psychologist asks the patient to tell stories to black-and-white pictures, commonly of people, and usually in ordinary settings. Designed for adults and children, the TAT can be given to youngsters starting at about the age of 7–8 years, depending on a number of developmental and cultural factors. Often, five to ten pictures (out of set of 20) are presented. The pictures may depict children or adults by themselves or in groups, perhaps in a rural scene or within an ordinary house. Some situations are more ambiguous or fanciful. Stories are assessed for cognitive factors such as coherence, as well as social/emotional concerns. The themes are seen in basically dynamic (psychological/personality) terms. A less arousing and challenging test has been designed for children: the Children's Apperception Test. It can involve ten scenes with animals (*CAT*/*CAT-A*) or people (*CAT-H*). Traditionally, the approach has been seen as based on psychoanalytic theory (a theory of psychological development focusing on characteristic themes at different ages/stages). Currently, the analysis is usually based on more generic psychodynamic understandings (general themes of psychological/interpersonal functioning). It is the premise of the thematic instruments that the patient will project their own views and concerns onto the scenes and individuals depicted. For example, the scenes might show a child with a musical instrument or might suggest a parent disciplining a child. The client has a wide variety of choices regarding how they see these situations and tell stories about them. Thematic material presents opportunities for the psychologist to identify patterns of perception and relating which might characterize the client in real life. While the CAT and TAT can be looked at systematically in order to understand the patient's approach, they are not (strictly speaking or very commonly) scored. However, another thematic test can be scored, the Roberts test/s (*RATC*, *Roberts-2*). In fact, because of its systematic approach, the authors deny it is a projective instrument. (For this reason, the publisher has discouraged referring to the second edition instrument as the RAT-2, apparently preferring not to include the word "apperception" in the test title.) All the same, because it involves telling stories which reveals aspects of the client's social perception and emotional approach, it is included here. Sixteen pictures (with parallel versions, depicting Hispanic, Caucasian, or Black characters) are presented; all pictures in a set must be provided because of scoring issues. Other less-used instruments, especially in assessments around autism, are potentially available. The Tell-Me-A-Story (*TEMAS*), which is a multicultural apperception test, can be scored for a range of cognitive, personality, and affective factors. The Adolescent Apperception Cards (*AAC*) comes in two versions (White and Black teenagers); it provides no normative data, and data interpretation is up to the clinical experience and skill of the examiner.

Unstructured Material: On the *Rorschach*, the examiner asks the patient to view ten simple to complex inkblot designs; they are commonly black but sometimes involve red or pastel colors. While this instrument theoretically can be given to younger children (down to 5 years), it is typically administered to individuals about 6–7 years and up. Because of the potential for scoring, it is given according to strict directions and rules, and responses are recorded verbatim for later scoring and analysis. On each blot, the examiner asks the client what the inkblots look like to them ("What might this be?"). This is a test of perception, where the patient first gives one to several responses to each blot and then is asked to explain or justify their percept. The responses can subsequently be scored for factors based on appropriateness of the response (goodness of fit of percept to blot) and the determinants of the percept (e.g., the shape or color of the design), as well as other features of the response (including thought process or subject matter). Different scoring systems have been utilized over the years. According to the more current Exner comprehensive system, the pattern of responding is assessed according to formal response characteristics, importantly providing information around cognitive integration (the ability to pull together information) as well as social and emotional functioning. While the Rorschach can be scored,

it is not uncommon for psychologists to interpret the client's responding without formally scoring the performance, but with knowledge of what scoring might mean to the individual's psychological functioning. Information can be provided regarding the client's reality testing as well as accessibility to human experience, including relationships and emotions. Data can also be provided around the subject's ability to deal with stress and their capacity for disorganization. For example, the psychologist commonly looks at the pattern of responding to learn how much structure the client requires to see the world as others do or to get a feel for how susceptible the client is to dysphoric affect (anxiety/depression).

Interpretation: While comments might be made about the significance of responding on individual tests, the test analysis is usually based on the battery as a whole.

Pattern: It is the assumption of the psychologist that the client's responding on these tasks reflects the ways they habitually perceive situations and organize their experience and, therefore, suggests their typical thoughts, concerns, and approach. No one instrument, or response on any instrument, is definitive. It is the pattern of responding which suggests the way a patient is apt to handle situations and conflicts and to cope in life. Further, the pattern can be understood in cognitive/processing as well as social/emotional terms and levels, with implications for adaptive functioning. For example, the instruments used in a battery of tests can require increasing verbal and conceptual skills and thus have increasing potential for revealing how the client understands their experience. In this context, a patient may have the skill or motivation to provide the short response required on the DAP or SCT, but not to tell or write a more extensive response to the TAT. Further, the SCT may provide only a glimpse of the concerns reflected in more elaborate form on the TAT or on the Rorschach. When the psychologist considers both cognitive/processing and social/emotional reasons for disruption, projective testing can help parents and professionals to better understand "why" the child proceeds as they do in life and help the treatment team to be more specific about the kinds of strategies which might benefit the patient.

Utility: Even when the projective instruments are scored, there is a large discrepancy between the information to be gleaned and any diagnosis to be made. And regardless of scoring, interpretation of projective tests can remain largely subjective. Further, most diagnoses are made based on psychiatric history and current presentation. Projective tests can only be viewed as consistent with the diagnoses being considered, and not as definitive of any particular diagnosis. Projectives provide only one (or several) data point/s among many in the process of assessing any child, adolescent, or adult. This is particularly true in the case of autism, where the diagnosis is made according to criteria falling within specific spheres and is based on history and behavior. All the same, when the patient cannot speculate about what the DAP figure is doing, thinking, or feeling; has difficulty telling a coherent story on the TAT/CAT which includes human motivations or interpersonal interactions; and struggles to identify ambiguous inkblot designs on the Rorschach in the most ordinary ways, one has a richer understanding of how the client approaches life and how challenging he or she finds it. To a certain extent, projective testing can be an assessment of severity – the performance suggests to what extent the client has difficulty making sense of their experience and therefore responding appropriately. Taken together, the test instruments can reflect difficulties with information processing which are seen on intellectual tasks (perhaps tasks which require creating a cartoon narrative or assembling a schematic puzzle) and also on projective instruments (which challenge the client to "make meaning" of a variety of scenes or blots). Together, the projective and cognitive tests can provide a fair assessment of the individual's ability to understand their experience and deal with the passing social scene. They can help to identify specific difficulties that suggest "what" to do and target interventions in the context of the treatment plan.

Appropriateness: It needs to be noted that this discussion about the use of projective tests in

assessing autism is being undertaken at a time when there are doubts about the validity of projective tests in the diagnosis and evaluation of psychological problems and psychiatric illness at all. In this context, a distinction needs to be made between clinical description and clinical diagnosis. Clinical diagnosis according to the Diagnostic and Statistical Manual of Mental Disorders (DSM, IV going on 5) tends to be made based on a constellation of criteria, noted in history and presentation. In the case of some diagnoses, while some intellectual or achievement testing might be relevant (and rating scales might be helpful), even in the case of more emotional disorders, projective testing tends not to be necessary. Clinical description is another matter. While not necessary, projectives might be very relevant in assessing affect, thinking, and relationships in a variety of diagnostic contexts. This can include autism, although the situation is complex. In the case of a developmental disorder like autism, it is legitimate to ask whether it is appropriate to use projective tests which have been developed, understood, and in some cases normed, based on neurotypical populations. It needs to be emphasized that projectives may not be relevant/necessary to making the diagnosis of autism, but they may be very useful in assessing the autistic individual, so long as developmental issues are taken into account. In diagnosing and evaluating autism, prudent practice can involve a range of specific assessments (e.g., adaptive functioning or communication skills), which further help to spell out the affected individual's strengths and weaknesses and to identify areas for intervention. As an extension of this evaluative and descriptive process, projective assessment can help to clarify the individual's functional profile, either as part of an original assessment or as part of a subsequent evaluation. To effectively intervene, it is not sufficient to label the patient as "autistic." The individual is not simply autistic – he or she may manifest their autism in personal as well as characteristic ways – and they may be responding to their own unique history in the context of their developmental disability. In a "comprehensive" evaluation of a complex patient, their unique presentation needs to be understood in order to intervene effectively. Projective assessment can help with this.

Historical Background

Projective testing was developed over the last century for use with adults and subsequently adapted for children. Over time, it has become apparent that the testing technique can help in the understanding of children with atypical as well as typical development, including individuals with autism.

Projective Technique: Any projective test is based on the projective hypothesis: given an ambiguous stimulus with no specific correct answer, the subject's response will reflect their personal interests and concerns. The most commonly used projective instruments were actually designed for adults, with versions more appropriate for children and adolescents being developed later. Formal projective tests date to the early 1900s, when Herman Rorschach, a Swiss psychiatrist, developed the Rorschach technique. Henry Murray, a Harvard psychologist, developed the TAT in the 1930s and 1940s. The initial CAT was developed in the late 1940s, using animals rather than people as characters in human situations based on the theory that children would readily (better) identify with them. In 1965, the human version (CAT-H) was produced. In keeping with the time in which it was developed, the Children's Apperception Test scenes pulled for specific issues psychoanalytically conceived. Currently, the pictures are seen according to more general interpersonal and developmental frameworks. The RATC has followed from the early 1980s, providing a more modern appearance and effective scoring. The Roberts-2 published in 2005 involved the updating of pictures and norms. The test approaches focusing on figure drawing were developed over the last century. Early on, Goodenough (1926) designed a system for scoring a male figure for intellectual maturity on the DAM. Over time (Harris, 1963), and especially since the 1940s, figure drawings

have been of more interest as a projective technique than cognitive test (Koppitz, 1968). Elaborations have included the DAP (where the individual is free to draw either sex or any age), DAF (where the drawing need not be the client's family), and HTP (where the objects requested are drawn on separate pages). The drawings might be supplemented by questions posed to the client. Over time, many versions of the SCT have been developed for different purposes, not only based on age and gender but also clinical population. In general, interpretation of projectives is based on the totality of the situation, including the patient's demeanor as well as what they saw, drew, or said. While early on projective interpretations may have been filtered through psychoanalytic understandings, currently interpretation typically involves more general dynamic, and cognitive, approaches. It should be noted that in a reciprocal development around thinking (and particularly relevant to autism), some psychological tests/tasks address social cognition or perception (e.g., subtests on theory of mind and affect recognition on the NEPSY-II) (Jura & Humphrey, 2009).

Research Data: Over the years, and even early on, there has been considerable debate about the value of projective techniques in psychological research and clinical practice (Blatt, 1975), with particular focus on the Rorschach and its scoring (Wood, Nezworski, Garb, & Lilienfeld, 2001). It is not possible to review or evaluate the extensive literature here, beyond noting that projectives are the subject of controversy. However, as an example of this debate, a range of projective techniques and their scoring (Rorschach and TAT, as well as figure drawings such as the DAP) have been attacked (Lilienfeld, Wood, & Garb, 2000) and defended (Hibbard, 2003). The debate about projectives has raged over the years, with a focus on the valid and ethical use of personality testing in general and the Rorschach in particular (Board of Trustees of the Society for Personality Assessment, 2005). However, psychologists have continued to use projective tests in clinical practice and have continued to explore their usefulness in research. Some of this research has been done around autism, and much of the research around autism has involved the Rorschach. This is probably because more than other projective tests, the Rorschach can be scored, allowing measurements to be compared across groups. Some of the research has involved the similarities and differences: (1) between autistic individuals and controls with similar intellectual levels (Ishisaka, Murasawa, Muramatsu, Kamio, & Toichi, 1997), (2) between students with Asperger's versus other emotional or behavioral problems (Holaday, Moak, & Shipley, 2001), (3) between individuals with Asperger's and high-functioning autism (Ghaziuddin, Leininger, & Tsai, 1995; Nihei & Nihei, 2008), as well as (4) between adults and older adolescents with high-functioning autism versus a reference group with schizophrenia (Dykens, Volkmar, & Glick, 1991). Because this list is not exhaustive and these studies tend to involve small numbers and focused issues, no attempt is made to review the findings here. However, taking the data in their entirety, they suggest individuals with ASD compared to controls have difficulties with cognitive integration as well as coping deficits, less interpersonal responsiveness, and more thinking problems. It is worth mentioning that in one study (Dykens et al., 1991), the schizophrenia index score was elevated among individuals with high-functioning autism, although there was no reason (based on history or symptoms) to believe this was their diagnosis. In this study, lower PIQ scores were related to greater perceptual distortions. These data argue for the necessity of taking all information into account in assessing any case, but particularly around issues of autism. These studies also suggest that larger and more complete comparative studies around Rorschach scoring may provide useful information in understanding many diagnostic groups, including individuals with autism. However, regardless of the usefulness of the Rorschach (or other projective tasks) in distinguishing autism from other conditions (normative or diagnostic), projective techniques can still be useful in (a) helping to understand complications of individual cases of autism, and (b) this understanding can involve identifying comorbid conditions, such as depressed or

disorganized psychological states. For example, the Rorschach may be useful in assessing disorganized thinking in individuals with higher-functioning autism (Klin, Saulnier, Tsatsanis, & Volkmar, 2005).

Psychometric Data

Most projective tests are not literally scored. While some tests may claim to "measure" aspects of personality, often this involves systematic notations and analysis, and perhaps some coding (e.g., the CAT), rather than actual scoring. The notable exceptions are the Rorschach (Exner, 2001) and the Roberts (Roberts & Gruber, 2005). However, because the instruments involve many scales and scores, the issues of reliability and validity are particularly complex. As a result, psychologists should exercise some care in using these instruments, particularly with unusual populations, such as individuals with autism. Just to add to the complications, readers should be aware that new instruments are constantly being introduced and old instruments (including scoring) updated.

Rorschach Technique: On the Rorschach, in the Exner system, each response to every blot is scored according to response location, quality, determinants, contents, organization, and special scores. All scores across the ten blots are tallied. While data regarding normative samples and descriptive statistics are gathered in some Exner publications, data and comments regarding reliability and validity are dispersed among books and papers. Ultimately, any interpretation might reflect the patient's capacity to think in an organized way, their psychological approach around personal concerns and the human sphere, in addition to their basic reality testing. Based on the response scores, a structural summary is compiled which reflects different aspects of the overall performance. These data are used to formulate many interpretive postulates concerning psychological characteristics and functioning. Once the measurements are obtained (which can appear as frequencies, ratios, or percentiles and can include derived scores and special indices), they are compared to tables of descriptive statistics organized by different factors, most importantly age. It is a complex system. Fortunately, the results can be analyzed by computer. Because of the complexity of the scoring and analysis, often clinicians forgo the full scoring and interpretation and interpret the results in some more general way based on their knowledge of scoring procedures as well as clinical experience. Readers should be aware that Exner's Rorschach Comprehensive System (RCS) has been revised and reformulated in an overlapping and co-existing scoring system designated R-PAS (Rorschach Performance Assessment System, manual published 8/11; www.r-pas.org). R-PAS promises an evidence-based and internationally-focused system, with an online feature which allows for updating norms and data as new information becomes available. While there is currently no data speaking to the utility of the R-PAS in the assessment of autism, it is expected to perform similarly to the Exner RCS.

Roberts Test: On the Roberts (RATC, Roberts-2), each story is scored separately on a number of rating categories. Check marks are made indicating that certain psychological factors (on developmental/adaptive and clinical scales) have been present in the stories. These data are summed and analyzed. Profiles (according to age group) are plotted based on these scores, reflecting, for example, reliance on others, basic human emotions, or even atypical responding. Together, the data are thought to reflect the child's feelings and reactions in the interpersonal sphere. The Roberts describes ways for both quantitative analysis (using T-scores) and qualitative interpretation (using clinical judgment). The manual provides descriptive statistics, as well as comments on reliability and validity studies. Because of the scoring, repeat testing can be particularly informative in assessing progress over time. It is acknowledged that only very general clinical inferences can be made and that clinicians must use skill and judgment in interpreting results.

Other Instruments: It is worth noting that other projective instruments might be subject to scoring or systematic analysis. For example, the

DAM can be scored for intellectual maturity. And Rotter, Lah, and Rafferty (1992) have published a scorable version of the SCT. Various scoring systems for the TAT have been developed. However, for the most part, the thematic tests have not been made amenable to strategic scoring or normative data of the sort which would allow for specific data analysis or diagnostic comparisons. All the same, professionals remain interested in more systematic approaches to projective testing, including the scoring of thematic stories (Jenkins, 2008).

Other Issues: Professionals have been concerned not only about the subjective aspect of the analysis of projective data but also the lack of racial sensitivity reflected in the thematic stimuli. Some of the instruments have gone through the trouble to provide pictures which recognize ethnic/racial diversity (TEMAS, ACC, Roberts-2). Professionals tend to assume that the disruptions in relating and communication in the case of autism are so basic that they transcend racial/ethnic considerations. All the same, it would always be prudent to consider whether cultural tensions have exacerbated or distorted social issues as they present in testing and in life.

General Comment: It is often lamented that normative (objective) data are not provided for all projective instruments. However, even when such normative data are available, one still needs to ponder their use. Norms are usually provided on large national samples of typical children and adults. Little useful data are commonly cited describing diagnostic groups, including autism. While such general normative data might facilitate the comparison of a client to population norms, when their data deviate from that of "typical" individuals, one still needs to account for differences. Differences might be associated with autism, or any number of other possibilities, all of which need to be considered.

Clinical Uses

In the context of a comprehensive assessment of autism, projectives are potentially a useful addition. However, much needs to be considered.

- *Diagnostic Clarity*: It is worth reiterating that projective testing may supplement and enrich the understanding of clients, including those along the autistic spectrum, but it may not always be directly relevant to the making of an actual diagnosis. All the same, the profile suggested by projective testing can be seen as consistent with a diagnosis of autism or perhaps can suggest some other (alternative or comorbid) condition which needs further evaluation. These comorbid conditions can include psychosis, depression, or anxiety, all of which may require medical as well as behavioral interventions (e.g., cognitive behavioral therapy). Testing may help to identify the need for attention to particular issues within more common treatments, such as parent training or social skills group. For example, projectives can help make very real the fact the child often does not know what is going on – and how confused, distressed, and disruptive they can become as a result. In this context, caretakers may need to focus on a child's social misperceptions and/or social anxiety (along with general skills deficits) before they can expect compliant or adaptive behavior.
- *Changing Situation*: According to DSM, diagnoses are clinical entities and, for the most part, are made based on criteria related to history and presentation. Autism screening and diagnostic tools have evolved over time. In this context, it needs to be acknowledged that autism rating scales may or may not detect autism, and even observations and interviews have limitations. Parent report is dependent on parent impression, and behavioral observation relies on current behavior. Ultimately, the diagnosis must be made based on a constellation of information. Further, given the changes afoot in the diagnosis of autism spectrum disorder, past impressions about the usefulness of diagnostic procedures and instruments may be in question going forward, and the situation around ASD is apt to be very complicated as the diagnosis is in transition. Projective testing provides a way of assessing the unique features of any client, regardless of

diagnosis; projectives will always be relevant to the kinds of unusual cognition, social disruption, and emotional approach which are characteristic of autism.

- *Case Selection*: While it is tempting to say that projective assessment is most likely to be relevant in the cases of high-functioning individuals who have the capacity to deal with the directions and responding involved in projective testing, in fact projectives are given to individuals of many ages, including young children, chronologically and/or developmentally (Jura & Sigman, 1985). In determining whether a patient along the spectrum might benefit from projective testing, professionals and parents should think in terms of developmental and skill level/s, and whether the child can understand and respond to the actual tasks being proposed. Where an individual (autistic or otherwise) might be dealing with intellectual challenges, the concept of mental age also comes into the interpretative process. The psychologist needs to ask to what extent the client's mental age accounts for his or her projective performance long before they consider other diagnostic possibilities.
- *Beyond Diagnosis*: More recently, in the assessment of diagnosis, the emphasis has been on evidence-based instruments and identifiable treatment outcomes (Ozonoff, Goodlin-Jones, & Solomon, 2005). At the same time, the basic theory behind best practices has been to provide as comprehensive and relevant an evaluation as practically possible in order to individualize and maximize treatment. While Klin et al. (2005) have noted that projective testing may typically be more optional than other assessments in autism, they identify projective approaches as useful with some patients. Particularly based on the battery of projectives described here, the psychologist can comment on an individual's cognitive comprehension, interpersonal style, and personal issues as they impact adjustment. For example, projective testing can help to focus caretakers on issues of pressure, and the need to increase structure and reduce stress. In general, projective testing can provide an opportunity for the adults to begin to comprehend a youngster in his or her own terms and to become sympathetic with their child's dilemma given how they understand the world in which they live. Projectives can help caretakers as well as patients themselves to make better sense of their experience. Sometimes, simply knowing what has been going on in a more specific cognitive, social, and/or emotional way allows caretakers and patients to respond differently and more effectively. Sometimes, very specific features of the testing can prompt further evaluation or specific intervention. At times in extreme cases, particularly where medication is involved, projective testing can be repeated after an appropriate interval of time in order to document whether progress is being made.

It needs to be acknowledged that autism is a complex and heterogeneous condition involving social and communication impairments and deficits, as well as restricted, repetitive patterns of interests, behaviors, or activities. Much needs to be done beyond diagnosing autism in some general way. A full workup often involves a number of assessments (including intellectual and academic achievement tests) in addition to specific evaluations (e.g., with a speech/language pathologist or occupational therapist or neuropsychologist). Certain medical consultations and procedures may also be in order. Any psychological testing, projective or otherwise, is deeply embedded in an elaborate evaluation process in order to assess the needs of any individual with autism and to make appropriate behavioral and medical recommendations.

See Also

- ▶ Emotion
- ▶ Human Figure Drawing Tests
- ▶ Norm-Referenced Assessment
- ▶ Perceptual Development
- ▶ Personality, Clinical Assessment
- ▶ Psychological Assessment
- ▶ Rorschach Inkblot Test

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Projectives

▶ Projective Tests of Personality

Proline-Rich Synapse-Associated Protein 2

▶ SHANK 3

Prompt Dependence

Brian Reichow
Child Study Center, Associate Research Scientist, Yale University School of Medicine, New Haven, CT, USA

Definition

Prompt dependence refers to a situation in which a child or adult does not perform a behavior until they are prompted. Prompt dependency is a common problem for individuals with autism

spectrum disorders (ASDs). Individuals with ASDs frequently only perform skills and behaviors they have acquired when asked to do so by an adult, regardless of whether or not natural prompts are present. For example, you might have a child that knows all of the steps of how to brush their teeth independently, but needs an adult to prompt them before beginning each step. Because prompt dependency is undesirable (we want to teach individuals to perform behaviors independently), it is essential to systematically fade prompts and thin reinforcement schedules to ensure that stimulus control is transferred to naturally occurring stimuli and reinforcers.

See Also

- ▶ Fading
- ▶ Prompt Fading
- ▶ Prompts

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Prompt Fading

- ▶ Fading

Prompt Hierarchy

Brittany L. Koegel
University of California, Santa Barbara, CA, USA

Definition

A prompt hierarchy is the range of cues necessary for an individual to complete a task. It can range from a physical prompt, a gesture, a verbal prompt, or no prompt at all where the individual is able to complete a task independently. A physical prompt can be lightly guiding the child into an activity or a more intense prompt where the child is completely guided in a hand over hand. A verbal prompt also has a range of cues, such as telling the child what to do or say, or just reminding the child, but not directly telling them what is expected. Prompts should be systematically decreased until the child is able to independently complete activities, so that the child does not become prompt dependent (McDonnel & Ferguson, 1989).

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PROMPT System

Megan Lyons
Laboratory of Developmental Communication Disorders, Yale Child Study Center, New Haven, CT, USA

Definition

Prompts for Restructuring Oral Muscular Phonetic Targets (PROMPT; Hayden-Chumpelik, 1984) is a speech therapy technique that utilizes tactile, visual, and positioning cues through manipulation of the tongue, lips, and jaw as well as other structures responsible for speech. The PROMPT technique is done by PROMPT-certified speech-language pathologists who physically guide the speech structures to elicit typical movement patterns for more intelligible speech.

For children with ASD who are sometimes thought to have difficulty with motor-speech production (e.g., apraxia), the use of PROMPTs is hypothesized to improve control over the speech structures, thereby enhancing functional communication skills.

Historical Background

PROMPT was first developed in the late 1970s for children who exhibited difficulties with motor-speech production and who were not responding to traditional therapies. The PROMPT technique stemmed from work done in the fields of neurobiology, cognitive-linguistics, and social aspects which form the basis of this approach. The focus of PROMPT treatment has recently shifted from emphasis on motor placement and planning to broader social-communicative and language goals. However, no empirical support for these broader goals has as yet been provided.

Rationale or Underlying Theory

PROMPT's use of tactile, visual, and positioning cues stemmed from work examining the tactile system (e.g., visual, auditory) in both normal and abnormal brains. It is based on the hypothesis that apraxic difficulties can be addressed by concentrated practice in articulatory postures and movements.

Goals and Objectives

The goal of PROMPT therapy is to improve speech intelligibility and to enhance overall functional communication skills.

Treatment Participants

Originators claim that PROMPTs can be used with infants as young as 6 months old through adulthood. Empirical evidence for this claim is lacking.

Treatment Procedures

PROMPTs are tactile, visual, and positioning cues done by a PROMPTs-certified clinician who guides a participant's speech structures through the movements necessary to produce intelligible speech. The focus is on both the sequence and transitions of movements for speech production through practice.

Efficacy Information

Little empirical evidence to currently support this therapeutic approach

Outcome Measurement

Increased speech-sound production and intelligibility for functional communication

Qualifications of Treatment Providers

PROMPT-trained speech-language pathologists use this therapeutic technique. In addition, there is a parent training program taught by the child's clinician with the focus on helping parents with strategies for working with their own child.

See Also

- Articulation Disorders
- Childhood Apraxia of Speech (CAS)
- Dyspraxia

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Prompting

Brian Reichow
Child Study Center, Associate Research Scientist, Yale University School of Medicine, New Haven, CT, USA

Synonyms

Prompts

Definition

A prompt is something an adult does to help someone perform a behavior (MacDuff, Krantz, & McClannahan, 2001; Wolery, Ault, & Doyle, 1992). The purpose of a prompt is "to cause students to perform the target behavior so that it can be reinforced when the target stimulus is present" (Wolery et al., 1992, pp. 42–43). Prompts give someone clues about how to perform a behavior and varying levels of assistance on how to perform it (e.g., verbally telling a child to say wave good-bye, providing a motor model of waving good-bye, placing your hand behind a child's hand and assisting them in performing the actions of waving good-bye). Prompts are not cues or task directions; cues or task directions inform the child that it is time to perform a behavior, whereas a prompt provides assistance to the child that helps them do the behavior (Wolery et al., 1992). There are many different types of prompts that can be classified in multiple ways (Reichow & Reichow, 2012; Wolery et al., 1992). One way we can describe and classify prompts is with respect to the method of presenting the prompt and how it looks. A second way to classify prompts is along a continuum of how much assistance they provide to an individual (e.g., a gestural prompt provides less assistance than a hand-over-hand prompt). A third way that we can classify prompts is with respect to the behavior of the individual being prompted – i.e., whether or not they perform the correct behavior after the prompt. Additional information on prompts and prompting can be found in the Autism Internet Module website (http://www.autisminternetmodules.org/) on prompting (Neitzel & Wolery, 2010).

See Also

- Prompt Dependence
- Prompt Hierarchy

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Prompts

- Prompting

Pronoun Errors

Jennifer Arnold
Department of Psychology, University of North Carolina, Chapel Hill, NC, USA

Definition

Pronouns are noun phrases that depend on the context for interpretation. For example, first (*I, we*) and second (*you*) person pronouns are defined by the speaker and the addressee, which shifts from one situation to the next. Third person pronouns (e.g., *he, she, they, it*) are also dependent on the context and are typically used to refer to things that are salient in the discourse or environment. Because pronouns interact with many aspects of language knowledge, there are several types of potential errors.

Although grammatical errors are possible (e.g., saying *me* for *I*, or *he* for *she*), most of the literature on the language of Autism Spectrum Disorder (ASD) has focused on pragmatic pronoun errors of several types. One commonly reported error is the use of third person referential expressions (like the speaker's own name, or a pronoun *he* or *she*) instead of the pronouns *I* or *you*. Research has also shown that speakers with ASD sometimes use over-specific expressions, like a name or description when a pronoun would be understandable in context. Another type of error is the use of a pronoun when the referent is not clear in the context. Such ambiguous pronouns are not frequently attested, but have sometimes been found to occur in the speech of individuals with ASD.

An often-cited type of error is pronoun reversal, which occurs when the words *I* and *you* (or *we* and *you)* are switched. For example, Lee, Hobson, and Chiat (1994) report a child saying to his teacher "I'm better now" when the teacher had been sick. This type of error was reported by Kanner (1943) in his seminal case study and since then has been frequently cited as a language characteristic associated with autism. However, contrary to this widespread attention, pronoun reversals are neither a defining characteristic of autism nor even a frequent one (e.g., Jordan, 1989; Lee et al., 1994).

See Also

▶ Language
▶ Pragmatics
▶ Pronoun Reversal
▶ Pronoun Use

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Pronoun Reversal

Jennifer Arnold
Department of Psychology, University of North Carolina, Chapel Hill, NC, USA

Definition

Pronoun reversal errors occur when the speaker switches the words *I* and *you*, or *we* and *you*.

For example, Lee, Hobson, and Chiat (1994) report a child saying to his teacher "I'm better now" when the teacher had been sick. This type of error was reported by Kanner (1943) in his seminal case study, and since then has been frequently cited as a language characteristic associated with autism. However, contrary to this widespread attention, pronoun reversals are neither a defining characteristic of autism, nor even a frequent one (e.g., Jordan, 1989; Lee et al., 1994).

See Also

- ▶ Language
- ▶ Pragmatics
- ▶ Pronoun Reversal
- ▶ Pronoun Use

References and Readings

Jordan, R. R. (1989). An experimental comparison of the understanding and use of speaker-addressee personal pronouns in autistic children. *British Journal of Disorders of Communication, 24*, 169–172.

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Pronoun Use

Jennifer Arnold
Department of Psychology, University of North Carolina, Chapel Hill, NC, USA

Definition

Pronouns (e.g., *I, you, she, he, it, they, us, me, him, her, them, this, that*) are noun phrases that typically refer to people or things that are easily understood in context. Pronouns contain very little explicit lexical information. For example, personal pronouns in English encode gender (e.g., *she* vs. *he*), number (e.g., singular *I* vs. plural *we*), and person (e.g., first person *I* vs. second person *you* vs. third person *she*). Some languages (like Spanish) use null reference forms that are absent completely (e.g., *canto* = *I sing*).

Pronouns therefore depend on the physical context, discourse context, or background information for interpretation. First and second person pronouns (*I, we, you*) change their referents depending on who is speaking. Third person pronouns (e.g., *he, they, it*) also depend on the context for appropriate usage and interpretation, and are generally considered to refer to the most salient or accessible entity in the context that matches the grammatical properties of the pronoun. This situational dependence requires pragmatic knowledge, making pronoun use an area of potential difficulty for those with Autism Spectrum Disorder (ASD).

Historical Background

In Kanner's (1943) initial description of the characteristics of autism, he noted that some children with autism used pronouns inappropriately, for example, using *you* instead of *I*. For example, his first case study, Donald, was reported to say "you did not fall down" at age 5, to describe a situation where he himself nearly fell. Since then, similar errors have been widely attested. However, despite the salience of these errors, systematic studies of pronoun use and understanding have found that pronoun reversals are neither ubiquitous nor as frequent as Kanner's focus on them would suggest (e.g., Jordan, 1989; Lee, Hobson, & Chiat, 1994).

Current Knowledge

Pronoun Use in Typical Speech

The ability to use pronouns correctly requires both (1) grammatical knowledge and (2) pragmatic knowledge about their function. Grammatical knowledge is required because pronouns in languages like English mark properties of the referent (e.g., person, number, gender), as well as its syntactic (i.e., structural) role, for example, using *we* in subject position and *us* in object position.

Speakers use this grammatical knowledge to select the correct pronoun when speaking, for example, *he* versus *she*, and to successfully interpret pronouns during language comprehension.

Pronouns are also unusual in the degree to which their interpretation is relative to the speaker and context. This requires language users to understand the pragmatic function of pronouns in order to successfully establish reference. That is, the intended referent of a pronoun changes from one situation to the next. It is this aspect of pronouns that has received the most attention in the literature about language and ASD.

The relativity of pronouns is especially salient for *I*/*we* and *you*, which have different referents depending on who is speaking. But the context is also important for the appropriate use of third person pronouns, like *he, they,* or *it*. First, the context determines whether a pronoun is appropriate at all, as opposed to some other form of reference. For example, I could say *he, my cat, Julio, the brown and white cat,* or *that furry creature* to refer to the same entity. Speakers must use their pragmatic knowledge about appropriate language use to choose the best expression for a particular linguistic and social context. A too explicit expression sounds awkward and redundant (e.g., *Julio ate kibble for breakfast. Julio went outside. Julio took a nap*), whereas a too general expression is ambiguous (e.g., *My cat and my son were playing. He fell down.*) Listeners also must rely on pragmatic knowledge to interpret pronouns. All forms of reference are ambiguous at some level (e.g., there are many Julios in the world), but pronouns are especially ambiguous. One view is that appropriate production and comprehension of pronouns relies on representations of the knowledge and attention of one's interlocutor, which are related to theory of mind (e.g., Bard & Aylett, 2004; Bard, Anderson, & Sotillo, 2000; Gundel, Hedberg, & Zacharski, 1993). It is also well established that pronoun use is highly constrained by the discourse context, which does not necessarily require theory-of-mind representations. For example, pronouns tend to be used for reference to recently and prominently mentioned things (Arnold, 2008).

Pronouns thus participate in a complex set of grammatical and pragmatic knowledge about language use. Some of this knowledge is absolute, like the fact that *I* is used for the speaker and *you* is used for the addressee. Thus, errors of pronoun reversal can be unambiguously identified if the speaker's intended meaning is known. But much of this knowledge is gradient. For example, in the passage above about Julio, the repeated mention of his name is awkward, but not ungrammatical. As an example of a too general expression, consider a quote from Kanner (1943): "The father made a special point of mentioning that Donald even failed to pay the slightest attention to Santa Claus in full regalia" (p. 218). If *Donald* were replaced by *he,* the referent would be somewhat ambiguous, but still understandable in context. Thus, assessments of an individual's ability to use pronouns need to take into consider the range of possible alternatives.

Pronoun Use in Autism Spectrum Disorder

Individuals with ASD often use language differently than their peers. These differences can relate to pronouns and the broader system of reference in several ways. Three potential areas of difference are discussed here: (a) Pronoun reversal, (b) treating first person references as third person, and (c) the pragmatically appropriate use of pronouns within the referential system more broadly, with a focus on third person reference (e.g., *he, she, it, they*).

Pronoun reversal. Much attention has been given to reports that individuals with ASD sometimes make errors referring to themselves. One such error is pronoun reversal, using *I* to refer to one's addressee, and *you* to refer to oneself. Lee et al. (1994) described an incident where a boy's teacher had just returned from sick leave, and he said to her "I'm better now," and another case where a 19-year-old subject said "Thank you for seeing you, Tony" at the end of the experimental session. These utterances are notable because they are readily identified as errors. Pronoun reversal errors also attested for typically developing toddlers, but are relatively rare, and tend to disappear by around 3 years of age (Clark, 1978). However, one should not conclude that these

errors occur in all instances, nor even that they occur for all children with ASD.

For example, Jordan (1989) found that the children with ASD in her study had some difficulty producing, but not understanding, pronouns. However, the most common errors were a name instead of you or I, or using the wrong case pronoun, and not the reversal of you and I. Even the three subjects (out of ten with ASD) in her study who did produce at least one reversal did not do so all the time. Similarly, Lee et al. (1994) found a few cases of pronoun reversal in their ASD group, but not their developmental delay group. However, this was not the most frequent type of pronoun error, and there were almost no errors in comprehension of personal pronouns.

Nevertheless, pronoun reversals are attested more often for individuals with ASD than other groups. Several explanations have been proposed. One view is that reversals reflect a difficulty representing one's social identity, or distinguishing oneself from others (Charney, 1980; Lee et al., 1994). Another possibility is that it results from the use of echolalia, that is, the tendency to repeat others' utterances, especially the ends of utterances where "you" is more commonly found than "I" (Bartak & Rutter, 1974). Other authors have suggested that the correct use of personal pronouns is related to joint attention (Loveland & Landry, 1986), or attention to the linguistic exchanges of others (Oshima-Takane & Benaroya, 1989).

Treating you and I as a third person. Another pronoun error often associated with ASD is the use of proper names or third person pronouns instead of *I* or *you*. This type of error emerged in Lee et al.'s (1994) study, which used questions to elicit answers that would most naturally use *you* or *I*. A frequent type of error was the use of the experimenter's name or the participant's own name instead of a pronoun. However, it is worth noting that these were equally frequent in both the ASD and the comparison group of children with mild intellectual disability. Jordan (1989) also found that children with ASD frequently used their own name or the experimenter's name instead of *you* or *I,* and in this regard differed significantly from both the group with intellectual disability and the typically developing group.

The use of a proper name or third person pronoun is not semantically incorrect, in that it does communicate the intended referent. However, it does not follow the pragmatic rules of language use, that is, the appropriate use of language in context. Thus, using a third person reference fails to adopt the convention of marking the speaker and addressee as the participants in the conversation, which is an important part of marking one's perspective in discourse.

Pragmatically appropriate third person reference. Pronouns are an important part of language because they allow us to refer to people and things, but they do not merely carry information about referential identity. The use of a pronoun also communicates something about the speaker's perspective on the referent or the situation. Pronouns tend to be reserved for things that are highly salient in the situation, whereas names and descriptions tend to be used for reference to less prominent entities.

This means that learning how to use pronouns appropriately includes learning that they are meant to indicate salient referents, and learning how to select the best reference form for the current situation. This choice applies mostly to third person references (e.g., *Mia* vs. *she*). By contrast, the discourse participants (*I, you, we*) are naturally salient in the context, and thus always should be referred to with pronouns.

Analysis of typical language use has identified numerous discourse properties that pattern with the use of pronouns. Speakers and writers typically introduce a character or object with a full name or noun phrase. Subsequent references can be pronominal, depending on a variety of factors stemming from the discourse context and the speaker's judgment about how interpretable the pronoun is. For example, pronouns are used more often for things mentioned recently, and especially in prominent syntactic positions, like grammatical subject (see Arnold, 2008).

The question is whether individuals with ASD produce third person reference differently than other groups of speakers. Differences could

emerge as a tendency to produce over-ambiguous speech, for example, using a pronoun in a context where the referent is not clear. Alternatively, differences could reflect a tendency to use overspecific forms, avoiding pronouns when they would be appropriate. Evidence has demonstrated that highly verbal individuals with ASD are generally sensitive to discourse constraints, and observed differences are a matter of degree, not complete failure to understand the referential system. Where differences emerge, they are primarily in the direction of overspecification, but some studies have also reported increased ambiguity.

For example, Arnold, Bennetto, and Diehl (2009) analyzed spoken narratives produced by children and adolescents with ASD, and a well-matched group of their typically developing peers. They found that pronoun use was driven by the discourse context for both the younger (age 9–12) and older (age 13–17) groups, both with and without ASD. That is, pronouns were used most often when the referent had been last mentioned as the grammatical subject of the preceding utterance, and new introductions were almost always with a full name or description. But at the same time, the younger children with ASD displayed a slight bias toward overspecific forms. This is consistent with the observation of Baltaxe (1977) that many adults with ASD used referential expressions that were more specific than needed, and with evidence of using names instead of first and second person pronouns (see above). This tendency emerged only in those cases where the discourse context was less constraining, which highlights the importance of assessing referential behavior within the context of a fine-grained discourse analysis. As another example, Colle, Baron-Cohen, Wheelwright, and van der Lely (2008) examined referential choices made by adults in a story-telling task. The adults in both the ASD and control groups were similar in their use of explicit expressions to introduce or reintroduce characters, and for the most part used pronouns to maintain reference. At the same time, the autism group was relatively less likely to use pronouns for maintenance than the control group, again showing a bias toward overspecific reference.

Some studies have also reported that speakers with ASD may use ambiguous reference more than comparison groups. For example, the participants in Colle et al.'s (2008) study were more likely to use ambiguous pronouns for reference to one of the characters. Similarly, Tager-Flusberg (1995) asked children to tell a story from a picture book. Children in the ASD group were more likely to introduce a new character for the first time with a pronoun.

Our understanding of how reference production is related to ASD also comes from studies on related aspects of reference, such as producing additional description when necessary. When the referent is salient or identifiable, a simple expression is sufficient (e.g., *the cup*), whereas additional description is necessary when a second possible referent is in the context (e.g., *the short cup*). Nadig, Vivanti, and Ozonoff (2009) found that the children with autism in their sample displayed individual differences. Some, who had higher structural language levels, behaved just like the typically developing group, adapting their expressions to both their own and their partner's perspectives. However, some failed to adapt their expressions at all, and some only adapted to their own perspective.

In sum, sometimes ASD is associated with errors in pronoun use, in particular the overuse of names or labels instead of the pronouns *you* and *I*, and on occasion the reversal of first and second pronouns. At the same time, many individuals with ASD have demonstrated sophisticated abilities to use pronouns appropriately within the discourse context.

Future Directions

Research has established that the pragmatic use of pronouns and other referential expressions is sometimes affected by ASD. Yet it appears that pronoun use strategies are not the same for all individuals with ASD. Future research is needed to better understand individual differences in referential strategies, and the range of both successes and difficulties with reference associated with ASD. To this end, detailed linguistic

analyses are needed in order to precisely identify the contexts in which speakers with ASD may use pronouns and other forms of reference differently than other groups.

Further research is also needed to better understand whether ASD impacts the comprehension of pronouns. Question-answering studies have found good pronoun comprehension among individuals with and without ASD, but these say little about moment-by-moment processing. Further work is needed to assess whether individuals with ASD are sensitive to the appropriateness of particular types of referential forms in a given context, and how referential processing proceeds in real time.

See Also

- ▶ Echolalia
- ▶ Language
- ▶ Pragmatics
- ▶ Pronoun Errors
- ▶ Pronoun Reversal

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Pronunciation

- ▶ Articulation

PROSAP2

- ▶ SHANK 3

Prosocial Behavior

Geralyn Timler
Speech Pathology & Audiology, Miami University, Oxford, OH, USA

Definition

Prosocial behaviors include a range of positive and friendly behaviors that individuals display toward others. In children, these behaviors include sharing, helping, and taking turns with others, cooperating with others to achieve a common goal, and negotiating with others to reach a mutually acceptable compromise when a conflict occurs (Bierman, 2004; Grusec, Davidov, & Lundell, 2002; Ladd, 2005). Prosocial behaviors are important to children's success in peer interactions. Children whose words and actions are perceived as prosocial are viewed more favorably by their peers than those whose words and actions are viewed as indifferent, passive, hostile, or irrelevant (Coie, Dodge, & Kupersmidt, 1990). Most social communication interventions aim to increase prosocial behaviors and may include specific activities to teach children to produce polite requests, compliment each other, respond to other's comments and questions, and resolve conflicts by staying calm and suggesting a compromise.

See Also

- ▶ Circle of Friends
- ▶ Peer-Mediated Intervention
- ▶ Pragmatic Language Impairment
- ▶ Pragmatic Language Skills Inventory
- ▶ Pragmatics
- ▶ Social Communication
- ▶ Social Language Development Test
- ▶ Social Skill Interventions
- ▶ Social Skills Improvement System
- ▶ TRIAD Social Skills Assessment

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Prosocial Behaviors

- ▶ Social Skills Improvement System

Prosocial Skills

- ▶ Social Skills Improvement System

Prosody

Lisa Edelson[1] and Joshua Diehl[2]
[1]Department of Psychology, Boston University, Boston, MA, USA
[2]Department of Psychology, University of Notre Dame, Notre Dame, IN, USA

Definition

Prosody refers to the rhythm and melody of the voice, including intonation, stress, and pauses. Prosody can provide cues to lexical meaning, (e.g., CONtract vs. conTRACT), grammatical structure, emphasis (e.g., I want THIS cookie), affect, and structure in discourse (e.g., asking a question or making a statement), among other functions.

Historical Background

In their initial descriptions of the disorder, both Leo Kanner and Hans Asperger noted the presence of differences in tone of voice used by children with Autism Spectrum Disorder (ASD). Asperger noted that the children with this disorder could sound too soft and far away, shrill, and have intonation with a singsong quality or that did not go down appropriately at the end of a declarative statement. Descriptions of prosody have ranged from flat or monotonous to variable, pedantic, and/or having a singsong quality. Because of this variability in symptom presentation across the autism spectrum, it has been historically difficult to identify which characteristics of prosody production are "autistic-like" As a result, it has been difficult to conduct research on the topic, and more notably, few researchers have attempted to develop interventions to directly address prosodic differences.

Early attempts to characterize prosodic performance in individuals with ASD divided prosody skills into broad categories such as "linguistic" prosody (i.e., types of prosody that communicate sentence structure, discourse structure, word meaning, among others) and "affective" prosody, based on the theory that children with ASD would have difficulty with judging emotions in tone of voice. More recently, researchers have focused on the nuanced nature of prosody comprehension and production, and its integration with words, grammatical rules, gestures, and facial expression. Notably, researchers have focused on profiles of performance across pragmatic communication skills, and its potential as an early diagnostic marker for ASD.

It should be noted that knowledge about prosody has historically lagged behind other areas of language research (such as syntax or semantics) in both typical and disordered populations. This lag in research has primarily been because of its complexity as a construct, difficulties in assessment, and its variable presentation in communication. Whereas syntax follows a set of rules that are consistently observable by most native speakers of a language, prosodic cues can be interpreted differently by different people, especially when the prosody is in conflict with other semantic or contextual information (e.g., irony or sarcasm). Similarly, research on prosodic performance in individuals with ASDs has been hindered by the relatively small (amongst communication domains) amount of research on normative samples.

Current Knowledge

Prosody refers to the patterns of rhythm, intonation, and stress of the voice. Prosody is considered to be a *suprasegmental* element of speech, meaning that one prosodic pattern can include more than just one sound or word, but potentially an entire sentence or conversation. Prosody has many functions in language and can be used to clarify linguistic, pragmatic, and affective aspects of an utterance.

At the word level, prosody marks lexical and syntactic distinctions. *Lexical stress* can affect the meaning of the word, depending on which syllable is emphasized. For example, the word, "CONtract," refers to a legally binding document, whereas "conTRACT" is a verb meaning "to shrink." Individually stressed words within a sentence can also function emphatically (e.g., "It was a REALLY big fish!"), or contrastively, to draw attention to a difference from a word in a previous clause or sentence (e.g., "I have a blue car and she has a GREEN one.") or repair a miscommunication (e.g., "Did you order chocolate cake?" "No, I ordered chocolate ICE CREAM."). These uses are sometimes called "linguistic" or "grammatical" prosody to differentiate them from prosodic patterns that express affect (or "affective" prosody).

At the sentence level, prosody can have both grammatical and affective/pragmatic functions. Grammatically, prosodic cues can be used to identify clausal boundaries, clarifying sentences that might otherwise be ambiguous. For example, by altering the rhythmic pattern of pauses in a sentence, we can change "The man (pause) tapped the woman (pause) with the cane." (i.e., the man used a cane to tap a woman) to "The man tapped (pause) the woman with the cane." (i.e., the man tapped a woman who uses a cane).

Sentence-level prosody can also convey social and affective information. Intonation patterns often indicate the pragmatic function of a sentence: whether it is a statement or a question, and whether it is intended literally or sarcastically. Further, prosodic cues can communicate the speaker's affective state, providing additional subtext to an utterance. For example, "My sister will be in town next week" could be said with excitement or with dismay, with each version shedding light on the relationship between the speaker and his sibling, and suggesting what the appropriate response might be. Listeners can also use prosody to identify a speaker's accent, which can provide information about regional origins and social status.

Prosodic Development

While most adults can use prosody for all of these purposes, our knowledge of the developmental trajectory of these skills is in its infancy. Research on prosody is particularly difficult to conduct due to the wide variety of acoustic cues that can be used to indicate stress, such as pitch (fundamental frequency) and intensity changes, vocalic lengthening, and pauses. Further, it is impossible to completely separate prosodic cues from the lexical content of an utterance, and thus prosody must be considered in context.

In typically developing children, prosody is one of the earliest (if not the earliest) social abilities to develop. Fetuses can hear and respond to vocal patterns in utero. Within the first few days after birth, children can differentiate between their mother's voice and other voices. Moreover, newborns are able to differentiate between the prosodic patterns of their native language and a foreign language.

Prosodic features of language are present very early in language production. Even at the babbling stage, children produce sentence-like strings of sounds that conform to the intonation patterns of their native language. As children incorporate words into their vocabulary and begin to combine them into sentences, these utterances tend to have not only the word order, but also the prosodic patterns of adult speech. In some areas of language acquisition, as in the case of forming questions, the use of prosodic cues precedes that of syntactic cues, with children using a rising intonation to indicate a question ("You go store?") before they are able to invert the subject and object ("Is he happy?") or insert auxiliaries ("Do you like ice cream?").

In the domain of comprehension, typically developing children are able to glean affective information from prosodic cues from infancy. Even before they have the vocabulary to understand their mother's speech, they are able to decipher whether she is happy or angry from her tone of voice. Later, children are able to use lexical stress cues to differentiate between words that contrast on stress patterns alone. By school age, children can use intonation patterns to interpret syntactically ambiguous sentences. Finally, around age 8, children begin to be able to understand the more complex pragmatic prosodic cues, such as sarcasm, a meaning in which prosody contrasts with lexical meaning and/or contextual meaning to provide an alternate mental state. Prior to this, most children will interpret all statements literally, regardless of tone of voice.

Prosody in Autism Spectrum Disorders

Prosodic impairments are common across individuals with ASDs, including individuals who have intact structural linguistic abilities. In production, individuals with autism are often noted for having unusual prosody in their speech, either for speaking in a flat, monotone, or robotic manner or for having an exaggerated, or otherwise odd style of speaking. In studies examining stress patterns, participants with ASD have been shown to be more likely than controls to misassign stress, or to accent multiple elements in a sentence, rather than highlighting only key words.

Individuals with ASD seem to have an uneven profile with respect to comprehension of prosody. Several studies have shown impairments in using prosodic cues to understand affect and mental states. Studies have been more mixed with respect to other linguistic or pragmatic uses of prosody, with findings generally suggesting more impairment in sentence-level processing, with more spared prosodic comprehension for word stress and question contours. Findings for differences in prosodic production have been

surprisingly limited, despite the pervasive nature of clinical reports of prosodic differences, and there is a need for more studies of subtle acoustic differences in prosodic patterns produced by individuals with ASD.

Assessment and Treatment of Prosodic Disorders

Prosodic disorders are notoriously difficult to assess objectively, and to treat. Clinically, prosodic impairments are often diagnosed based on the therapist's subjective judgments of "oddness," and a determination of whether any atypical speech patterns can be accounted for by other articulatory or phonological disorders. A few standardized measures have been developed to test prosodic abilities in children, including the Prosody-Voice Screening Profile (PVSP) and the Profiling Elements of Prosodic Systems for Children (PEPS-C). Generally, prosodic disorders are identified in the domain of language production. To this end, the PVSP analyzes samples of a child's natural speech and compares them to a normative database to find atypical prosodic patterns. However, to score this test, one must be able to transcribe prosody, which requires a great deal of time and training, making it less practical for typical clinical settings. The PEPS-C is a more structured assessment, which makes it possible to elicit language that uses prosody in a variety of functions such as phrasing, focus, and affect. This test includes both a production and a comprehension component using audio CDs and thus can be used to test receptive as well as expressive prosodic abilities.

There is currently no standard treatment for prosodic disorders. Speech therapists might model appropriate speech patterns for their clients, or use Melodic Intonation Therapy, which first presents pitch patterns and rhythms with humming, and progressively approximates natural speech. Other therapies have been developed that focus on specific areas of prosody such as stress placement as well. Future research should focus on developing and testing interventions for prosodic impairments as this is an area that has been somewhat neglected in treatment plans. For high-functioning children with autism, odd prosody can be an obstacle in gaining social acceptance with peers.

Future Directions

Future research should utilize acoustic characteristics of the speech signal to characterize some of the subtle differences in prosody production that children with ASD exhibit. Future studies should focus on developing assessment techniques and interventions for prosodic impairment. Furthermore, automatic analysis of the acoustic signal is promising for evaluation and instant feedback during therapy. In all areas of research, assessment, and treatment, it will be very important to be sensitive to individual differences in prosodic abilities and deficits, as these differences might be informative (i.e., a "bellwether") for an individual's specific cognitive/linguistic strengths and weaknesses.

See Also

- ▶ Communication Assessment
- ▶ Communication Disorder/Communication Impairment
- ▶ Intonation
- ▶ Monotone
- ▶ Paralinguistic Communication Assessment
- ▶ Pragmatic Communication
- ▶ Pragmatics
- ▶ Social Communication

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Prosody-Voice Screening Protocol

Sue Peppé
High Appin, Tynron, Thornhill, UK

Synonyms

PVSP

Definition

The Prosody-Voice Screening Profile (PVSP) is a test of prosody production. The PVSP collects spontaneous speech in order to assess the prosodic and vocal characteristics of the speaker. Phrasing, rate, stress, pitch loudness, and vocal quality are transcribed and judged for appropriateness. It is suitable for use with children and adults; assesses expressive but not receptive prosodic ability; and has normative data to which comparisons can be made.

See Also

► Intonation
► Paralinguistic Communication Assessment
► Prosody

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Prospective

▶ Longitudinal Research in Autism

Protection and Advocacy System (P&A)

Susan Luger
Susan Luger Associates, New York, NY, USA

Synonyms

Client assistance program

Definition

The Protection and Advocacy (P&A) System is comprised of a nationwide network of organizations that has been mandated by the Congress to protect and advocate for the rights of people with disabilities. These organizations provide legal representation and other advocacy services. The goal of P&A is to provide people with disabilities, including children and adults on the autistic spectrum, equal access to employment opportunities, education, public services, healthcare, housing, and public accommodations. P&A organizations investigate abuse, neglect, and barriers that prevent disabled people from becoming productive and independent members of their community. Protection and Advocacy agencies are located in every state and are the primary nonfederal enforcers of disability rights statutes. These organizations may be part of the government or private not-for-profit organizations.

See Also

▶ Advocacy
▶ Disability
▶ Employment
▶ Employment in Adult Life
▶ Employment Specialist

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Protodeclarative

Cheryl Smith Gabig
Department of Speech-Language-Hearing Sciences, Lehman College/The City University of New York, Bronx, NY, USA

Synonyms

Comment; Communicative act

Definition

A primitive speech act used to establish social interaction and direct a caregiver's attention to an object, action, or entity. It is referred to as a protodeclarative because the directed attention

to an object, action, or entity by the child acts as a comment in a communicative exchange. A protodeclarative may take several gestural forms including pointing to, showing, or giving of objects. The gesture may or may not be accompanied by a ritualized vocalization. The protodeclarative appears in typically developing children between 8 and 9 months of age. It is thought to demonstrate a shift in cognitive-linguistic development in that its use reflects the child's conscious intent to initiate social interaction and establish joint attention to an object, action, or entity with a caregiver.

Children with autism engage less often in the intentional use of protodeclarative gestures such as pointing, showing, and giving, meant to establish or maintain social interaction and joint attention. There is evidence that the lack of intentional communication and bids for social interaction are related to a failure of various underlying mechanisms supporting development of preverbal communication.

See Also

- ▶ Communicative Functions
- ▶ Gestures
- ▶ Joint Attention

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Protoimperative

Cheryl Smith Gabig
Department of Speech-Language-Hearing Sciences, Lehman College/The City University of New York, Bronx, NY, USA

Synonyms

Communicative act; Intentional, ritualized request

Definition

A protoimperative is a primitive speech act used as a request for objects or actions. A protoimperative may take the form of a vocalization, a conventional gesture, or a combination of both. The protoimperative, as a ritualized request, appears in typically developing children between 8 and 9 months of age and is thought to demonstrate a shift in cognitive-linguistic development in that its appearance reflects the child's conscious intent to communicate to the caregiver to act as an agent to attain an object or perform an action. The protoimperative often takes the form of a pointing gesture or a whole-hand or swiping motion toward the desired object, frequently accompanied by a ritualized vocalization, such as a whine or grunt. Eye contact is usually established between the child and the caregiver during or following the ritualized request act. The intentional gestural communication and vocalization occur away from the object or action and are considered to be distal in nature.

Children with autism frequently do not develop a protoimperative communicative function characterized by the use of distal communicative gestures, such as pointing while vocalizing. Rather, a request function may be accomplished via a contact gesture, such as leading a caregiver by the hand toward the desired object/action, or placing the caregiver's hand on the object. Protoimperatives using distal signaling via conventional gestures, vocalizations, and eye contact are often absent.

See Also

- ▶ Communicative Functions
- ▶ Gestures
- ▶ Joint Attention

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Protowords

Andrea McDuffie
M.I.N.D. Institute, Sacramento, CA, USA

Synonyms

Phonetically consistent form; Quasi-words; Vocable

Definition

Protowords are word-like forms produced by young children as they transition from prelinguistic to linguistic communication (i.e., the time at which children produce intelligible single words that approximate conventional pronunciation). In typical development, protowords emerge between 10 and 12 months of age and are made up of the types of sounds that children use when babbling. Common examples of protowords are mama, dada, and baba. Protowords differ from repetitive babbling in two critical ways: (a) protowords are limited to one to two syllables in length and (b) protowords are used consistently by the child to refer to a corresponding object, person, or event in the child's immediate context. Protowords also have been referred to as repeatedly occurring phonetic units loosely bound to specifiable contexts.

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Protriptyline

Lawrence David Scahill
Nursing & Child Psychiatry, Yale University School of Nursing, Yale Child Study Center, New Haven, CT, USA

Synonyms

Vivactil

Definition

Protriptyline is in an older class of antidepressants known as tricyclics. The term "tricyclic"

refers to the three-ring structure of this class of antidepressant medications. These medications are not used as commonly as in the past as they have been largely replaced by the SSRIs. Protriptyline is predominately a norepinephrine reuptake inhibitor.

The tricyclic antidepressants have several adverse effects in common including dry mouth, urinary retention, constipation, nausea, increased heart rate, dizziness, and, at higher doses, confusion. The tricyclic antidepressants also carry some risk of altering the electrical conduction in the heart. They are well known to be fatal on overdose due to their potential for causing cardiac arrhythmia. Because of their known toxicity at higher doses, treatment with tricyclic antidepressants requires blood-level monitoring and electrocardiogram monitoring as well. Finally, the tricyclic antidepressants are also vulnerable to drug-drug interaction. For example, some medications such as SSRIs or certain antibiotics may interfere with the breakdown of tricyclic antidepressant medications. The interference of metabolism of the tricyclic can cause a sharp increase in the blood levels of the tricyclic antidepressants and increase the vulnerability to toxic effects. The tricyclic medications have not been well studied in children or adults with autism.

See Also

► Antidepressant Medications

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Provider Training

Jacqueline Kelleher
Education, Sacred Heart University Isabelle Farrington School of Education, Southern Connecticut State University, Fairfield, CT, USA

Definition

Provider training is the professional development or technical assistance offered to or participated in by providers to develop competencies and proficiencies on a particular topic or in a specific area necessary for ensuring services, supports, and programming are delivered appropriately and with fidelity. Provider training often includes a variety of topics, such as the characteristics of autism (including diagnostic, cognitive, sensory, and attentional features), functional assessment (including behavior and adaptive skills), instructional strategies (including applied behavior analysis or ABA techniques such as discrete trial training, structured teaching, and incidental teaching), data collection, teaching functional communication and social skills development, and transitioning into employment settings. Provider training also extends to higher education and other agencies preparing preservice professionals.

A provider is someone whose business is to supply a particular service or commodity or a person or group of people who plans and delivers a program. In the area of autism, providers may include but are not limited to the following domains: health care (medical, dental, physical, mental health, pediatric), special education, related services, school personnel, developmental services, rehabilitation, birth to three, community-based staff, post-secondary disabilities units, developmental specialists, and parents or legal guardians. Further, federal requirements under the Individuals with Disabilities Education Act call for qualified providers in the area of special education and related services. Related service providers can include, in addition to the aforementioned areas, professionals in

audiology, early intervention, physical/occupational therapy, speech-language pathologists, recreation, school health/nursing, and social work. Providers can deliver direct services, usually referring to hands-on interactions between the provider and client or student, or indirect services, which may involve consulting with or supervising other staff in the delivery of services.

Historical Background

Though *ASD* is a familiar term in the early twenty-first century, it was only recognized in the 1940s as a severe disability. Since that time, there has been extensive interest in and professional activity concerning autism.

Current Knowledge

It is well understood among the experts developing and delivering provider training in the area of autism spectrum disorders that those receiving the training are prepared on the nature of *ASD* (etiology, incidence, range of symptoms, possible medical concerns), early identification, intensive programming, comprehensive curricula, systematic instruction, objective assessment, providing structured and predictable environments, delivering evidence-based practices and interventions for ASD, strategies and tools for implementing best practices across a multitude of settings (classroom, home, workplace, community, etc.), transition planning, and knowledge of facilitating peer relationships. Moreover, providers need to be familiar with terms and definitions used by professionals and consultants developing programs and supports in other service areas in order to best plan for and support the individual with ASD.

School-based personnel need training in understanding the characteristics of ASD and providing supports for individuals with the disorder. Further, it is recommended that school administrators should understand the educational needs of students with Autism so they can provide a quality program using a variety of service delivery models for children across the age span. Students with autism benefit from individualized and often intense educational services beginning early in life, services that require specialized training for those providing educational interventions with the following characteristics: (1) behaviorally based; (2) carefully planned and monitored instruction involving task analyses of skills, individualized incentives, goals embedded in routines and activities, and adequate intensity and quality; (3) ongoing, planned opportunities for interaction with typical peers; (4) need-based supports and intervention for families; (5) services delivered in many different settings to meet support needs and promote generalization; (6) broad curricular content that addresses all developmental needs; and (7) proactive use of positive behavior support for challenging behavior. Children with autism typically require the services of special educators, general educators, and speech and language pathologists; occupational or physical therapists often address children's movement and sensory limitations. A collaborative team approach is necessary to plan, problem-solve, implement, and monitor the individualized education programs (IEPs) of these students; as part of a collaborative team, those participating on behalf of an individual with ASD should receive training in how best to support the individual with ASD given deficits in the areas of communication, behavior, and social interactions.

In the area of early screening for ASD, clinicians engaged in developmental screening in health care, community, and school settings are in a unique position to promote children's developmental health, and the Centers for Disease Control strongly suggests clinicians participate in training through the American Pediatric Association in the importance of early childhood development, early intervention, the screeners, appropriate referrals, and billing information; clinicians, in turn, should train other staff and personnel in the practice, particularly in using the screening instruments. Other service providers

who may or may not be a part of an individual's educational team require training in how to meet the needs of people with ASD in a variety of areas and settings including:

- Consultation for families, educators, and service providers
- Evaluations for eligibility determination
- Training for supporting professionals and families
- Treatment planning and planning for families
- Service coordination
- Early intervention services
- Genetic evaluation, treatment, and counseling services
- Stipends for day care (through ABC block grant) and transportation
- Individualized summer services and camps
- Adult companion services
- Adult dental services
- Adult vision services
- Audiology Services
- Behavioral support services
- Environmental modifications
- Personal care services
- Nursing services
- Occupational therapy services
- Physical therapy services
- Prescribed drugs
- Private vehicle modifications
- Psychological services
- Respite care
- Specialized medical equipment, supplies, and assistive technology

Future Directions

Numerous legislative blue-ribbon commissions and statewide needs assessment initiatives are adding to the literature on the dissemination and implementation of best practices. In the 2008 session, the Connecticut General Assembly passed Special Act 08-5, *An Act Concerning the Teaching of Children with Autism and Other Developmental Disabilities*, and legislated a study group comprised of designees from four state agencies to complete an assessment of school-based personnel needs regarding service delivery to this population of learner and their families. The study group gathered, analyzed, and interpreted new and existing data from seven public forums, three online surveys, policy documents, and information from state data systems to generate recommendations and assemble a statewide plan addressing the methods of teaching children with autism in accordance with requirements of the Act. Findings included several themes confirmed by other states in their own investigations of provider needs including inconsistent quality assurance procedures for ensuring existing statewide training opportunities provided to school personnel and families reflect evidence-based practices, specifically around content, delivery, expertise, results, and alignment with national ASD competencies. Another example is the California Task Force on Education and Professional Development which delivered a set of best practice guidelines for those serving persons with ASD concerning the design and delivery of effective programs as well as a credentialing system for preservice professionals and teacher aides seeking to work with children and youth with ASD in educational settings. Further, California has proposed that all teachers, including general educators, receive training in ASD as part of their preparation programs. The Alabama Autism Task Force and the University of Alabama Birmingham listed provider training as a top priority in its 2008 statewide assessment across agencies serving individuals from birth through adulthood, covering screening and early intervention through supportive employment opportunities. The Pennsylvania Department of Public Welfare and its state autism task force made training a top priority for its Bureau of Autism Services and has instituted a free, online virtual training site/resource center for its providers in state in order to build capacity across all regions. Many states are beginning to develop and/or implement community and direct service provider trainings tailored for staff involved in autism insurance waiver programs. Waiver provider trainings in most states supporting this effort include focuses

on supports coordinators, level of care assessors, behavioral specialist interventions, individualized service plan development, and navigating systems of care. Additionally, several states are reviewing and revising state statute regarding language around coursework or training necessary for providers in meeting the needs of individuals with ASD as well as for those delivering training to the providers across multiple areas.

See Also

- ▶ Related Services
- ▶ Special Education

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Prozac

► Fluoxetine

Prozac Weekly (Once-Weekly Dosing)

► Fluoxetine

PRS-SA (Pragmatic Rating Scale-School Age)

► Pragmatic Rating Scale

PRT®

► Pivotal Response Training

PSAP2

► SHANK 3

Pseudoscience

Madison Pilato
Neurodevelopmental and Behavioral Pediatrics, University of Rochester Medical Center, Rochester, NY, USA

Synonyms

Bad science; Bogus therapy; Quack science

Definition

Pseudoscience is a term used to describe proposed theories and therapies that are described as evidence based but actually have limited or no scientific support. Examples of therapies for autism whose proponents describe them as scientifically based, but, in the judgment of most experts, are currently not supported by scientific evidence include the following: biofeedback/neurofeedback, "energy" therapies, animal-assisted therapies, electroconvulsive therapy, withholding vaccinations, and facilitated communication (Thyer & Pignotti, 2010). Other such therapies are elimination diets, vitamin therapy, and anti-yeast therapy. The evidence provided to support these therapies meets many of the criteria listed below, which can serve as red flags for recognizing pseudoscience:

- *Rationale or underlying theory is not based on existing data* (Lilienfeld, 1998): The intervention is not connected to other bodies of scientific knowledge and does not build upon existing research. A treatment may be pseudoscience if it is recommended without research that points to a link between the variable being manipulated (e.g., yeast, vitamins, gluten, etc.) and the symptoms of autism. In place of this research, the authors of pseudoscience may instead use complicated, scientific-sounding language to explain why the intervention works.
- *Reversed burden of proof* (Lilienfeld, 1998): Scientists typically place the burden of proof on themselves. That is, if they propose a relationship, it is their responsibility to try to find evidence to support this relationship. Pseudoscientists may place the burden of proof on others and require someone else to prove that the relationship *does not* exist. For example, proponents of anti-vaccination insist that others refute the hypothesis that autism is linked to vaccines.
- *When studies have been done, they suffer from methodological weaknesses* (Offit, 2008): Strong studies will have multiple levels of control including large sample sizes, random assignment, and isolation of a single variable,

while other variables are held constant. These characteristics make the results of a study more reliable. Studies without these levels of control that lead to generalizations and unqualified conclusions may be pseudoscience.

- *Reliance on anecdotal evidence and testimonial (*Offit, 2008): Instead of referring to clinical trials as evidence that their interventions work, proponents of pseudoscientific interventions often give anecdotal examples of children and families treated with great results. Aside from the obvious problem of verifying these testimonials, anecdotal reports are problematic because the effects of an intervention on one child cannot be generalized to the entire population of children and adults with autism. Additionally, without isolating a single variable, there is no way to attribute improvement to the intervention. Improvements may be explained by another therapy or by normal growth and maturation.
- *Overinterpretation of results* (Offit, 2008): At this time, there is no single known cause or cure for autism. An intervention that is touted as a "cure" or describes "recovery" may be pseudoscience. Additionally, the causes of autism are numerous & complex, a study singling out one "cause" of autism, without reference to complex and interacting factors should raise a red flag.
- *Results have not been replicated; replications may be difficult or impossible* (Offit, 2008): Offit warns against reacting to a single study, especially if the study is the first of its kind or "appears to break new ground." A reliable intervention will be supported by many studies replicating the same positive results. Furthermore, a good study will have a detailed methods section, allowing other researchers to replicate the study. Vague descriptions of the methods may prevent replication and indicate pseudoscience.
- *Unchanged by disconfirming research* (Bunge, 1984): Although the original study that led to a proposed relationship between autism and vaccines has been discredited and several large studies have found no link, many anti-vaccination proponents continue to believe in the relationship. Similarly, specific interventions (e.g., elimination diets) may still be encouraged after several studies fail to find evidence for their support.
- *Conflict of interest* (Offit, 2008): Most peer-reviewed journals require authors to report funding source and potential conflicts of interest. An example of a conflict of interest is a scientist receiving income from a drug company to show that a drug manufactured by that company is effective; the scientist's financial interest (i.e., income) may compete with his scientific interests and cause falsification or omission of data. Another example is an intervention that requires families to pay for a product or service, outside of an established medical or educational system.

See Also

- ▶ Facilitated Communication
- ▶ Gluten-Free Diet
- ▶ Nutritional Interventions
- ▶ Vaccinations and Autism

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PSI Test

▶ Pediatric Speech Intelligibility Test

Psychiatrist

Fred R. Volkmar
Director – Child Study Center, Child Study Center, Irving B. Harris Professor of Child Psychiatry, Pediatrics and Psychology, School of Medicine, Yale University,
New Haven, CT, USA

Definition

A physician specializing in the evaluation and treatment of mental disorders. In the USA and Canada, these specialists have received M.D. or D.O. degrees. Following specialty training, board certification is available in general psychiatric and a variety of subspecialties including child and adolescent psychiatry. The latter group often has the most experience with individuals with disabilities (of all ages), and all child and adolescent psychiatrists in the USA have received training in adult psychiatry as well. Forensic psychiatrists specialize in work with courts and the legal system. Training systems differ somewhat in other countries. Psychiatrists work to evaluate, diagnose, and treat a range of disorders with a range of methods including pharmacological (drug) and other treatments. For individuals with autism, a variety of comorbid psychiatric conditions may require such treatment and a handful of medications have now been specifically approved for use in autism. These individuals also have special expertise in working with other medical professionals around other conditions the individual might exhibit, and this can be particularly important in situations where the person exhibits a medical problem with behavioral aspects such as epilepsy. It is important that the psychiatrist have experience in the evaluation and assessment of individuals with autism (Ghaziuddin, Tsai, & Ghaziuddin, 1992; McCracken et al., 2002; Scahill & Martin, 2005; Tuchman & Rapin, 2002).

See Also

► American Psychiatric Association

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Psychoanalyst

► Psychodynamic Theories

Psychodynamic Theories

Digby Tantam
School of Health and Related Research, University of Sheffield, Sheffield, UK

Synonyms

Psychoanalyst

Definition

Psychoanalysis

In their classic book on the *Language of Psychoanalysis*, Laplanche and Pontalis define psychoanalysis as a therapeutic approach developed by Sigmund Freud with a characteristic method of investigation ("free association") that Freud claimed identified emotions and emotional conflict in the psychoanalytic relationship, a theory that attributes experience and behavior to conflicts between emotional impulses or instincts of which we are not directly conscious

and the efforts that we make to block them from influencing us, and a psychology that is based on the theory and justified by the investigative method.

Psychodynamics

The psychology developed within psychoanalysis has also been called dynamic psychology, or psychodynamics. A basic premise of psychodynamics is that actions and reactions need energy and that this is derived from a well of energy, or drive, of which a person is not directly conscious or, as psychoanalysts would say, that are "in the unconscious." These drives, like the hot fluids from the earth's mantle, may break through a crust of repression and come into the light of consciousness, albeit changed. An easy and nondisruptive discharge of this energy on a social appropriate object is healthy: blocked discharge or a discharge that causes damage through its force or its trajectory is unhealthy. Psychodynamic theories of autism are therefore based on the vicissitudes of drive energy supplemented in the post-Freudian era by energy arising from a new source (corresponding to a more recent theory of motivation) – the need for another person.

Freud originally supposed that it was sexual desire that was the most important drive (at least in people who were not starving or parched with thirst). So his psychodynamics concentrates on the vicissitudes of sexual desire during development. The open expression of sexual desire is inhibited by the primary carer, he thought, at least until the child develops some personal awareness (Freud attributes this to the creation of an "intrapsychic structure," the Ich; Lacan calls this a new order of representation, l'Imaginaire, ushered in by the growing awareness of the father) and later some social awareness (again, attributed to an "intrapsychic structure," the uber-Ich; Lacan calls this order, le Symbolique, and considers that it is ushered in by the name of the father). Freud supposed that there was sexual desire from birth, but at birth, it was directed toward the baby's own skin. This development is easily derailed and so fails to develop normally, getting stuck or "fixated." Early derailment was supposed to be associated with psychosis (no evidence was given for this assertion nor for the apparently normal development of people who developed psychoses in adulthood). Lacan thought that normal development required the acquisition of the name of the father, i.e., of the "name of the father," and that a failure to acquire this led to a persistent susceptibility to imaginary rather than symbolic representation.

Lacan's theory seemed to provide a neat explanation of the lack of language development in children with Kanner's syndrome although it was not clear why it did not also apply to children who were normally socialized but had severe speech and language disorder. Freud's theories were equally facile, but this time, in explaining the touching, sucking, poking, and self-stimulatory stereotypies associated with children with Kanner's syndrome. Again, it was not explained why it applied so well to children with intellectual disability and neglected children if it was to be a theory of ASD.

Autoerotic

The earliest phases of emotional development were the ones linked by Klein, a follower of Freud, to "psychosis" (never a clearly defined term in psychoanalytic literature) and to autism, which was considered to be a kind of psychosis. Freud had termed the earliest phase of sexual development when the infant was supposed to be erotically gratified by its own body, "autoerotic."

"Autism"

Bleuler had, like Sigmund Freud, studied with Charcot, at Salpetrière. He wrote a favorable book review (Bleuler, 1896) of the monograph by Freud and his mentor Breuer that described their use of the hypnotic method to treat anxiety-related disorders and which launched psychoanalysis as a treatment. His assistant, Jung, and he had corresponded with Freud and had devised a word association experiment to test Freud and Breuer's theory of repression which led Jung to formulate the concepts of "complexes," for words that were delayed in recall, as against

"simplexes" which were repeated with minimal delay. Bleuler moved away from Freud from about 1911 on, just after the publication of his textbook in which he introduced the word "autism" to a wider audience (Bleuler, 1911). Bleuler gave his reasons for the distance in 1913 (Bleuler, 1913), but he remained supportive of psychoanalysis, and in 1914, Freud could cite him (Freud, 1914) *as an influential sympathizer:* "After this it was impossible for psychiatrists to ignore psycho-analysis any longer. Bleuler's great work on schizophrenia (1911), in which the psychoanalytic point of view was placed on an equal footing with the clinical systematic one, completed this success" (Bleuler, 1911, p. 28).

The term "autism" was coined by Bleuler in 1907 and was derived from Freud's term "autoeroticism." Freud wrote to Jung (Freud & Jung, 1974) that "Bleuler still misses a clear definition of autoeroticism and its specifically psychological effects. He has, however, accepted the concept for his Dem[entia] pr[aecox] contribution to Aschaffenburg's Handbook. He doesn't want to say autoerotism (for reasons we all know), but prefers 'autism' or 'ipsism'" (Freud & Jung, 1974, pp. 44–45).

What Freud's correspondents would "all have known" is now forgotten, but there was no doubt that Bleuler used the word "autism" knowing that it implied a psychological cause for schizophrenia. Indeed, his treatment method, and that of his son, Manfred, attempted to link the psychological approaches of Freud and Jung with the organic approach of Kraepelin.

Historical Background

The psychoanalytic roots of the autistic spectrum disorders (ASDs) lie in the development of schizophrenia, or rather of dementia praecox, at the end of the nineteenth century and some 40 years before ASD was first described. That century had seen a conflict between the Romantic view of psychiatric disorder that attributed it to hidden mental problems and the organic approach that attributed it to pathological changes in the brain (Ellenberger, 1970). It was widely recognized in the nineteenth century that the reasons for many actions were "unconscious" but determined by learned associations (Thomson, 1964). The Romantics sought to correct these associations by rewards and punishments, believing that in this way mental illness could be cured. Paradoxically, this could lead to the development of coercive treatment that was often cruel and abusive, although not always. Samuel Gaskell, physician superintendant of Lancaster Moor Hospital in the UK, gave "disappointment in love" as the most common reason for admission of women to the asylum but also advocated conditions that would enhance the dignity and autonomy of his patients as much as possible (Tantam, 1990).

The same paradox has reasserted itself in ASD a century later, where expectations of cure have sometimes led to cruelty and harm, although this has not been restricted to the proponents of a psychological cause for ASD.

The opponents of the Romantic approach, the biological psychiatrists, were much more negativistic, believing that mental illness was due to degeneration of the brain, with a number of them concluding that this degeneration was both hereditary and progressive. Enlightened biological psychiatrists thought that as their patients were incurable, they should be given the conditions most likely to mitigate their condition. This could be interpreted benignly, as it was by Gaskell, but also led to the development of the "institutions" where people were simply sequestered with minimal attention to their health and safety, and none to the possibility of recovery. Institutions became a byword for neglect, environmental poverty, and a lack of social stimulation that contributed so much to the clinical presentation of older children and adults with an ASD who had been "kept" in these conditions. However, there was an alternative approach that stressed what we would now call "normalization," but would then have been called "moral treatment."

In the midst of this confusion, it was difficult to make any scientific progress on which treatments worked for who – if any did – or what the course of a person's particular condition or

problem would be. Griesinger, the father of the biological psychiatry approach, pinned his faith in pathological studies of the brain and that proved well founded for "general paralysis of the insane" a psychosis caused by syphilitic infection. But the pathology of other psychoses, the so-called functional psychoses, remained elusive, as it does today.

Again, there are parallels with ASD. There are some genetic conditions that are known to have a high risk of conferring ASD, and the neuropathology of these is increasingly well understood. But the pathology or pathologies characteristic of most of the ASDs remain obscure. As a result, the future of an individual with an ASD, and therefore knowing what would best help that person, remains unclear.

Emil Kraepelin's answer to this situation was to undertake a kind of case-control study, selecting the records of patients with a poor outcome and comparing previous notes made of their presentation and course with those in the records of patients with a good prognosis to see if there were features that could predict the outcome. He coined the term "dementia praecox" for this group, a term that did not find favor in the UK or the USA. Anglophone psychiatrists accepted Kraepelin's concept of the remitting "manic-depressive" psychoses but thought that Kraepelin had been too nihilistic about the other group of functional psychoses, for which they much preferred Eugen Bleuler's term "schizophrenia," introduced by Bleuler in 1911 (Bleuler, 1911).

It is at this point that the history of psychoanalysis begins, as well as the history of the term "autism" which psychoanalysis inspired.

Current Knowledge

Kanner, in applying Bleuler's term "autism" to children in 1944, did so knowing that it evoked a psychological causation. But by this time, Freud's specifically sexual description of infant development, and the centrality of the vicissitudes of sexual energy or libido, had changed with the impact of Melanie Klein and the object relations theorists. She had, confusingly, adopted a term developed by the Scottish psychoanalyst and medical anthropologist Fairbairn – "schizoid" – to describe the stage of development shortly after the stage that Freud called "autoerotic." This term had also replaced "autism" in the second edition of Bleuler's textbook on schizophrenia. It is not clear whether Bleuler read Fairbairn, or Fairbairn read Bleuler. Bleuler's textbook was only translated into English in the 1950s, and Fairbairn's only published in the 1950s, too although he had given his paper about schizoid personality in the 1920s. But the shared etymology – both are derived from the ancient Greek for split – suggested to many commentators that there was a fundamental connection.

Muddying the Waters: Schizoid Personality, Autism, and Schizophrenia

Inferring a connection of things from their resemblance has a long history in medicine. The use of mandrake (*Mandragora* sp.) as a "sympathetic" treatment comes, for example, from its forked root that was said to resemble a pair of legs. Mandrake looked to the credulous eye like a homunculus and so was assumed to have some human qualities (see, e.g., the references to it "screaming" when uprooted in the Harry Potter novels). Freud himself characterized such metaphorical or "iconic" reasoning to be characteristic of "the hysteric" and the dreamer (Freud, 1965), but it has been a fallacy into which many psychoanalytic theorists have slipped.

The resemblance of autism in schizophrenia and early childhood autism created a connection between the two that led to ASD being rechristened early childhood schizophrenia for a number of years. Although some research groups do identify childhood-onset schizophrenia in children as young as age 7, they also consider that there are key symptoms can distinguish between the two and that the outcomes are different. So more narrowly defined schizophrenia and autism do not overlap, as Kanner indicated in his first description although they may occur together.

Psychoanalysts might also refer to schizophrenia but on the basis of the presence of schizoid traits. One of the splits in the British

Psychoanalytic Society that Melanie Klein provoked was that she would use the term schizophrenia in such a loose way that medically qualified analysts, notably Edward Glover, wanted nothing to do with her. He reportedly said to Hannah Segal at her assessment for a training there that "In that case [Segal had begun her analysis with Klein] I have nothing to do with you! They've got their people; we've got our people. Goodbye" (http://www.melanie-klein-trust.org.uk/segalinterview2001.htm).

German psychiatrists used the term "schizoid" to include sensitivity, "introversion" (the term coined by the follower of Freud, CG Jung), and emotional detachment (Kretschmer), although there were many differences in detail and these are now reflected in the confusing DSM-IV descriptions of schizoid and schizotypal personality. They attributed it to temperament that was an expression of the broad phenotype of a genetic disposition to schizophrenia. This link has never been adequately established, however, and in clinical practice, depression seems to be a more commonly linked mental illness. Analysts attributed schizoid personality to a disorder of object relations, and the research evidence points to that being the case (Lenzenweger, 2010) although it also suggests that there is a hereditary, temperamental component, too (Cohen, Emmerson, Mann, Forbes, & Blanchard, 2010).

The term "schizoid" would not be relevant if it were not for the persisting notion that Asperger syndrome and schizoid personality disorder in children are different descriptions of the same condition (Wolff, 2000). I have argued that people with AS may be more at risk of developing schizoid traits but that the two are quite distinct: One is a developmental disorder of brain developmental; the other is an emotional disorder, a disorder of mental development (Tantam, 1988). However, the analytic stance on schizoidia may have reinforced the notion that autism, too, was psychogenic.

Getting information about outcome is particularly difficult for clinicians and researchers who see children or adults once or only at one stage of their development. This is commonly the situation for psychotherapists, including psychoanalysts. It is an even greater problem when their observations are confined to a few, albeit intensively studied, individuals – again a problem for psychoanalytic theorists.

Psychogenic Theories of ASD

Freud's original formulation of an inner, autochthonous sexual drive continues to find some support as an explanation of deviant sexuality, but it was otherwise quickly replaced by post-Freudian accounts, except in the work of the influential French psychoanalyst, Jacques Lacan, who combined it with a semiological theory. He argued that drive had to be coupled to signification, in order to fill the "lack," béance, that unsatisfied drive created. The final stage of signification, when drives emerge into our conscious awareness and we can find conscious ways of satisfying them, is its linkage to language and the symbolic order or "le nom du père." Autism, as Lacan thought, occurs because this does not happen. He is credited as saying that the child with autism is too taken up with talking to himself that he cannot talk to others and also that when a child with autism hears his speech, it sounds like a hallucination, and he covers his ears to protect himself from it (Tendlarz). It is tempting to think that Lacan may have been aware of Sir Michael Rutter's briefly held view that autism was a language disorder. The linkage of desire to language is, in Lacanian terms, the "fourth stage of the cycle of the drive" that is the stage when, according to the solipsistic Freudian theories of infant development, the infant discovers the reality of other people (Lacan, 1977). Some Lacanians attribute autism to a failure at the third cycle of the drive, leading to a developmental arrest at the stage before other people are recognized (Laznik, 1993).

Developmental arrest is a very common psychoanalytic theme. Psychoanalysts suggest that development stops either because it "is fixated" because desire is too fully gratified (Freud postulated a series of sexually gratifying nursery nurses unknowingly fixating precociously prurient little boys) or because it is thrown back or regressed to an earlier stage by a disappointment, of which the type is the "Oedipal situation."

In the 1920s, Freud began to consider that there was also a death instinct or rather an instinct to kill, as well as a sexual instinct, which he broadened into an affiliative or cooperative instinct. In his answer to Einstein's question, "Why war?," Freud thought that this destructive instinct might be overcome by an increase in the positive instincts as actions, Freud now thought, were motivated by the balance between these often opposing instincts. Kurt Lewin, who worked at the Institute of Social Relations in Frankfurt before moving to the USA, would have been familiar with these ideas, as the "Frankfurt school" was strongly influenced by psychoanalysis, and his formulation of the "approach-avoidance conflict" demonstrates this. For a short while, ASD was attributed to an irresoluble approach-avoidance conflict.

Freud's idea of the protective effect of social solidarity did not apply to the Austria from which he fled in 1938 or any of the other Fascist powers which seem to have experienced an increase in in-group social harmony in proportion to their out-group violence. It may not be unrelated to this that the differences of children with autism from neurotypical children were first noted by both Asperger and Kanner in 1938, although their observations were not widely published until just before the end of the war when some of the terrible civilian consequences of the war were becoming all too apparent.

The casualties of war included children orphaned, women bereft, men broken in the stress of battle, and people of all ages dehumanized. Psychoanalysts were involved in dealing with these crises. Fairbairn, who had described schizoid personality, worked with men who went absent without leave, for example. These war experiences changed the thinking of many health professionals dealing with children, and several of them saw a similarity between children with ASD and children who were traumatized in the war. Bruno Bettelheim, for example, who claimed to have been psychoanalyzed in Vienna and used Freudian concepts in his work, likened children with ASD to prisoners in a concentration camp and wrote that the mothers of these children were like the SS guards (Bettelheim, 1967). His work did much to fuel the stigmatization of parents by professionals, particularly those that were psychoanalytically orientated, and in the end brought psychoanalytic approaches into disrepute, particularly after Bettelheim committed suicide and some of his ex-patients accused him of physical abuse of them.

Stress-Diathesis

Fairbairn's approach to men who went AWOL was that the stress of war brought out a latent overdependence on the mother and led to incapacitating separation anxiety. This is an example of what two other analysts called the "stress-diathesis" model (Grinker, 1945): that a hidden vulnerability acquired in early development could lead to disorder if disclosed by a later stress. Over subsequent years, the most commonly postulated diatheses have been neurological and not, as originally proposed, psychological but the notion that stress can disclose ASD – an originally psychoanalytic concept – is still being propounded (Pfaff, Rapin, & Goldman, 2011).

Few people would now discount Adolf Meyer's idea that circumstances, environment, and brain interact. So the stress-diathesis seems completely in harmony with this holistic approach. But psychoanalysts are often normative thinkers, and any deviation from statistical normality has often been considered to be a diathesis that could lead to disorder. The evidence from neuroscience or genetics does not support this. Diversity in the brain and in the genes has survival value for the group because it allows for rapid evolution and for role differentiation within the group that confers adaptability.

Maternal Deprivation and Affective Contact

Curiously, the same 1948 issue of the *Journal of Mental Science* that contained a review of Men Under Stress (Issue 94) also contains review of a book on the psychology of the unwanted children by Agatha M. Bowley.

The war substantially increased the number of children without families: unwanted children, orphaned children, displaced children, evacuated children, all of them were more vulnerable to distress. In 1949, the World Health Organization,

recognizing this, commissioned a psychoanalyst and director of the child psychotherapy training program at the Tavistock Clinic in London to report on these children. He concluded that there was a characteristic psychological reaction to what came to be called "maternal deprivation." The idea received powerful support from the cruel experiments of Harry Harlow who raised rhesus infants in isolation providing them with a series of inanimate mother surrogates. The maternal deprivation hypothesis was effectively laid to rest by Rutter (1981) but by this time had already been succeeded by Bowlby's much more nuanced attachment theory, developed in conjunction with Mary Ainsworth, among others. Attachment theory was partly inspired by *King Solomon's Ring*, a book of essays by the naturalist Konrad Lorenz (later joint recipient with Nico Tinbergen of a Nobel Prize for his part in creating ethology). Lorenz was brought up in a remarkable family who seem to have kept a menagerie in their Vienna flat. He was adopted by a family of goslings after their mother had died and postulated that an infant gosling imprinted on the first animal that they saw moving after they had hatched. Bowlby thought that this was an example of a more general process of "bonding" for which there was intrinsic disposition – now thought to involve oxytocin and perhaps vasopressin surges in the mother – leading to grooming of the infant and a disposition to respond to a species-specific cry in the infant. Grooming by the mother changes the infant's amygdala so that the infant treats the mother as a unique source of comfort from anxiety or threat and draws near to her protection under these conditions. Oxytocin probably mediates the proverbial savagery of a mother's aggression when protecting her young, too. Bonding and oxytocin remain active areas of research in ASD.

Bowlby's work was anticipated by Kanner. Kanner (1943) reported on 11 children, the first of whom, Donald, he saw in 1938. Many of these children would now be diagnosed as having Asperger syndrome.

Kanner's descriptions are uncannily good. He noted that the 11 children had previously been diagnosed as having intellectual disability or schizophrenia but, as Kolvin later confirmed (Kolvin, 1971), that schizophrenia could not apply as there was no period of normal development (although early development is still an important differentiator of ASD and schizophrenia, a period of early development is no longer considered unusual in ASD).

Kanner considered that the children that he was describing had a condition not previously described (he did not know of Asperger's work), and he wrote that it was an "autistic disturbance of affective contact."

Affective contact corresponds to Lorenz' imprinting, and Bowlby's attachment, but unlike Freud's ideas of a sexual instinct which created a bond only when it had been shifted by learned experience from being directed to the self to being directed toward the mother, affective contact was purely biological. Kanner wrote that ". . . these children have come into the world with innate inability to form the usual, biologically provided affective contact with people."

It is not clear why Kanner chose the words affective contact. They had been used in the 1920s in relation to schizophrenia http://bjp.rcpsych.org/cgi/reprint/75/310/526-b but also in relation to religious experience http://www.jstor.org/pss/3745867. (Flower, 1929), but I could not find any other reference to their use except, possibly, by the psychoanalyst and originator of the sandbox technique of play therapy, Margaret Lowenfeld, who began her career as a research scientist studying mother's milk before becoming a child psychotherapist.

Blaming the Mother

Psychoanalytic approaches to autism have included one or more of five assumptions (see Textbox).

Textbox. Psychoanalytic assumptions leading to a psychogenic theory of ASD

That autism is a normal developmental stage

That autistic disorder is either an arrest or a regression to an earlier developmental stage as a result of some kind of stress, shock, or trauma

That the child has a diathesis to arrest or regression in the face of this stress, shock, or trauma that is psychological

That the stress, shock, or trauma most likely to be involved is separation from the mother

That rejection by the mother without physical separation may be enough stress, shock, or trauma to cause autism

Kanner's, 1943 description gave credence to assumption 5 (see Textbox), by his choice of the term "autistic" in the first place and by suggesting that emotional deprivation played a part in the "autistic disturbance": "One other fact stands out prominently," Kanner writes "In the whole group, there are very few really warmhearted fathers and mothers…. The question arises whether or to what extent this fact has contributed to the condition of the children." Kanner strengthened his view that ASD could be psychogenic in a later paper (Kanner, 1949) in which he first used the term "refrigerator parent" and gave credence to both elements 2 and 5 (Textbox) in his thinking. He wrote of children with ASD that "Their withdrawal seems to be an act of turning away from such a situation to seek comfort in solitude," the situation being that "They were the objects of observation and experiment and not of genuine warmth and enjoyment." Kanner thus gave his authority to a psychogenic account of the etiology of autism and opened the way for the extremes of those like Bettelheim (1967) who would accuse the parents of children with ASD of being unfit, remove their children from them, and then, sometimes – or so some of those children have alleged – treat those children abusively. Bettelheim was not an analyst but was strongly influenced by Freudian theory.

Kanner's formulation of the children regressing in the face of some kind of trauma was entirely consistent with psychoanalytic theories of ASD at the time and indeed up to the 1980s. Frances Tustin's work was particularly influential in the UK and Lacan in France. Tustin had trained in a program directed by John Bowlby but remained resolutely Kleinian in her outlook, and she included all of the five elements mentioned in her early theories. She thought that the infant had to deal with both the life and the death instincts toward the mother. This was consistent with the object relations school of psychoanalysis, championed in the UK by Melanie Klein in opposition to more traditional approaches championed by Freud's youngest daughter, Anna. Klein's analysis of "Dick" described in The Psychoanalysis of Children (1932). In The Writings of Melanie Klein, Vol. 2. London: Hogarth Press 1975 is often taken as the starting point for psychoanalytic approaches to the treatment of ASD. Klein had previously analyzed her younger son, Erich, and was just completing her own analysis with Abraham. "Dick" was suffering from a psychological disorder that had been diagnosed as schizophrenia, but Klein considered that his mother had rejected him from birth and that as a result his "…symbolism had not developed. This was partly because of the lack of any affective relation to the things around him, to which he was almost entirely indifferent" (Klein, 1975, pp. 223–224). Klein felt that this incapacity to symbolize was related to the abnormality of his "object relations," and what appeared to be a failure to understand people as people, toward whom he could show "opposition and obedience" or be "intelligible" (Klein, 1975). She interpreted this impairment as being a result of "anxieties rooted in the child's relations with others…" and as "a manifestation of defenses against his own destructive impulses toward the mother's body" (Morra, 2002, p. 287).

Tustin's original formulation (in Autism and Childhood Psychosis) was that birth and bodily separation from the mother could lead to such negativity toward the mother that development was arrested at the "autistic" stage. Later, she detected "encapsulated autism" in children with many other conditions (Autism and Childhood). Toward the end of her career, she thought that autism was not a normal stage of development, a conclusion that another psychoanalyst who treated children with an ASD, Margaret Mahler, had come to much earlier. Mahler, unlike Tustin, had also concluded that children with an ASD had a biologically based disorder of affective contact and routinely included the mother along with the child in her analyses.

War Brings People Together

The impact of the Second World War was not confined to a front line of fighting men. Rapidly advancing armor and airplanes could spread it much more widely. As I noted earlier, many professionals were familiar with the civilian trauma that was a consequence of this. Children were often at much at risk as adults, and the image of the desolate and traumatized child has rarely been out of the newspapers, and out of our consciousness, since. The images of children traumatized by war have been joined by those of children beaten or neglected by carers, or institutionalized in Romanian, or Russian, orphanages. Psychoanalysts made important contributions to this awareness. Spitz wrote of institutionalism in children, and Bowlby of the consequences of "maternal deprivation." Maternal deprivation led, in Bowlby's view, to a lack of empathy and of emotional response that he called "affectionless psychopathy." He may have been influenced in this description by the interposition of a nanny or series of nannies between mother and child that was typical of an English upper class upbringing as well as by the wealth of research that he had reviewed for his WHO monograph (later published as Bowlby, J. (1951). *Maternal care and mental health* (p. 89). New York: Schocken).

The basic assumption in psychoanalysis that developmental disorders, like psychoses, were mental and not biological led many of its practitioners to reject Bowlby's idea that maternal deprivation affected the brain directly. They preferred Klein's idea that the child imagined what to expect of a carer and felt hostility toward a carer who did not come up to these expectations. Bowlby was ostracized in the British Psychoanalytic Society following three seminars that he had on attachment to the society, although he was rehabilitated after his appointment as Freud Professor of Psychotherapy at University College, London, in 1980. Since then, attachment theory has become mainstream.

Psychoanalysts and other psychotherapists often assumed that maternal deprivation could cause ASD. There were superficial similarities between children with an attachment disorder and children with an ASD although follow-up studies of neglected and traumatized children often withdrew from social interaction. They rocked, mumbled unintelligibly, masturbated or self-stimulated (echoes of autoeroticism), and related to objects but not to people. Follow-up studies of neglected children from Romanian and Russian orphanages provide strong evidence against these children with "attachment disorders" having the same course as children with an ASD, and therefore against the two conditions having a shared etiology. However, these findings could only have been made after a substantial number of children from Romania and Russian being adopted in Western Europe and North America, thus providing a natural experiment of the effects of early neglect. This only happened recently. So psychoanalysts could and, as we have seen, did fall into the same fallacy as Freud himself in thinking that similar symptoms meant a common cause.

Given the assumptions that the effects of maternal deprivation were purely psychological, and that maternal deprivation could cause ASD, it was not surprising that many psychoanalysts took the view that a child with ASD had been made that way by their parents. It was not the parents' objection to being so stigmatized that changed this, but psychoanalysts' acceptance that Bowlby had been right, if not about maternal deprivation but about its successor, attachment theory. Most psychoanalysts now accept that there is a biological basis to ASD although continuing to believe – as indeed do most practitioners – that there are familial influences that might affect its expression. Some try to bolt on Kleinian concepts almost in their entirety to this biology, however, as if reluctant to yield the possibility that autism is really a mental disorder.

Recent Developments in Psychoanalysis

Bowlby's rehabilitation and the incorporation of attachment theory into mainstream psychoanalysis have been followed, either coincidentally or synchronously, by a reversed trend from the previous years. Scientific theories about ASD have been adopted into psychoanalysis, rather than psychoanalytic theories being applied to autism. Psychoanalysts are now taking developments

from research in ASD and applying them to their own theories of mental functioning, applying these to neurotypical as well as people with ASD.

"Theory of mind" has been particularly susceptible since it is already a cognitive rather than a brain-based theory. Theory of mind sounds almost like "mindfulness," and in the way that thinking in this area seems to proceed, the two have been subsumed into a new kind of psychoanalytic approach that is targeted at a political priority, so-called borderline personality disorder (Fonagy & Bateman, 2006).

Neuroscientists have also suggested that the mirror neuron theory of contagious emotion might also be applicable in psychoanalysis (Scalzone, 2005), but this brain-based theory has met with much less response.

Future Directions

Alexithymia

Alexithymia was first posited by two Bostonian psychotherapists, Sifneos and Nemiah. They were struck that some people with psychosomatic disorders who got worse with psychoanalytic treatment, rather than better. They attributed this to the inability of these people to put their emotions into words, that is, a lack of words for feelings, or alexithymia (Sifneos, 1972). Frith suggested that alexithymia might also affect people with Asperger syndrome (Frith, 2004). Like impaired theory of mind in anorexia nervosa, there is evidence that alexithymia might be particularly likely to occur as a result of disorder (Tantam, Kalucy, & Brown, 1982) rather than as a cause of disorder. So, although it is important for psychotherapists to bear in mind that people with an ASD may be uncomfortable dealing with emotion words, it should not be assumed that this discomfort has led to their ASD but may be a consequence of a lack of previous narrative with other people about emotions. Psychoanalytic treatment relies heavily on analyst and participating in a discourse with the analyst about the emotional connotations of the words that they use. Alexithymia blocks this, meaning that analytic interpretations based on these connotations may be experienced by the analyst and as mysterious and threatening. The negative effects of psychoanalytic treatment of adults with an ASD, like psychoanalysis of people with schizophrenia, may be a consequence of this. Other person-centered or existentially orientated methods are more successful since they emphasize practical solutions.

Intersubjectivity

Relational psychoanalysis has emerged as an influential approach (Stolorow, 2002), especially in the USA. Its proponents sometimes locate its origins in the work of Guntrip and his two analysts, Winnicott and Fairbairn, already mentioned as the first psychoanalyst to use "schizoid" in psychoanalysis. Other influences are Laing, himself influenced by the Scottish school begun by Fairbairn (Sutherland, 1989), and also Kohut. Existential analysis (van Deurzen, 2002) was a strong influence on Laing and through him, on relational psychoanalysis, too.

A key concept for relational psychoanalyst is "intersubjectivity," a term coined by Husserl (1973, originally published 1905). Stolorow, Atwood, and Orange define this ". . . a field theory or systems theory in that it seeks to comprehend psychological phenomena not as products of isolated intrapsychic mechanisms but as forming at the interface of reciprocally interacting worlds of experience."

Intersubjectivity as used by Husserl was purely mental, but it has been taken up by developmental psychologists who use it to describe the shared world of mother and infant (Trevarthen, & Aitken, 2001) that they argue is based on interacting biological systems. In a recent book, I have described these interactions as evidence of an "interbrain" network, mediated by nonverbal communication (Tantam, 2009). Trevarthen and Aitken trace intersubjectivity as a development concept to work on interactional synchrony in the early 1970s. Daniel Stern, a psychoanalyst, was one of these researchers (Stern, 1971) and is often considered to be one of the originators of relational psychoanalysis (Stern, 1985). Like Sullivan (1953) and Foulkes and Anthony (1957), he rejected the conventional analytic view that the infant is born in a state of autistic

self-preoccupation from which he or she needed to be awakened although he still took the view that a failure of "attunement" by the mother to the infant could lead to deviant development; he considered that the inability of the mother to attune to a child with autism was due to the child's inability to make affective contact.

Autistic Psychopathy

"Lust" is a disturbing but gripping narrative of a woman who feels devoured by the sexuality and aggression of an alien species – men – who hold her in thrall. It is written by Elfriede Jelinek, a Nobel Laureate who had been referred to Hans Asperger as a child (Delantaye, 2005), is also reputed to have been a patient of Hans Asperger. It is, perhaps, the life experience of someone with Asperger syndrome. The focus of this entry has, so far, been on the Kanner and his description of early childhood autism. However, Hans Asperger had almost simultaneously with Kanner published (Asperger, 1944) his habilitation on children that he described as having "autistic personality disorder" and that he had first reported in 1938 (Asperger, 1938).

Although Asperger worked in the cradle of psychoanalysis, Vienna, he does not seem to have been influenced by the approach. He was sure that the condition that he described was a disorder of the brain (Hippler & Klicpera, 2005) that could be partly or wholly circumvented by education. He wrote (2005) of children with Asperger syndrome learning rules of etiquette in the same way that they learned sums and of conflict-ridden intellectual training leading to assimilation to the community.

What is notable about Asperger's work is the focus on peer relationships, rather than parenting relationships; his notion that the symptoms of children with ASD are an attempt to overcome their difficulties, and not a kind of pathology and that children with an ASD are not merely helpless victims: In fact, he wrote that they can sometimes be malicious. Psychoanalysis with its emphasis on pathology rather than resilience, on parents rather than peers, and on unconscious motives rather than effort and training is poles apart from this kind of thinking.

These children can take note of "rules of etiquette" given to them in a down-to-earth kind of way, which they then can fulfill – like they would a sum. The more "objective" such a law is – maybe in a form of schedule, which includes all possible variations of daily routines and which must be stuck to by both parties in the most pedantic kind of way – the better it will be. So it is not through a habit, which unconsciously and instinctively grows by itself but through conscious, intellectual training, in years of difficult and conflict-ridden work, that one will achieve the best possible assimilation to the community, which will be more and more successful with growing intellectual maturity.

Conclusion

For all the fascination of psychoanalysis, it has perhaps created too much of a focus on parent-child relationships in the study of people with ASD and detracted from peer relationships. It has also led us to think too often of the symptoms of ASD as symptoms and to obscure the possibility that the actions of people with ASD are the expression of a uniqueness and resilience in the face of a different brain and therefore a different participation in the connectedness of society.

It is regrettable that psychoanalysis also contributed to a victimization of parents, especially mothers, that increased the burden on already heavily burdened families. On the plus side, psychoanalysis has focused on the development of thought and language in children with ASD that might still lead to a better understanding of the subjective experience of having an ASD. That it has not yet done so may be because, as Bowlby pointed out many years ago, psychoanalysis has prioritized the child's imagination of threat at the expense of real danger and loss. Most of us do assimilate our life experience to an emotionally charged narrative about who and what has made us the way we are, and this is the stuff of psychoanalysis, at least new paradigm psychoanalysis (Rudnytsky, 2008). People with an ASD lack the narrative facility of many neurotypicals (Losh & Capps, 2003) and do not usually dip into and out

of autobiographical memory. On the other hand, people with ASD, even those who are gifted, often experience victimization, exclusion, and loneliness that are all too based in reality and that are not just in the past but continue in the present (Wainscot, Naylor, Sutcliffe, Tantam, & Williams, 2008). These experiences, along with the sometimes condemnatory attitudes that people with ASD may develop about neurotypicals, are often a more productive focus for psychotherapy than the presumed parental failure.

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Psychoeducational Profile – Revised (PEP-3)

Elaine Coonrod[1] and Lee Marcus[2]
[1]Department of Psychiatry, School of Medicine, TEACCH The University of North Carolina at Chapel Hill, Chapel Hill, NC, USA
[2]TEACCH Autism Program, University of North Carolina, Chapel Hill, NC, USA

Synonyms

PEP-3

Description

The Psychoeducational Profile: TEACCH Individualized Psychoeducational Assessment for Children with Autism Spectrum Disorders – Third Edition (PEP-3; Schopler, Lansing, Reichler, & Marcus, 2005) is the most current version of an assessment developed by professionals at TEACCH to evaluate the skills and behaviors of 2- to 7- year-old children with suspected autism spectrum disorders. Similar to its predecessors, the PEP-3 was designed to (a) measure developmental strengths, weaknesses, and learning style to inform educational programming; (b) assist in the autism diagnostic process by obtaining information from caregivers and by providing opportunities to observe social, communication, and play behaviors; and (c) provide developmental ages and other scores for diagnostic decision-making, educational planning, and/or assessing change in behavior and development over time. As such, the PEP-3 has utility in clinical, educational, and research contexts.

Developmental subtests on the PEP-3 assess early cognitive abilities, language/communication, and motor skills. Subtests included are cognitive verbal/preverbal, expressive language, and receptive language, which together comprise the communication composite, and fine motor, gross motor, and visual-motor imitation, which together comprise the motor composite. Each developmental subtest item is scored as passing (the child can execute the task successfully without needing a demonstration), emerging (the child demonstrates some knowledge of how to complete the task but needs demonstration or practice), or failing (the child does not attempt or is unable to complete any aspect of the task). Raw scores are converted to developmental ages, percentiles, and developmental levels.

Maladaptive behavior subtests on the PEP-3 assess behavior areas related to an autism spectrum diagnosis. Subtests included are affective expression, social reciprocity, characteristic motor behaviors, and characteristic verbal behaviors, which together comprise the maladaptive behavior composite. Ratings for the maladaptive behavior subtests are based on observations throughout the assessment, and each item is scored as appropriate (the behavior is appropriate for the child's chronological and overall mental age), mild (the behavior is slightly or mildly unusual for the child's chronological and overall mental age), and severe (the behavior is unequivocally unusual or dysfunctional). Raw scores are converted to percentiles and adaptive levels. New PEP-3 software can be used to assist with scoring, statistical analyses, graphing, charting, and report generation.

The caregiver report component is a questionnaire completed by a caregiver, such as a parent, guardian, or teacher, based on his or her daily observations of the child. Two sections ask caregivers to provide estimates of the child's developmental level in several areas and rate the applicability and severity of several diagnostic labels. This information provides the examiner with a broader perspective of the child's overall strengths and weaknesses and helps the examiner understand the caregiver's perceptions of the child. The caregiver report also has subtests asking caregivers to rate behavioral problems associated with autism, skills in personal self-care, and adaptability and responses to the environment. Caregiver ratings are scored as appropriate, mild, or severe, and raw scores are converted to percentiles and developmental/adaptive levels. A developmental age equivalent can also be computed for personal self-care skills.

The item content and administration procedures of the PEP-3 were designed to maximize its utility in children with autism spectrum disorders. Test materials are manipulative and interesting to young children, and with the exception of the language subtests, items require minimal language ability. Items are not timed, and tasks can be administered in an alternative order if doing so will make the assessment more engaging or appealing for the child. Further, given the scattered skills often shown by children with autism spectrum disorders, basals and ceilings are not used, though examiners may credit lower level skills when higher level skills are demonstrated. Finally, performance on test items readily translates into educational planning goals, and observation of the child during the assessment provides information about his or her learning style and the best way to begin teaching those goals.

Historical Background

The development of the PEP-3 (and its two earlier versions) (Schopler & Reichler, 1979; Schopler, Reichler, Bashford, Lansing, & Marcus, 1990; Schopler et al., 2005) parallels the understanding, assessment, and treatment of autism from the 1940s through the present. The early formulations of autism were based on psychogenic principles attributing the atypical behaviors to profound emotional disturbances caused by faulty parenting. The apparent intellectual deficits shown by the majority of cases were considered pseudo-mental retardation, a mask covering up normal intelligence. The "islets of intelligence" noted by Kanner were offered as evidence of normal abilities. The children who were tested failed to score anywhere near the normal range and also were difficult to manage in the assessment setting. The concept of "untestable" was used to describe these children. It was in this context that Schopler and Reichler, in their pioneering research in autism in the 1960s and early 1970s, determined that an appropriate assessment instrument, developmentally-based and geared to the unique characteristics of children with autism, would demonstrate that not only could these children be fairly tested but also meaningful individualized information could be gathered to help with diagnosis and program planning.

At that time, the main tests used were the Stanford-Binet and Wechsler Scales, designed for language-proficient children with relatively even patterns of skills and adequate competence, motivation, and relating. Only the brightest of children with autism could be expected to successfully take these tests, and, even then, their responses and scattered skill profiles might be misinterpreted. The introduction of the PEP, an autism-specific assessment tool, addressed the long-standing problems inherent in testing based on the misunderstanding of the children. By using an instrument based on developmental principles and administrative flexibility, examiners not only were able to obtain accurate information, but the understanding of the nature of autism and how it affected children was better appreciated.

Another insight Drs. Schopler and Reichler highlighted was the distinction between diagnosis and individualized assessment, particularly relevant to autism. Diagnosis involves the grouping of cases based on a set of common

characteristics, while individualized assessment pertains to the specific profile of skills, deficits, interests, and behaviors. In their research, Schopler and Reichler developed both the Childhood Autism Rating Scale (originally the Childhood Psychosis Rating Scale) and the PEP as companion scales, with the former addressing diagnosis and the latter individualized assessment, with both emphasizing direct observation. The PEP was also unique in its integration of behavioral and developmental data in one instrument, emphasizing the importance of linking the atypical features with the developmental delays and irregularities. Autism was meant to be understood as a disorder of development, not an emotional or primarily behavioral disturbance, and the PEP was a means of documenting this.

The first published edition of the PEP was in 1979, although a working version had been available within the TEACCH program during that decade. The first revision, the PEP-R, was published in 1990 in response to the increased numbers of younger children being diagnosed with autism and the passage of PL 99–457 expanding public school services for exceptional children under the age of five. The revised PEP added many items developmentally at the three and under age range. Other changes included expanding the language functioning area, streamlining sections dealing with the assessment of behavior problems, and modifying terminology to meet current definitions and usage. The second revision, the Psychoeducational Profile – Third Edition (PEP-3) was published in 2004. In addition to improving psychometric properties (e.g., larger normative sample, more reliability and validity data), the PEP-3 also updated behavioral items to be more consistent with current research on characteristics of autism and added a caregiver form to gather information on self-care skills, autism characteristics, and adaptive behavior.

Psychometric Data

The PEP-3 was developed using a normative sample comprised of 407 children and adolescents with ASDs and 148 children with typical development from around the United States. Development data were collected by professionals who had experience with the PEP-R and/or work as psychologists within the TEACCH program. Overall, analysis of reliability and validity indicates that the PEP-3 demonstrates sound psychometric properties (Schopler et al., 2005).

The PEP-3 demonstrates high reliability (Schopler et al., 2005). Internal consistency was assessed by calculating coefficient alphas for all subtests and composites in a sample of individuals with ASDs at 11 age intervals (ages 2 through 12). Average coefficients indicated high reliability and for the developmental subtests ranged from .92 to .97, for the maladaptive behavior subtests ranged from .90 to .93, and for the caregiver report subtests ranged from .84 to .90. Test-retest reliability was assessed over a period of 2 weeks in a sample of 33 children with ASDs. Raw scores were used to calculate correlation coefficients for each subtest, and all indicate high reliability: developmental subtest correlation coefficients ranged from .97 to .99, maladaptive behavior subtest correlation coefficients ranged from .94 to .98, and caregiver report subtest correlation coefficients ranged from .98 to .99. Interrater reliability for the caregiver report subtests was assessed for 31 children with ASDs and 9 children with typical development. Two parents for each child completed the caregiver report form. Polychoric correlation coefficients were calculated for each item due to the ordered, categorical nature of the data. Coefficients ranged from .70 to .91 for the problem behaviors subtest, from .65 to 1.00 for the personal self-care subtest, and from .52 to .90 for the adaptive behavior subtest. One additional item on the adaptive behavior subtest was excluded from the calculation ranges due to its low reliability.

Criterion-prediction validity was assessed in a series of studies correlating scores from the PEP-3 with scores from other developmental and behavioral assessments used to measure similar constructs. Overall, the vast majority of correlations were large (.50 and above) and in

the expected direction, thus supporting the validity of the PEP-3 as a measure of development and autism characteristics (Schopler et al., 2005). In the first study, correlations between the PEP-3 subtests and subtests from the Vineland Adaptive Behavior Scales (VABS) were computed for a sample of 45 children and adolescents with ASDs. The VABS is a parent report measure of child adaptive behavior and self-care skills. As expected, positive and significant correlations were found between the VABS and the PEP-3 for subtests related to developmental skills, self-care skills, and behaviors related to an autism spectrum diagnosis. Lower correlations were found between PEP-3 caregiver report of problem behaviors and VABS scores of motor and daily living skills, though these scales were not predicted to correlate highly. In the second study, correlations between the PEP-3 subtests and total scores from the Childhood Autism Rating Scales, a measure of autism symptom severity, were computed for a sample of 68 children and adolescents with ASDs. Because higher scores on the PEP-3 reflect a more typical pattern of behavior and higher scores on the CARS reflect a more impaired or autistic pattern of behavior, significant negative correlations were predicted and found. Similarly, the third study examining the relation between the PEP-3 and the total score on the Autism Behavior Checklist – Second Edition in 316 individuals with ASDs yielded significant negative correlations between the measures except for the PEP-3 characteristic verbal behavior subtest.

The PEP-R and the PEP-3 have been translated into several languages including Chinese, Japanese, French, Portuguese, Dutch, Italian, and Estonian. Although some versions may benefit from further study, evidence available in English indicates that translated versions continue to show strong reliability and validity, and the PEP is a valuable instrument internationally for assessing children with autism (De Leon, 2005; Fu et al., 2010; Fu, Chen, Tseng, Chiang, & Hsieh, 2011; Kikas & Häidkind, 2003; Steerneman, Muris, Merckelbach, & Willems, 1997; Villa et al., 2010).

Clinical Uses

The PEP-3 has multiple clinical and educational purposes including gathering developmental data for program planning and informing diagnostic decision-making, although it should not used as a stand-alone measure for making a diagnosis. However, the PEP-3 collects information on the behavioral characteristics associated with ASD. It has normative data based on a large sample of children with autism, particularly useful in clarifying the extent to which the child being tested shows features shared by the sample of children with ASD. The PEP-3 can be used as the primary test in the evaluation process, but it should be supported by other information such as parent report, observations in a natural setting (e.g., home or school), previous history, and collateral reports. When diagnostic clarification is a primary goal of the evaluation, it is preferable if the PEP-3 is used in conjunction with the Childhood Autism Rating Scale, the Autism Diagnostic Observation Schedule, or another scale specifically designed for diagnostic classification.

Perhaps the greatest utility of the PEP-3 is in generating developmental information across multiple function areas. A strength of the test is that it was designed specifically for children with autism; it can be flexibly administered, contains materials of interest to children, and does not depend on language for instructions. The nonverbal domains and items do not require language processing for the child to complete them. The test covers a wide range of important developmental functions. Examples of test flexibility include the options of alternating easy and challenging activities, conducting the assessment using work systems or routines familiar to the student, and teaching and scaffolding to get complete information.

Developmental age scores can be derived and can be converted into a developmental quotient (Delmolino, 2006). However, more important to program planning is the breakdown of skills into patterns as well as item analysis. In reviewing the data, the clinician is able to consider multiple levels of analysis including examining the child's

overall pattern of strengths and weaknesses, analyzing the individual items that were passed or where an "emerging" score was obtained, reviewing the pattern of maladaptive behaviors, and considering the caregiver information. A careful analysis provides insight about appropriate developmental expectations useful in planning goals and curriculum.

Each of the developmental functions or domains is made up of many items that tap a variety of skills. For example, the Cognitive Verbal/Preverbal Scale measures the skills of problem-solving (nonverbal), matching, sorting and categorizing, and visual-motor integration. In addition, the examiner can observe characteristics of social communication (e.g., directing attention or commenting, seeking help or praise, sharing enjoyment), cognitive style (e.g., organization, flexibility, ability to transition between materials, persistence, cognitive areas of strength and weakness), and use of and response to materials (e.g., appropriate or inappropriate, unusual sensory responses, rigid or flexible). Results from performance on the different developmental domains can be used to develop instructional goals, curriculum, and behavioral strategies for implementation at school and home. Integrating the information from the developmental and behavioral scales leads to a well-rounded approach to intervention and program planning. Other resources are available that show examples of how skills can be taught in a visual, structured way (Boswell, Reynolds, Faulkner, & Benson, 2005; Eckenrode, Fennell, & Hearsey, 2003; Eckenrode, Fennell, Hearsey, & Reynolds, 2009).

See Also

- ▶ Age Equivalents
- ▶ Autism Diagnostic Observation Schedule
- ▶ Expressive Language
- ▶ Psychological Assessment
- ▶ Receptive Vocabulary
- ▶ Schopler, Eric
- ▶ Vineland Adaptive Behavior Scales
- ▶ Visual-Motor Function

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Psycholinguistics

Inge-Marie Eigsti[1] and James S. Magnuson[2]
[1]Department of Psychology, University of Connecticut, Storrs, CT, USA
[2]Department of Psychology, University of Connecticut Haskins Laboratories, New Haven, CT, Storrs, CT, USA

Synonyms

Psychology of language

Definition

Language is a symbolic system of communication. Although animals also have systematic ways of communicating (e.g., the call of the vervet monkey, which alerts other monkeys to the presence of eagle or snake predators; the honeybee's waggle dance, which communicates the location of pollen; or the ultrasonic vocalization of rodent pups, which alerts the caregiver that they have fallen from the nest), these animal systems of communication do not have the unique and communicatively powerful features of human language. Linguists note that the 5,000-plus languages of the world all share two features that are central to the ability to create unique novel sentences: they are *hierarchical* and *rule-governed*. The hierarchical (generative) nature of language refers to the fact that language consists of small components that can be combined to into larger units. Thus, noun phrases (which can contain relative clauses) can themselves be embedded within clauses. This enables us to produce messages of theoretically infinite length, as in this sentence: "John said that Sally said that the boy with the dog that bit her brother is actually quite nice." Certainly, limitations on cognitive resources constrain the number and type of embeddings we can readily understand. Secondly, the rule-based feature of language allows us to express novel concepts using familiar structures. Thus, we can produce sentences consisting of entirely unique combinations of words and sounds (as in Chomsky's famous sentence, "colorless green ideas sleep furiously," which, though semantically nonsensical, nonetheless is a grammatical English utterance).

Psychology of language is commonly referred to as "psycholinguistics," (Spivey, Joanisse & McRae, 2012). The field of psycholinguistics has four primary concerns: (1) language comprehension, (2) language production, (3) language acquisition, and (4) neurobiological bases of language. Comprehension involves a range of processes, including the perception of language-specific sounds (speech perception) or orthographic patterns, the mapping of those patterns onto words in memory (word recognition), the mapping of combinations of words into structured phrases (i.e., syntax), and the integration of linguistic forms with general and pragmatic knowledge. This latter component is known as discourse and refers to how two or more people understand each other during conversation; it involves the understanding of utterances that may go beyond literal meanings (e.g., implicature, metaphor, irony). Language production has to do with the actual motor acts involved in speech (or, in the case of sign languages, in signing) or writing, as well as the cognitive processes involved in creating an utterance. Language acquisition focuses on the processes involved in child language learning, as well as the phenomena of bilingualism and adult language development. Interesting recent work, for example, has examined the apparent enhancement in executive function skills that characterizes children who are fluent in, and can switch between, multiple languages (see, e.g., Bialystok & Viswanathan, 2009). In recent years, techniques from cognitive neuroscience have led to new understanding of the neurobiological bases of language comprehension, production, and

acquisition. These techniques have included research using functional magnetic resonance imaging (fMRI), electroencephalography (EEG) and the related tool of event-related potentials (ERP), transcranial magnetic stimulation (TMS), and magnetoencephalography (MEG).

See Also

- Aphasia
- Communicative Functions
- Cortical Language Areas
- Deictic Terms
- Dichotic Listening
- Expressive Language
- Grammar
- Language Acquisition
- Syntax
- Theories of Language Development

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Psychological Assessment

Melissa Maye
Clinical Psychology, University of Massachusetts, Boston, Boston, MA, USA

Synonyms

Intelligence tests (see specific tests); IQ test

Definition

Assessment is the process by which a professional meets with and evaluates an individual, family, or family subsystem for a determined need. There are many different types of assessments. The presenting concerns of the individual, family members, or family system should determine the type, focus, and amount of testing. Most often, assessment is conducted with individuals. Depending on the age of the individual, in addition to a diagnostic evaluation, assessment of the domains of neurocognitive, academic, language, adaptive, and social-emotional functioning and behavior problems is routinely recommended for individuals who have been identified as having, or as at risk for an, autism spectrum disorder (ASD).

Assessment can be both formal and informal. However, all methods of assessment should be completed with the aim of gaining information about an individual that will aid in making informed decisions. There are many purposes of assessment: screening, problem solving, diagnosis, counseling and rehabilitation, and evaluating treatment progress. In some circumstances, it may be possible to complete one assessment that can inform several of these purposes. However, in other circumstances, multiple specialized assessments may be required to obtain the information necessary to develop an accurate picture of the individual and the most complementary treatment plan (Sattler, 2001).

Screening assessments are brief evaluations designed to signal initial risk for a particular disorder, condition, or problem. Examples of autism screeners include the Screening Tool for Autism in Toddlers and Young Children (STAT; Stone & Ousley, 2008) and the Social Communication Questionnaire, Revised (SCQ-R; Rutter, Bailey, Berument, Lord, & Pickles, 2003). These brief observation and questionnaire tools are generally quite sensitive, thus ensuring that children who are at risk get the additional assessment needed to determine or rule out an ASD diagnosis. Another highly sensitive screener of emotional and social functioning is the Infant Toddler Social Emotional Assessment

(ITSEA) (Briggs-Gowan & Carter, 2006). This screener may be a good first tool in assessing general social and emotional competence before deciding on using an autism specific screener.

A problem-solving assessment is a detailed evaluation of a specific concern, or area of functioning. These assessments are often used to determine whether or not an individual has a specific diagnosis, such as an ASD. The Autism Diagnostic Observation Schedule (▶ ADOS; Lord, Rutter M, DiLavore, & Risi, 2002) and the Autism Observation Scale for Infants (Bryson, Zwaigenbaum, McDermott, Rombough, & Brian, 2007) are two examples of problem-solving assessments often used as part of an evaluation designed to diagnose ASDs.

A comprehensive psychological assessment requires a detailed evaluation of an individual's functioning in more than one area. This type of assessment often results in a profile of an individual's strengths and weaknesses in areas such as academics, cognition, language, and social functioning. These types of assessments allow for accurate diagnoses and treatment plans to be made that best aid the individual in achieving at their highest ability. One important addition to the comprehensive evaluation is intelligence testing. This is especially important for individuals with an ASD given that intellectual ability has been linked to severity of autism symptoms, ability to acquire skills, level of adaptive functioning, and overall trajectory (Ozonoff, Goodlin-Jones, & Solomon, 2005). Commonly used cognitive tests for individuals with an ASD include the Wechsler Intelligent Scale for Children, Fourth Edition (▶ WISC-IV; Wechsler, 2003), the Differential Ability Scales-II (▶ DAS-II; Elliott, 2007), the Mullen Scales of Early Learning (MSEL; Mullen, 1995), and the Leiter-Revised (▶ Leiter-R; Roid & Miller, 1997). The Leiter-R is an especially useful tool for individuals with limited language. Additionally, language assessments are also imperative to assessments of individuals with an ASD. Expressive language level is the second best predictor of overall trajectory (Ozonoff et al., 2005). Common, relatively brief receptive and expressive vocabulary tests used with individuals with an ASD include the Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 1997) and the Expressive One Word Vocabulary Test (EOWPVT; Martin, & Brownell, 2007), respectively.

Counseling, rehabilitation, and adaptive assessments focus on the individual's abilities, rather than their weaknesses. These assessments evaluate the individual's abilities to adjust and successfully complete daily responsibilities. A common measure that may be used with individuals with an ASD to assess adaptive behavior is the Vineland Adaptive Behavior Scales II (Vineland II; Sparrow, Chicchetti, & Balla, 2005). This Vineland-II is a semi-structured parent interview that assesses an individual's daily living skills. Additionally, the TEACCH Transition Assessment Profile (TTAP; Mesibov, Thomas, Schopler, & Chapman, 2007) could also be utilized as a direct assessment of an individual's ability to complete daily tasks such as answering the phone, counting money, and sorting. The TTAP also includes parent and teacher interviews as well.

Progress evaluation assessments occur periodically after initial assessments to track an individual's changes in development and to evaluate the effectiveness of treatment.

Historical Background

Modern psychological testing originated a little less than one hundred years ago with the development of some basic sensory and motor measures by British scholar, Francis Galton. Following Galton's initial development of testing, American psychologist, James McKeen Cattell continued this work throughout his academic career, revolutionizing testing, beginning with his paper "Mental Tests and Measurements," published in 1890.

Moving forward to 1943, Kanner offered the first description of autism when he identified a subset of individuals with intellectual disability. These individuals suffered deficits of social and communication skills that predominantly occurred in boys (Kanner, 1943). Assessment of

autism has long been left to the clinical interview with the aid of the Diagnostic and Statistical Manual of Mental Disorders (DSM). Autism was first mentioned in DSM-I under Schizophrenic reaction, childhood type (Author, 1952). It was not until DSM-III, launched in 1980, that Autism was considered a unique diagnosis (Author, 1980). While several diagnostic questionnaires and clinical interviews have been in use for many years, it was not until the ADOS was developed that clinicians were able to assess autism through the process of provoking behavioral symptoms through presses during a semi-structured interaction (Lord, Rutter, & DiLavore, 2001). The ability to assess autism symptoms from a behavioral observational perspective has provided assessors with a first-hand method of assessing and evaluating an individual's behaviors as opposed to relying on second-hand accounts in isolation.

Current Knowledge

While there have certainly been historical missteps in the application of psychological assessment throughout the evolution of the practice, including the damaging role of prejudicial psychological assessment in the Immigration Restriction Act of 1924, assessment remains a useful and critical tool of understanding one's unique individual profile (Gregory, 2004). Today, there are clearly defined standards and general protocol to follow. Additionally, psychologists today should practice with the understanding that while general profiles can be created for different diagnoses, cultural influences are important and should be considered within each unique case.

An important distinction exists between psychological testing and psychological assessment. The emphasis on psychological testing is rooted in data collection, whereas psychological assessment is not purely focused on data collection through tests, but is concerned with a more global evaluation of an individual. Current theory dictates that there are four important "pillars" of psychological assessment.

The four pillars of assessment include norm-referenced tests, interviews, observations, and informal assessment procedures (or, more generally, tests). An assessment that incorporates each of the four pillars is considered to be a good representation of an individual's unique profile (Sattler, 2001).

Norm-referenced texts are considered to be critical in conducting psychological assessments (Carter, Godoy, & Marakovitz, 2009). These tests are standardized on a clearly defined group and are scaled so that each score indicates an individual's rank within the normed group. Norm-referenced tests are most commonly used to assess intellectual ability, academic achievement, adaptive behavior, and fine/gross motor skills (Sattler, 2001). Norm-referenced tests allow for quantification of an individual's behavior. Quantification can be helpful in determining where an individual ranks in comparison to his/her chronological peers, determining the location of specific deficits/strengths, and providing a baseline to track progress. It is important to select standardized tests that have a sufficient number of items at the level at which an individual is functioning so that there is sufficient variation in functioning to observe relative strengths and weaknesses, or sufficient sensitivity to develop a cognitive profile that is not subject to floor effects.

Norm-referenced rating scales are often used given that they are inexpensive and can be administered flexibly (i.e., online, through the mail, in person). Additionally, norm-referenced rating scales can be used to enrich a comprehensive assessment of an individual by asking teachers, employers, daycare providers, and others in an individual's daily life to complete questionnaires as well (Carter et al., 2009).

Interviews with multiple informants are another key component to a sound assessment. This is especially true for individuals with ASDs, as symptom severity may depend largely on the environment (Ozonoff et al., 2005). For example, high-functioning individuals with an ASD may appear to be astute and connected with their schoolwork and peers in a class that they both are interested in and excel in. However, that

same individual may have severe difficulties maintaining a part-time job as a cashier due to the many social demands of the position and a lack of interest. Interviewing a child's parents, teachers, and other caregivers provides critical insight into the child's functioning in several different environments. Interviews can be structured, semi-structured, or unstructured. While all interviews provide the opportunity for information to be delivered in a conversational matter, structured interviews are the most rigid with a set list of questions and often result in a comprehensive caricature of the individual and are usually designed to aid in diagnosis. The Autism Diagnostic Interview-Revised (▶ ADI-R; LeCouteur, Lord, & Rutter, 2003) and the Childhood Autism Rating Scale, Second Edition (CARS2; Schopler, Van Bourgondien, & Wellman, 2010) are popular semi-structured parent interviews used to contribute to a diagnosis of ASD. Both the ADI-R and the CARS 2 review, with parents, critical information regarding the affected individual's communication, social, and behavioral development. Assessment of these three domains is an important piece of a comprehensive assessment of an individual with an ASD (Ozonoff et al., 2005). Semi-structured and unstructured interviews provide less structure but are also important to the assessment of an individual because they give the opportunity for information to be transmitted that may have been lost in a more structured and formal setting. While structured and semi-structured interviews provide an in-depth amount of information they are more commonly utilized in research settings (Carter et al., 2009).

Observations are another critical component of psychological assessment. Observations can be made both formally, through observational assessment tools such as the ADOS (Lord, Rutter, & DiLavore, 2001), and/or informally throughout the evaluation and/or in other environments (e.g., school, work, community). Observations are important because they allow a clinician to identify factors that may be contributing to, or reinforcing, specific problem behaviors. Through making these direct observations, clinicians are then better able to create effective, personalized, intervention plans.

Assessments of individuals with an ASD should also strive to be multidisciplinary whenever possible. Professionals from psychology, psychiatry, pediatrics, and neurology and speech and language specialists are often imperative members of the treatment team. While interdisciplinary coordination is essential to promoting quality care it is important that one professional take the lead as the evaluation coordinator. The evaluation coordinator should communicate with the parent and the affected child/adult in order to ensure that all information is equally shared and that the family only needs to speak with one professional who will then disseminate the information. Utilizing an evaluation coordinator is essential to a successful evaluation and ensures accurate transmission of information (Ozonoff et al., 2005).

In regard to informal assessment procedures, or tests, there are many different options for clinicians to choose from. It is important to choose tests that assess for the information that is pertinent to the individual's needs. It is important to use tests that have sound reliability and validity. If a test does not have either of these qualities, it should be used cautiously (Sattler, 2001). Additionally, measures of sensitivity and specificity are especially important psychometric issues to evaluate when considering which test to administer. High percentages of sensitivity and specificity ensure that a test is sensitive enough to capture enough of a population for screening purposes, but restrictive enough to not overwhelm service systems (Carter et al., 2009).

Although the four pillars of assessment do not operate independently, they are unique. Each pillar contributes to the overall assessment and creates a vivid picture of the individual's strengths, weaknesses, and overall level of functioning. A quality assessment should be derived from a number of sources, assessment methods, and cover multiple domains of functioning (e.g., intelligence, memory, oral language, adaptive behavior, etc.). Following completion of the assessment, results should be calculated, substantial evidence in the form of observations should

contribute to sound clinical impressions, and recommendations should then be made to facilitate treatment (Sattler, 2001).

When completing an evaluation it is especially important to interpret the scores by considering what they suggest about the individual's strengths and weaknesses. Clinicians should be careful to not interpret scores at face value as they diminish the qualitative data gathered in the assessment period and may overgeneralize an individual's profile. For example, an individual may have a low adaptive behavior score but may be capable of completing high-level tasks such as preparing a simple meal. If only a low score was interpreted from an adaptive behavior scales interview, a recommendation might be made to focus on self-help skills, such as preparing simple meals. However, given that the individual has already mastered this skill, the recommendation is not useful in facilitating adaptive growth.

When assessing individuals for ASDs, two levels of screening and evaluation exist. Level 1 screening involves observation by routine service providers, such as pediatricians. Level 2 evaluations involve comprehensive diagnostic assessments provided by an experienced clinician (Ozonoff et al., 2005). Comprehensive diagnostic assessments should take into consideration the developmental component of ASD. Generally, children are diagnosed with ASDs in early childhood and continue to fit criteria through the life span.

When considering psychological assessment of young children at risk for a diagnosis of an ASD it is important to understand the challenges of assessing infants and toddlers. Often psychological assessments of young children focus on social-emotional problem behaviors, without equal focus placed on social-emotional competencies. While it is understandable that externalizing behaviors often drive parental concern and therefore prompt assessment, it is arguable that focusing on a child's competencies allows clinicians to gain more insight into the overall profile of the child. Namely, recognizing a delay in social and emotional competencies indicates risk for the emergence of additional behavior problems. Further, competencies in areas of social-emotional functioning generally indicate continued mastery. Knowledge of both social-emotional problems and competencies contribute to better treatment plans that capitalize on a child's strengths (Carter et al., 2009).

It is also important to take into consideration the contexts of race, ethnicity, and culture when completing an assessment. Often, race, ethnicity, and culture are used interchangeably as different ways of stating the same thing, when they are distinctly different constructs. Race, is a socially constructed concept that has been created based on physical characteristics. Culture is distinct in that it describes the shared values, beliefs, and practices of a group that are transmitted across generations. Lastly, ethnicity indicates a specific culture and is usually associated with a common geographic or national origin (Carter, Briggs-Gowan, & Ornstein Davis, 2004). Assessments that incorporate sensitive understanding of these three domains contribute to a comprehensive understanding of the affected individual that takes into account factors other than test scores and addresses potential clinician biases.

Future Directions

While psychological assessment has certainly made advancements since the 1890s, both in developing the sophistication of the testing instruments and in considering cultural issues, assessment is not a perfect science. Certainly, the four pillars of assessment and integration of empirical knowledge of specific disorders and profiles contribute to a useful conceptualization of an individual's functioning. However, as assessment tools continue to develop, it is important to consider the imperfections that currently exist and work toward rectifying them in an effort to further advance the field. For example, it may be helpful to develop diagnostic specific norms for different measures of assessment. Developing norms that are specific to different diagnostic groups allows clinicians to make quantitative impairments within groups, thus allowing for more specific recommendations and expectation.

See Also

- Adaptive Behavior Scales
- Autism Diagnostic Interview-Revised
- Autism Diagnostic Observation Schedule
- Peabody Developmental Motor Scales (PDMS)
- Vineland Adaptive Behavior Scales
- WISC-IV

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Psychologist

Tracey Ward
Simons Autism Family Collaboration, University of Washington, Autism Research Center, Seattle, WA, USA

Synonyms

Analyst; Clinician; Psychologist; Psychotherapist; Social scientist; Therapist

Definition

Academic or clinical professional who holds a doctoral degree in psychology from an

organized, sequential, and regionally accredited school or university; an expert or specialist in psychology who carries out research in and/or practices psychology; a person who provides psychological services that include diagnostic evaluations, functional assessments, interventions, preventative and ameliorative care, consulting, program development and/or administration, education, and supervision.

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Psychology of Language

▶ Psycholinguistics

Psychomotor

Fred R. Volkmar
Director – Child Study Center, Irving B. Harris Professor of Child Psychiatry, Pediatrics and Psychology, School of Medicine, Yale University, New Haven, CT, USA

Synonyms

Psychomotor development

Definition

As typically used in psychology, psychomotor skills are those abilities that are related to motor activity in association with cognitive/mental activity. A number of psychomotor skills must be learned by the young infant including coordination, movement of the body, coordination of movement with thought/intention, and so forth. Complex psychomotor skills include activities like dancing, pitching, or playing a musical instrument.

Early investigators like Arnold Gesell (1949) charted the progress of early psychomotor skills and noted that, in general, there was a cephalocaudal ("head to tail") and proximodistal ("inner to outer") pattern of motor control, e.g., head control before trunk control, shoulder control before hand control. Other investigators like Piaget (1952) were more interested in the way that the development of thinking interrelated to motor control with coordination of early motor and perceptual abilities and simple reflexes into much more cognitively and motorically complex action. Some of the early work on charting the normative acquisition of skills also highlighted patterns of delay and developmental deviation. For example, delays in imitation skills in autism appear to reflect a fundamental lack of social orientation and interest rather than deficits in motor skills as such and may be important implications for treatment (Ingersoll, Lewis, & Kroman, 2007; McDuffie et al., 2007).

See Also

▶ Imitation
▶ Occupational Therapy (OT)
▶ Physical Therapy

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Psychomotor Development

► Psychomotor

Psychomotor Development Index

Zoe Mailloux
Private Practice, Redondo Beach, CA, USA

Synonyms

Motor development assessment

Definition

Psychomotor Developmental Index generally refers to a measure of motor skills that also involve some aspects of conceptual or psychological functioning. The term Psychomotor Developmental Index (PDI) is most closely associated with the Bayley Scales of Infant Development (BSID), first published by Nancy Bayley in 1969 and revised in 1993 as the BSID-II. The BSID-II includes the following three scales, mental, motor, and behavior, with the motor scale referred to as the Psychomotor Developmental Index (PDI). Test items for the PDI include motor skills such as rolling, crawling, grasp, and use of utensils.

Assessment of developmental functions emerged in the twentieth century with the advent of assessments such as the Gesell System of Developmental Diagnosis (1925), the Cattell Infant Intelligence Test (1940), and the original Bayley Scales of Infant Development (1969). These assessments focused on documenting normative expectations and were aimed at identifying a child's developmental progressions. Over time, these assessments also led to efforts to identify developmental delays for the purpose of planning appropriate early interventions.

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Psychomotor Epilepsy

Katie Shattuck[1], Rob Christian[2] and Stephen R. Hooper[2]
[1]School of Nursing, University of North Carolina-Chapel Hill, University of North Carolina School of Medicine, Chapel Hill, NC, USA
[2]Department of Psychiatry, The Carolina Institute for Developmental Disabilities, School of Medicine, University of North Carolina, Chapel Hill, NC, USA

Synonyms

Epilepsy and autism

Short Description or Definition

Introduction

Autism spectrum disorders (ASD) and epilepsy are both clinically heterogeneous entities whose co-occurrence has long been recognized to exist at a frequency that is greater than could be predicted by chance alone. This observation has led to interest in the possibility of shared causal pathways for both disorders and raises the possibility of future novel interventions that could impact the course of both conditions. Further, the co-occurrence of the disorders presents several diagnostic and treatment challenges and controversies. This encyclopedia entry will provide an overview of terminology, epidemiology and etiology, clinical expression, available findings on developmental course, issues in differential diagnosis, and treatment considerations.

Categorization

Terminology

Terms associated with autism include autism spectrum disorder (ASD), high-functioning autism (HFA), pervasive developmental disorders (PDD), and infantile autism. ASD are behaviorally defined disorders. These terms are defined in introductory chapters in this encyclopedia. Key terms associated with epilepsy include seizure disorder and pediatric seizure disorder. A seizure is commonly understood as uncontrolled electrical activity in the brain, which may produce a physical convulsion, minor physical signs, changes in consciousness, thought disturbances, sensory disturbances, or a combination of symptoms. While the terms seizure disorder and epilepsy are generally used interchangeably, epilepsy is more formally defined as having two or more seizures within a set period of time, most often within 3 years, for which there is no other identifiable cause such as mass lesion, head trauma, infection, toxic exposure, or metabolic derangement (Matson & Neal, 2009).

Epidemiology

Epidemiology and Etiology

The prevalence of autism in the pediatric population is approximately 11.3 cases per 1,000 children. Autistic traits are more commonly seen in males, with a prevalence rate of 18.4 cases per 1,000 males, as compared to 4.0 cases per 1,000 females (Center for Disease Control, 2012). In the general pediatric and adult population, the prevalence of epilepsy is 2–3% (Canitano, 2007). The prevalence of having epilepsy and autism as comorbid conditions ranges widely from 11–45% (Gabis, Pomeroy, & Andriola, 2005; Mouridsen, Rich, & Isager, 1999; Olsson, Steffenburg, & Gillberg, 1988; Spence & Schneider, 2009; Volkmar & Nelson, 1990). Within the population of children with ASD, it is estimated that about one third will experience at least one seizure by adolescence (Olsson et al., 1988; Volkmar & Nelson, 1990). Interestingly, females with autism appear to have a 27% increased risk for seizures, whereas males with autism have only a 14% increased risk (Tuchman, Rapin, & Shinnar, 1991).

Etiological Mechanisms

The frequency of co-occurrence of these two disorders has led to interest in the possibility of shared etiological mechanisms in seizure disorders and ASD. Proposed theories of shared causality have been related to the deleterious effects of the seizures themselves. Additionally, contemporary mechanistic understandings of several key neurodevelopmental disorders have led to new theories about the shared role of impaired plasticity during development.

For example, portions of the temporal lobe of the brain and associated neural pathways are likely to be key brain regions in the complex network that has been described as “the social brain.” The temporal lobe has long been a suspected region of importance because of the relative frequency of temporal lobe epilepsy both among epilepsy patients with social challenges and among those with ASD and epilepsy. Animal research using mouse models has demonstrated that mice with induced temporal lobe seizures

exhibited less social behavior than control mice (Marin et al., 2008). Other work has provided neuroimaging evidence for damage to other recognized social brain structures in this network, such as the hippocampus, in patients with temporal lobe epilepsy (Cendes et al., 1993; Dager et al., 2007; Marin et al., 2008).

Another set of examples wherein a potential shared mechanism for both ASD and seizure disorders has begun to be explored comes from the study of several recognized genetic syndromes that are associated with both autism features and seizures. In this regard, fragile X, tuberous sclerosis complex, and Rett's syndrome all have been proposed as possible models of overlapping causality in ASD and epilepsy/seizures. For example, Rett's syndrome is a neurodegenerative disorder that affects girls that is currently understood to be caused by mutations in the gene encoding methyl-CpG binding protein 2 (MeCP2). Rett's syndrome is characterized by regression of verbal skills along with repetitive hand motions that usually begin to occur between 6 and 18 months of age (Brooks-Kayal, 2010). Up to 90% of Rett's syndrome patients develop seizures (Canitano, 2007). Tuberous sclerosis has been associated with both epilepsy and autism. The prevalence of tuberous sclerosis in the general population is around 1 case per 10,000 to 20,000 (Sherpherd, 1999). Around 1% of children with autism will have tuberous sclerosis (Harrison & Bolton, 1997), and approximately 80% of patients with tuberous sclerosis will also have seizures (Canitano, 2007). With respect to epilepsy, tubers are thought to be foci of epileptic activity, and many of the ASD symptoms have been linked to tubers found in the temporal lobes of the brain (Bolton, Park, Higgins, Griffiths, & Pickles, 2002). Finally, fragile X syndrome is the most common form of inheritable intellectual disability, which frequently manifests with co-occurring autism and seizures. This syndrome is caused by excessive CGG trinucleotide repeats on the X chromosome, methylating either in whole or in part the Fragile X Mental Retardation gene leading to many of the phenotypic features associated with fragile X syndrome (Brooks-Kayal, 2010). With approximately one third of individuals with fragile X syndrome showing co-occurring ASD, this syndrome provides a clear single gene disorder for examining not just autism but its related comorbidity.

While exact mechanisms for the behavioral manifestations remain unknown, in each of these disorders, there has been an expanding knowledge base relating to presumed causal genetic defect(s) and their downstream molecular effects. Resultant impaired inhibitory/excitatory regulation and impaired neuroplasticity have been proposed as a possible common explanation for seizures and ASD-related behaviors (Brooks-Kayal, 2010). Further, a number of other gene mutations have been associated with ASD, IDD, and epilepsy/seizures including the genes encoding neuroligins, neurexins, arestelles region X-linked (ARX), and neuropilin-2 (Brooks-Kayal, 2010).

Clinical Expression and Pathophysiology

There a number of ways that the co-occurrence of seizures and ASD can be examined in terms of clinical expression and variables associated with seizure pathophysiology: These included: type of seizures, seizure location, epilepsy syndromes, age of seizure onset, level of intellectual functioning, and developmental course.

Type of Seizures

There are several classification schemas for seizure types and epilepsy. The most commonly used classification is based on the broad categories of generalized seizure onset versus focal onset, each with subcategorizations based on various clinical features and origin of seizure activity. Further, there are numerous recognized epilepsy syndromes. Seizure types in individuals with ASD are highly variable, and multiple seizure types in the same individual are not uncommon. It is important to note, though, that the prevalence of particular seizure types among those with both disorders does not seem to differ significantly from the distribution of seizure types in epilepsy patients in general (Sternberger, 2003).

Seizure Location

There is a suggestion that seizure location may point to a relationship with autistic features or autism. In epilepsy in which the seizure activity manifests from the frontal lobe, behavioral changes may include irritability, altered mood, subtle changes in alertness, associated attention dysregulation, and cognitive rigidity features often associated with ASD (Fohlen, Bulteau, Jalin, Jambaque, & Delalande, 2004). Seizures originating in the temporal lobe may be associated with autistic features or autism (Hamiwka & Wirrell, 2009) in that the individual may present with affective blunting, odd or impaired language functions, including impairments in core language functions or pragmatics, and poor recognition of faces.

Epilepsy Syndromes

The relationship between ASD and seizures also can be understood by considering the presence of an epilepsy syndrome. There are numerous epilepsy syndromes, and those that are believed to contribute to progressive disturbance in cerebral function may be termed "epileptic encephalopathies." These disorders begin early in life and are often associated with regression of cognitive, language, and other neurodevelopmental functions. Many children with these disorders may present with features of ASD or they may in fact meet diagnostic criteria for an ASD (Nabbout & Dulac, 2003: Nabbout & Dulac, 2008). Among these syndromes, infantile spasms (IS), Landau-Kleffner syndrome (LKS), and epilepsy with continuous spike-waves during slow-wave sleep (CSWS) are most strongly associated with ASD symptomology (Ballaban-Gil & Tuchman, 2000).

In IS, the association with ASD may as high as 35%, and this risk seems to increase in the presence of a severe intellectual disability, structural brain lesions, and ongoing epileptiform activity in frontal brain regions (Kayaalp et al., 2007; Saemundsen, Ludvigsson, & Rafnsson, 2007, 2008). LKS and CSWS have overlapping symptoms in relationship to seizure presentation, and both manifest features that overlap with ASD symptoms. The failure or regression of language development in these disorders often leads to confusion with autistic regression that is reported in children with and without underlying seizure disorders (Canitano, 2007; Nass, Gross, & Devinsky, 1998).

Age of Seizure Onset

The relationship between ASD and seizures/epilepsy can also be considered by considering the age of seizure onset. It has been theorized that epilepsy with a late onset during adolescence is brought on by the hormonal fluctuations associated with puberty (Gillberg, 1991). One study of children with autism showed that seizure activity peaks between 3 and 10 years of age (Matson & Neal, 2009). Other studies, however, have suggested that epilepsy has two peaks in children with autism: one during infancy and another during adolescence (Olsson et al., 1988). The peak during infancy may correlate with the peak of seizure activity that is seen in children with epilepsy without autism. The second peak during adolescence, however, may be unique to children with autism (Nomura, Nagao, Kimura, Hachimori, & Segawa, 2010).

Intellectual Functioning

The range of the overall level of intellectual functioning in individuals with ASD is quite large and variable; however, it has been well established that in populations of children with epilepsy, the risk of autism or autistic features is increased among those with the lowest intellectual functioning (Hamiwka & Wirrell, 2009). Among populations of children with ASD, those with severe intellectual disability, severe receptive language deficits, and motor dysfunction have the highest risk of epilepsy (Tuchman, Moshe, & Rapin, 2009).

Developmental Course

When considered independently, the developmental course, severity, and outcomes of individuals with ASD and epilepsy are highly variable and dependent on numerous factors. To date, there are scant empirical data related to the moderating or mediating effects of epilepsy and ASD on one another in relation to developmental

course and outcomes. In general, children with comorbid or co-occurring ASD and seizures/epilepsy have lower IQ, lower adaptive behavior, more emotional problems, and evidence more frequent use of psychiatric medications (Matson & Neal, 2009). Also, a higher rate of seizure activity has been linked to decreased intellectual functioning (Matson & Neal, 2009), but is unclear how medications or other factors (e.g., other neurological factors) may be contributing to this suspected association. Additionally, the presence of temporal lobe seizures has been described as a poor prognostic indicator in relation to social adaptation among individuals with ASD and seizure disorders (Matson & Neal, 2009). As noted above, the notion that children with comorbid ASD and seizure disorders have more pronounced social impairment when compared to children with ASD who do not have seizures has been proposed, but this issue is only beginning to be evaluated.

Evaluation and Differential Diagnosis

Issues in Differential Diagnosis

Early diagnosis and treatment of both epilepsy and autism are crucial in order to maximize quality of life (Tuchman, Alessandri, & Cuccaro, 2010). Early identification and treatment allow for the optimal usage of all therapies and resources available. The potential co-occurrence of these disorders does raise several important issues in differential diagnosis. For example, the mainstay of evaluation in seizure disorders is the electroencephalogram (EEG), but a seizure evaluation also can include metabolic and genetic components. It is important to note that abnormal EEG activity can be seen in 7–28% of children with autism, but without any other symptoms of epilepsy (Youroukos, 2007). On the other hand, high-functioning individuals with autism may be missed when presenting for epilepsy treatment (Matsuo, Maeda, Sasaki, Ishii, & Hamasaki, 2010). The association between autism and seizures has led the Committee on Children with Disabilities of the American Academy of Pediatrics to recommend prolonged sleep-deprived EEG in children with ASD showing developmental regression or in those where there is a high suspicion of subclinical seizures (American Academy of Pediatrics, 2001). Due to the current dearth of empirical knowledge about subclinical epileptiform activity and its treatment, universal screening via EEG for all children with ASD has not yet been recommended (Johnson & Myers, 2007).

Another important area of concern relates to the convergence of sleep problems in the populations of children with ASD and epilepsy/seizures. Sleep difficulties are common among individuals with neurologic disorders in general as well as in those with ASD and seizure disorders (Malow, 2004). Screening for sleep problems and formal sleep evaluations (based on clinical need) are often important for individuals presenting with comorbid ASD and epilepsy. Sleep disorders have significant implications for behavioral functioning and quality of life beyond challenges associated with the underlying disorder (Clarke et al., 2005), such as creating daytime sleepiness, increased irritability, less efficient cognitive functioning (potentially in addition to cognitive impairment), and decreased seizure threshold. Further, sleep studies in some children with ASD and sleep problems in rare instances may elucidate a previously unrecognized seizure disorder related to sleep (Malow, 2004).

Treatment Considerations

Early recognition of ASD and co-occurring epilepsy is important in that it is hoped that developmental outcomes can be improved via early treatment. Medication is a first-line treatment in children with epilepsy. The chief goal here is to eliminate (or lessen) all seizure activity while minimizing medication-related side effects such as behavioral problems or weight gain. In autism, psychosocial and behavioral interventions are commonly used as first-line interventions for behavioral symptoms. In autism, medication treatment is used as an adjunctive therapy to lessen symptoms of inattention, hyperactivity, repetitive behaviors, impulsivity, irritability, and aggression (Tuchman et al., 2010).

Antiepileptic medications (AEDs) are the mainstay of treatment in epilepsy. Several AEDs are used commonly in general psychiatric practice due to beneficial psychotropic properties, most notably in mood stabilization and the mitigation of aggression. Examples include valproic acid, carbamazepine, lamotrigine, and levetiracetam. While a full discussion of this class of medication is beyond the scope of this chapter, the aforementioned AEDs have been evaluated in the ASD population with and without epilepsy in several case series or small open-label trials. At present, AEDs seemed to have had equivocal results in terms of benefit with irritability, aggression, or behaviors associated with the core features of autism such as repetitive behaviors (Tuchman et al., 2010), and concerns always are present for the medications to create affective blunting and/or to negatively impact cognitive and social capabilities. Formal evaluation via large randomized clinical trials in the ASD population with seizures is lacking and will be an important future step in guiding the care of this population (Tuchman et al.).

Epileptic encephalopathies associated with ASD, such as infantile spasms (IS) or Landau-Kleffner syndrome (LKS), are treated early and aggressively with AEDs, adrenocorticotropin hormone (ACTH), steroids, the ketogenic diet, or surgery. The main focus of these interventions is to improve seizure control. Outcomes of these practices as they relate to mitigation or prevention of ASD features are unknown (Crumrine, 2002; Kosso, Thiele, Pfeifer, McGrogan, & Freeman, 2005; Prasad, Stafstrom, & Holmes, 1996; Trevathan, 2002; Wheless, 2004).

The treatment of epileptiform activity on EEG, without the presence of clinical seizures, is an area of considerable debate. This debate is most relevant among those with ASD showing cognitive regression, but without a clear epilepsy syndrome or epileptic encephalopathy. Approximately 30% of children with ASD present autistic regression, which is understood as a loss of verbal and nonverbal communication skills between approximately 12 and 24 months of age. The relationship between regression and epileptiform activity noted in this subgroup has been postulated, but remains unclear, and treatment recommendations for this subgroup remain without a clear evidence base (Baird, Robinson, Boyd, & Charman, 2006; Venkateswaran & Shevell, 2008).

New information about shared genetic and molecular causal pathways may provide new insights about the management of children with epilepsy and autism. For example, in fragile X syndrome, mouse models have provided evidence that FMRP dysfunction may lead to behavioral and cognitive deficits as well as seizure formation (Brooks-Kayal, 2010; Penagarikano, Mulle, & Warren, 2007). A key target in this dysregulation may be the metabotropic glutamate receptor (MgluR). Modulation of MgluR in mouse models has provided promising results in terms of behavior, cognition, and seizure formation (Brooks-Kayal, 2010). Several molecules that modulate the function of this receptor are currently in various phases of development. Their role in epilepsy treatment and treatment of any ASD feature remains to be seen, but it is clear that much is to be learned from conditions where ASD and epilepsy coexist (Brooks-Kayal, 2010).

Conclusion

This encyclopedia entry provided an overview of the interesting association between autism and seizures disorders. This is an intriguing area for clinical inquiry, but it is also an area ripe for scientific investigation. With the prevalence of seizure disorders in the general population being approximately 2–3%, the rate of seizures in the population of individuals with autism is arguably as high as 22 times as much, with about one third experiencing at least one seizure by adolescence. With the recently documented prevalence of autism in the population, this combines to create a significantly large number of individuals with comorbid ASD and seizures. As a subgroup of individuals with ASD, however, this area has only begun to receive scientific scrutiny. Increased understanding of the type of seizures, identifiable

neurological contributors, other associated conditions, and developmental course all should contribute to improved seizure management in tandem with the ASD symptoms. Key to this understanding is early, comprehensive evaluation and associated differential diagnosis. Also, recognizing that at least one third will manifest a seizure by adolescence implicates the need for routine and thorough developmental surveillance by an interdisciplinary group of trained professionals. Ultimately, coordinated multimodal treatment approaches will be critical to maintaining a good quality of life for individuals with ASD and comorbid seizure disorders.

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Psychopathology

Fred R. Volkmar
Director – Child Study Center, Irving B. Harris Professor of Child Psychiatry, Pediatrics and Psychology, School of Medicine, Yale University, New Haven, CT, USA

Definition

The study of mental illness. A term used in the field of mental health in a way equivalent to the use of the term pathology (illness) in other parts of medicine. The area of psychopathology is concerned with mental disorders and maladaptive/abnormal aspects of behavior or development. This area is one of concern to many different disciplines including psychiatry, psychology, and social work. Research work in the area ranges from the level of the brain and gene to the expression of maladaptive patterns of behavior/development in the individual, to cultural and epidemiological studies.

The most widely used guides to descriptive psychopathology are the DSM (Diagnostic and Statistical Manual) of the American Psychiatric Association and the ICD (International Classification of Diseases) manual; the former exists in one form for both researchers and clinicians and the latter in two different guides – one for researchers and another more general one for clinician. It is important to note that of itself difference does not imply psychopathology and that the cultural, family, and other factors may greatly impact the way mental disorders are expressed. Developmental factors are also particularly important for disorders, like autism, which arise in the first years of life and may impact many aspects of subsequent development and functioning. Having one disorder may also increase the risk for others (what is termed "comorbidity"). In addition to the study of specific patterns of distress/impairment at the level of disorders, the term psychopathology can also be used to

refer to specific symptoms or behaviors suggestive of mental illness, e.g., delusions or hallucinations.

See Also

- ▶ Comorbidity
- ▶ DSM-IV
- ▶ ICD 10 Research Diagnostic Guidelines

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Psychophysiology

- ▶ Neurophysiology

Psychosis

- ▶ Psychotic Disorder

Psychosocial

Fred R. Volkmar
Director – Child Study Center, Irving B. Harris Professor of Child Psychiatry, Pediatrics and Psychology, School of Medicine, Yale University, New Haven, CT, USA

Definition

This term refers to the combination of psychological and social factors as relevant to the development of the individual. The term was used by Erikson in his elaboration of life span model of development characterized by tensions typical of each age level. In some ways, research on psychosocial factors in autism was inhibited by the early focus on (and blaming of) parents and parental psychopathology in the etiology of autism (see Riddle, 1987 for a review). As it became apparent that autism was a strongly brain-based and highly genetic disorder, work on psychosocial factors diminished substantially. It has increased in recent years with an awareness of the many and varied factors that can enhance (or inhibit) the optimal development of children with autism. This work has now included family factors including aspects of parenting (Rodrigue, Morgan, & Geffken, 1992) and of sibling development (Rodrigue et al., 1992) as well as the importance of interventions in this area (Lord et al., 2005). The perspective of various relevant adults on the impact of psychosocial factors (Foley Nicpon, Doobay, & Assouline, 2010) as well as the interaction of biological factors and psychosocial risk (Rutter & Casaer, 1991) has also been explored.

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Psychostimulants

► Stimulant Medications

Psychotherapist

► Psychologist

Psychotherapy

Josh Nadeau[1], Eric Storch[2] and Jeffrey J. Wood[3]
[1]Department of Educational Psychology, University of South Florida, Tampa, FL, USA
[2]Departments of Pediatrics and Psychiatry, University of South Florida, St. Petersburg, FL, USA
[3]Departments of Psychiatry and Education, University of California, Los Angeles, CA, USA

Definition

Barker provides a concise and pragmatic conceptualization of psychotherapy, defining the process as a psychological treatment of life problems. Of interest are four added caveats: the treatment must be provided by a trained practitioner; treatment must occur as part of a professional relationship between provider and patient; treatment must attempt to remove, attenuate, or change the life problems; and the process must involve the genesis or nurturance of adaptive behavior and/or personal growth (Barker, 1999).

While there are multiple theoretical orientations within the realm of psychotherapy, treatments based upon behavioral and cognitive-behavioral theories have emerged as having the strongest evidence base. These treatments are provided under an array of titles (e.g., self-instructional training, problem-solving therapy, social skills training, and exposure therapy). However, a common thread among all of these psychotherapy programs is their basis upon an empirically derived model which seeks to explain problem behaviors by way of focusing upon cognitive processes, emotional responses, and/or behavioral theory.

In and of itself, a diagnosis of ASD indicates the presence of noticeable deficits in communication, significant rigidity with respect to thought patterns, and excessively routinized behaviors (American Psychiatric Association [*DSM-IV-TR*], 2000. As such, psychotherapy protocols have been modified to accommodate the need for foundational skill building in these areas. However, a growing literature indicates that patients with ASD are also at high risk for comorbid mental health conditions, including anxiety, depression, bipolar disorder, aggressive behavior, and eating disorders (e.g., Anderson & Morris, 2006; Brereton, Tonge, & Einfeld, 2006; Gilliot, Furniss, & Walter, 2001). Notably, such conditions are often more problematic to the child and his/her family than the core autism symptoms per se. Because of this, psychotherapy protocols have been developed that target the specific elements of comorbid conditions.

Historical Background

Studies examining the effectiveness of various types of psychotherapy in typically developing youth with various presenting disorders are numerous (e.g., Abbass, Hancock, Henderson, & Kisely, 2006; Churchill et al., 2001; Haby,

Donnelly, Corry, & Vos, 2006; Leichsenring, Rabung, & Leibing, 2004; Smith, Glass, & Miller, 1980). In the case of ASD, however, there are several issues which limit extrapolations from these studies to youth with ASD and the respective comorbid condition. Specifically, changes in how the etiology of ASD has been conceptualized over time – from willful withdrawal by the child and poor parenting practices to the contemporary position of a neurobiological etiology – affect the perceived need for psychotherapy, as well as the ultimate goals of such treatment.

Perhaps the first example of such change – and its impact upon psychotherapy as treatment – lies with Kanner's appropriation of the term "autism." Bleuler (1911) used the term to describe a pathognomonic feature of childhood schizophrenia, specifically, a willful withdrawal by the child into their fantasy world. In contrast, Kanner (1943) emphasized the inability of children with autism to use and/or recognize social cues from people or situations.

Kanner went further by linking autism to a lack of warmth within intrafamilial relationships, although this did not account for asymptomatic siblings of children with autism. The subtle shift from motivational deficit to skills deficit takes on significance when juxtaposed against the prevailing Freudian theory of the 1940s and 1950s, wherein the etiology of ASD was conceptualized as a fundamental lack of parental love and attention, such that healthy interpersonal relationships were unable to be formed or developed by the child. Accordingly, psychotherapeutic treatment of the day consisted of removing the children to foster homes for recovery.

While Freud's theory had little empirical or heuristic value, the notion of parental causation as a determinant in ASD etiology continued into the 1960s and 1970s. It is at this juncture that Bettelheim (1967) compared autism to being imprisoned in a concentration camp and directly linked indifferent mothers to its etiology. This conceptual shift did not affect the core belief that autism is a skills deficit; instead, Bettelheim asserted that these deficits were inflicted by the mother rather than via passive family dynamics. For the next two decades, therapeutic intervention continued to involve removal of children from their homes; the children were increasingly sent to Bettelheim's institutions to receive intensive treatment, typically involving pharmacotherapy (including untested pharmacological agents such as D-lysergic acid diethylamide [LSD]), electric shock therapy, and aversive behavioral conditioning.

Interestingly, it was aspects of behavioral-based psychotherapy used to address problem behaviors in ASD which began to show positive treatment outcomes. The first such techniques were pioneered by Lovaas and colleagues (e.g., Lovaas, Koegel, Simmons, & Long, 1973) and consisted of a comprehensive functional behavior analysis to identify problematic skills or activities, task analysis to generate an incremental learning path, and use of shaping to reward progress toward displaying the desired skill or activity. Taken as a whole, this treatment package represents the first known instance of early intensive psychotherapeutic interventions wherein behavioral methods were used to instill and develop positive skills needed by the child while simultaneously decreasing or extinguishing negative or challenging behaviors. Although nearly forty years have elapsed since these techniques were introduced for children with autism, they remain highly effective for skill building and management of undesirable behaviors (e.g., Matson & Smith, 2008; Sofronoff & Beaumont, 2009).

Beyond changes in conceptualization, the issue of psychotherapy effectiveness is further clouded by the observation that the social, emotional, and behavioral skills commonly found to be impaired among children with autism (e.g., Brereton et al., 2006; Cohen & Volkmar, 1997; Myers, Plauche-Johnson, & Council on Children with Disabilities, 2007) are the foundational skills of most forms of psychotherapy (Cashin, 2008). As a result, the magnitude of such deficits is key prognostic indicators for children (Mackay, Knott, & Dunlop, 2007) and is commonly integrated into psychotherapy addressing higher-level skills and/or comorbid deficits.

In addition to aggressive and/or disruptive behavior management, attempts to address social skills deficits in children with ASD are numerous (e.g., Kamps et al., 1992; Koegel, Koegel, Hurley, & Frea, 1992; Krasny, Williams, Provencal, & Ozonoff, 2003; Ozonoff & Miller, 1995; Parsons & Mitchell, 2002; Paxton & Estay, 2007); however, the findings from most evaluative studies indicate that traditional social skills training shows relatively limited outcomes for children with ASD. Specific criticisms include the following: most programs are intended for application with various populations of neurotypical children (i.e., not children with ASD); a fundamental lack of agreement as to what constitutes the group of behaviors considered necessary for social skills training; lack of techniques to promote or monitor generalization of acquired skills throughout the course of the curriculum and beyond; and a failure to consider and account for variability in cognitive functioning of target children (e.g., Rao, Beidel, & Murray, 2008; Reichow & Volkmar, 2010; White, Keonig, & Scahill, 2007).

More recent studies have addressed comorbid anxiety and problems with social functioning in children with ASD, typically through using specific techniques (e.g., small group exercises, increasing structure within all activities, and parent training) within a more typical cognitive-behavioral therapy framework. Examples include "Exploring Feelings: Cognitive Behavior Therapy to Manage Anxiety" (Attwood, 2004) and "Behavioral Interventions for Anxiety in Children with Autism" (BIACA; Wood & Drahota, 2006; Wood et al., 2009). While maintaining a focus similar to psychotherapy for typically developing children (e.g., exposure, emotion recognition, cognitive therapy, and relaxation), both programs also include specific strategies designed to address skill deficiencies common to children with ASD (e.g., nonverbal communication, prosocial behaviors, emotional regulation, and perspective taking).

Current Knowledge

Relative to the general pediatric population, children with ASD are at a heightened risk for certain comorbid mental health conditions, such as anxiety, depression, externalizing behaviors, eating disorders, and/or bipolar disorder (e.g., Anderson & Morris, 2006; Brereton et al., 2006; Gilliot et al., 2001). As mentioned earlier, cognitive-behavioral psychotherapy shows strong empirical support for the treatment of symptoms used as diagnostic markers for ASD as well as for associated comorbid conditions (e.g., Chambless & Hollon, 1998; Kazdin & Weisz, 2003). As such, it became necessary to modify traditional cognitive-behavioral techniques to address the particular combination of diagnostic symptoms and comorbid conditions in children diagnosed with ASD (e.g., Attwood, 2003, 2004).

Examination of treatment elements of cognitive-behavioral therapy for neurotypical youth reveals some commonality across targeted problems. For example, cognitive-behavioral therapy for anxiety disorders (e.g., Wood & McLeod, 2008; Wood, Piacentini, Southam-Gerow, Chu, & Sigman, 2006) includes affective education, exposure therapy, cognitive restructuring, contingency management, and problem solving. Cognitive-behavioral treatments commonly used for most presenting concerns contain some or all of these elements (e.g., Anderson & Morris, 2006). Therefore, any necessary modification to such programs for children with ASD is related to previously mentioned social, emotional, and cognitive deficits rather than to the comorbid conditions (Paxton & Estay, 2007; Shapiro, 2009).

Extending this idea can provide guidelines for determining the appropriateness of psychotherapeutic intervention. For example, the psychotherapy protocol must account for the child's language and cognition skills; specifically, that their skills are sufficiently advanced to allow for meaningful discourse within session. If these skills are not sufficiently developed, then the protocol must include contingencies for building and generalizing such skills. A reluctance to speak or participate may be addressed through improving rapport and information sharing with the parents such that more information is gained about the child for use in session (e.g., increasing relevance of materials, rapport building through common interests). Similarly,

positive reinforcement methods (i.e., shaping) may be used to address reduced language skills. Further, a mechanism for increasing the child's awareness and self-reflection must be included to allow for generalization of new skills to novel situations (Shapiro, 2009).

To date, there are few randomized clinical trials examining the use of varied forms of psychotherapy for children with ASD; however, the few available studies are promising. For example, studies using manualized psychotherapy protocols for children with ASD and comorbid anxiety have described significant reductions in anxiety symptoms, increased independent living skills, increased usage of adaptive coping strategies, and improved quality of life (e.g., Chalfant, Rapee, & Carroll, 2007; Sofronoff, Attwood, Hinton, & Levin, 2007; Wood, Drahota, Sze, Har et al., 2009). While generally similar to psychotherapy for children without ASD, these protocols are typically more intensive with respect to foundational skill building to address presumed deficits in cognitive, social, and emotional functioning (e.g., Wood, Drahota, Sze, Har et al., 2009).

Future Directions

While a limited but growing research base exists to support the utility of psychotherapy for social and behavioral problems in children with ASD, there remains a need for investigation into the efficacy of psychological treatments for adolescents with similar comorbid diagnoses. Though preliminary, several promising steps have been taken; one example is a research protocol being developed by the authors to address comorbid anxiety symptoms in adolescents with ASD, which places emphasis upon social situations and basic skills unique to adolescent populations (e.g., social coaching to address adolescent peer relationship building, emotional regulation with respect to peer harassment/bullying, and independent living skills) in addition to core CBT elements (e.g., exposure).

Ultimately, the true measure of success for psychotherapy in children and adolescents with ASD will be the degree to which treatment outcomes are clinically meaningful and translate into changes in functioning and quality of life. Some preliminary results suggest that psychotherapy incorporating in vivo exposure is superior to waitlist controls with respect to improvement in parent-reported social responsiveness and that psychotherapeutic gains are durable over the short term (e.g., Wood et al., 2009). As well, it remains to be seen how evidence-based forms of psychotherapy fare in randomized clinical trials against both pharmacological and exclusively behavioral techniques.

See Also

- ▶ Anxiety Disorders
- ▶ Asperger Syndrome
- ▶ Autism
- ▶ Autism Spectrum Disorders
- ▶ Behavior Modification
- ▶ Cognitive Behavioral Therapy (CBT)

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Psychotic Disorder

Betsey A. Benson and Whitney T. Brooks
Nisonger Center, UCEDD The Ohio State University, Columbus, OH, USA

Synonyms

Psychosis; Schizophrenia

Definition

Psychotic disorders are a group of psychiatric disorders in which distortion of reality and severe disorganization are present. Reality distortions include hallucinations, which include sensory experiences in the absence of external stimulation that appear real, and delusions, false beliefs that persist, despite evidence to the contrary. Disorganization can be reflected in speech, thought, or in behavior. According to the DSM-IV-TR (American Psychiatric Association, 2000), the psychotic disorders include schizophrenia, schizophreniform disorder, schizoaffective disorder, delusional disorder, brief psychotic disorder, and shared psychotic disorder. In addition, psychotic disorder can be diagnosed due to a general medical condition or as a substance-induced disorder. A diagnosis of psychotic disorder not otherwise specified indicates that there is not enough information to make a more specific diagnosis or that there are insufficient symptoms to meet the criteria of one of the specific diagnoses. The lifetime prevalence of psychotic disorders in the general population is estimated to be about 2%.

To receive a diagnosis of schizophrenia, an individual must present with two or more of five characteristic symptoms including delusions, hallucinations, disorganized speech, disorganized or catatonic behavior, and negative symptoms. Negative symptoms include dulling of affect and avolition which is a lack of self-directed behavior. The onset of schizophrenia can be slow and gradual or can be acute. There must be social or occupational dysfunction, and the duration of the symptoms must be at least 6 months. The course of the illness can present as a single episode, multiple episodes, or continuous.

There are several subtypes of schizophrenia that are defined based on the prominence of specific symptoms. The subtypes include paranoid, disorganized, catatonic, undifferentiated, and residual type. The committee for the development of the DSM-V has considered removing the subtype distinction due to relative instability of categorization across time and questionable validity (American Psychiatric Association, 2010). If there is a history of autistic disorder or pervasive developmental disorder, the DSM-IV-TR states that a diagnosis of schizophrenia can be made only if there are prominent delusions or hallucinations that are present for at least a month (or less if it is successfully treated). To receive a diagnosis of schizophreniform disorder,

the individual must have symptoms of schizophrenia without a functional decline, and the episode is of short duration from 1 to 6 months.

In schizoaffective disorder, there are characteristic symptoms of schizophrenia along with either a depressive, manic, or mixed mood episode. The mood disorder must be present during much of the illness.

In delusional disorder, there are nonbizarre delusions of at least 1-month duration. Unusual behavior is directed toward the delusions. Hallucinations, if they occur, are related to the delusions. The individual's functioning is not significantly impaired.

In brief psychotic disorder, the symptoms last between 1 day and 1 month. Full recovery is the typical outcome.

Shared psychotic disorder occurs when one individual shares a delusion that is maintained by another individual. The symptoms are usually grandiose or paranoid.

Infantile psychosis and early childhood schizophrenia at one time were terms used to describe autism. Kanner (1949) stated that autism would likely be determined to be an early type of schizophrenia. In later years, Rutter (1972) distinguished between autism and schizophrenia based on a number of factors such as age of onset and the course of the disorders. Case reports of individuals diagnosed with autism in childhood and found to be diagnosed with psychotic disorders as adults raised the question of whether autism in childhood increases the likelihood of psychosis in adult life (e.g., Clarke, Baxter, Perry, & Prasher, 1999). Based on a larger study group of well-documented cases, Volkmar and Cohen (1991) found that the frequency of schizophrenia in autism is comparable to the general population (about 1%).

Individuals with ASD may be misdiagnosed as psychotic if there is an appearance of a thought disorder. The presence of a thought disorder is evidenced by bizarre, disorganized, or idiosyncratic speech. Individuals with ASD may have unusual interests and ways of expressing themselves verbally. They use language concretely and have difficulty describing abstract or emotional concepts (Howlin, 1997).

Significant impairments in language and cognition occur commonly in autism spectrum disorders which poses a challenge to the accurate diagnosis of psychiatric disorders. The DM-ID was developed jointly by the American Psychiatric Association and the National Association for the Dually Diagnosed (2007) to address the difficulties inherent in making psychiatric diagnoses with persons with intellectual disability. The DM-ID suggests adaptations to the DSM-IV-TR. The adaptations include using reports from others as a substitute for self-report and reducing the number of required symptoms for making a diagnosis if the individual is nonverbal. In the case of the psychotic disorders, the DM-ID notes that engaging in self-talk is relatively common in individuals with intellectual disability and it should not be interpreted as a symptom of psychotic disorder (p. 150).

See Also

▶ Schizophrenia

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PT

► Physical Therapy

Public Law 94-142

Debra Dunn
The Center for Autism Research, The Children's Hospital of Philadelphia, Philadelphia, PA, USA

Definition

Public Law 94-142, also known as the Education for All Handicapped Children Act (EAHCA) of 1975, is the landmark federal legislation pertaining to the education of children with disabilities. The law guaranteed a "free, appropriate public education" to all children and young adults aged 3–21. PL 94-142 was an amendment to the Education of the Handicapped Act (EHA) of 1970 and served as Part B of the EHA. Congress has since replaced PL 94-142 with the Individuals with Disabilities Education Act and the Individuals with Disabilities Education Improvement Act, but the tenets of the EAHCA – namely to improve the educational opportunities of students with disabilities – remain intact.

Historical Background

Although considered groundbreaking, PL 94-142 was not the first piece of federal legislation pertaining to the education of students with disabilities. Many pieces of federal legislation beginning in the 1950s had touched on educational issues of students with disabilities, including several portions of bills (e.g., PL 85-926, PL 86-158, PL 87-276, PL 87-715, and PL 88-164), which provided training to teachers of deaf students and students with mental retardation (now called intellectual disability). Additionally, the Elementary and Secondary Education Act of 1965 (PL 89-10) is considered a significant bill pertaining to education because it was the first law to provide federal funding to states for the education of students. (It funded the education of students in specialized state schools for the blind, deaf, and mentally retarded and also provided federal funding to help educate impoverished students.)

The Education of the Handicapped Act of 1970 (EHA) (PL 91-230) was the first federal law to exclusively address the education of children with disabilities. It provided grants to institutions of higher learning to develop programs to train teachers of students with disabilities and funded regional resource centers to deliver technical assistance to state and local school districts. Its first amendment in 1974 mentioned the term "appropriate education" for the first time in federal legislation and added a requirement that states which received federal funds adopt the goal of full educational opportunities for students with disabilities.

Despite the EHA, however, as of 1975, over half of the students with disabilities were not receiving appropriate educational services, including over a million children who were not receiving any public education at all. Many of the students who were receiving educational services received them in institutions far away from their families, at great cost to the families or through the generosity of charities.

Spurred by the civil rights movement and by *Brown v. Board of Education* (1954), which ruled that states must provide equal educational opportunities to children regardless of race, beginning in the 1960s, advocates for students with disabilities began to file lawsuits against their home states and school districts. These lawsuits claimed that exclusion, segregation, and inappropriate educational services for students with

disabilities violated the students' rights under the 14th Amendment of the United States Constitution. Cases like *Pennsylvania Association for Retarded Citizens (PARC) v. Commonwealth of Pennsylvania* (1972) were filed by parents of children with disabilities asserting their children's right to a public education.

By 1973, 27 right-to-education lawsuits had been filed on behalf of students with disabilities across 21 states. As a result, the policies being developed across the country varied significantly. While many of the early lawsuits resulted in expanded educational opportunities for children with disabilities, not all lawsuits were won by the students petitioning. Indeed, the combination of district court losses like *Harrison v. Michigan* (1972) and the United States Supreme Court decision in *San Antonio v. Rodriquez* (1973), a school finance case which held that the Constitution did not establish a right to public education, caused many disability advocates to worry about how the Supreme Court might decide the right to education cases for students with disabilities. Rather than continue to take their chances in the courts, these advocates chose to pursue a legislative agenda.

In addition to the EHA, Congress had already begun to pass several pieces of progressive social legislation, including the Occupational Safety and Health Act of 1970, the Child Development Act of 1971, and Section 504 of the Vocational Rehabilitation Act of 1973, which outlawed discrimination on the basis of disability in programs receiving federal assistance. The climate for an expanded bill related to the education of children with disabilities seemed favorable. Disability and child advocates persuaded Senator Harrison Williams to introduce an amendment to the EHA to ensure that children with disabilities receive a free and appropriate public education (FAPE), to protect the rights of students and their parents, and to assist states in providing educational services to students with disabilities. The legislation was supported by the Council of Chief State School Officers and the National School Boards Association. Indeed, not a single person or organization testified against the bill in Congressional hearings. The bill, which came to be known as the Education for All Handicapped Children Act, or PL 94-142, passed by wide margins. Despite initial resistance by former President Gerald Ford, the President signed the act into law in 1975.

Since the bill's passing in 1975, there have been several amendments to the law. In fact, the laws pertaining to the education of children with disabilities are changed somewhat regularly because portions of the legislation must be reauthorized periodically and because Congress must routinely approve funding. The most significant changes to PL 94-142 include: the Infants and Toddlers with Disabilities Act of 1986 (PL 99-457), which required states to provide programs and services from birth (PL 94-192 only required programs for ages 3–21); the Individuals with Disabilities Education Act of 1990 (PL 101-476), which changed the name of the law from the Education for All Handicapped Children Act to the Individuals with Disabilities Education Act (IDEA), added two categories of disability – including autism, and supported initiatives for transition to adulthood; the Individuals with Disabilities Education Act Amendments of 1997 (PL 105-17), which strengthened the role of parents, emphasized student progress toward meaningful educational goals, encouraged nonadversarial mediation to resolve disputes, added disciplinary provisions, and made extensive changes to the individualized education plan (IEP); and the Individuals with Disabilities Education Improvement Act of 2004 (PL 108-446), which required the use of scientifically based instructional practices and interventions whenever possible, required special education teachers to be "highly qualified," revised the discipline procedures, revised dispute resolution procedures, created "early intervening services" to assist students who are struggling but who do not require special education services, reduced paperwork burdens on states and school districts, emphasized student progress and progress monitoring and reporting, and made other changes to the IEP process.

It is important to note that the federal laws pertaining to the education of students with disabilities are subject to state implementation.

States are at liberty to provide more rights to students, but cannot provide less than those guaranteed by the federal statute. Each state has its own regulations interpreting and executing the federal law, and thus implementation will vary from state to state.

Current Knowledge

As indicated by the legislative history, the impetus for PL 94-142 was a national recognition of the poor outcomes of children with disabilities due to their unequal educational opportunities and a desire to significantly improve access to education for these children. The law addressed how children with disabilities were identified, how they would be educated, how to evaluate the success of educational efforts, and how to protect the rights of children with disabilities and their parents. As an improvement on the EHA of 1970, the law authorized significant financial incentives for complying with PL 94-142.

Specifically, the law mandated that "all children with disabilities [must] have available to them . . . a free appropriate public education which emphasizes special education and related services designed to meet their unique needs." It required that special education and related services for children between the ages of 3 and 21: (1) be provided at public expense; (2) include an appropriate preschool, elementary, and secondary school education in the home state of the student; and (3) be provided in accordance with an Individualized Education Program (IEP) uniquely designed for each student. The federal law also required states to set standards to implement the federal law. Thus, with the passage of PL 94-142, the federal government and the states became partners in the education of students with disabilities.

The concepts arising from PL 94-142 – in particular, the paradigm of a free and appropriate public education, the creation of the individualized education program, and the creation of a federal/state partnership in education – have been expanded upon greatly since 1975. Yet despite frequent litigation over the principles and years of state and federal regulations, PL 94-142 remains the most significant piece of federal legislation pertaining to the education of students with disabilities.

Future Directions

The most current legislation pertaining to the education of individuals with disabilities is Public Law 108-446, commonly referred to as the "Individuals with Disabilities Education Improvement Act of 2004" or "IDEIA." Other legislation, such as the No Child Left Behind Act of 2001 (PL 107-110) and its subsequent revisions, have also influenced the development of laws pertaining to students with disabilities.

See Also

- ▶ Free Appropriate Public Education
- ▶ Individuals with Disabilities Education Act (IDEA)

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Pull-Out Room

► Resource Room

Punishment

Thomas Zane[1], Sean Field[2] and Brandon Nichols[2]
[1]The Institute for Behavioral Studies, Endicott College, Beverly, MA, USA
[2]The School at Springbrook, Oneonta, NY, USA

Definition

Punishment is defined as a contingency that results in a decrease in the future rate of a response. The contingent stimuli or events used are referred to as punishers. Punishers fall within two categories, unconditioned or conditioned. *Unconditioned* punishers are stimuli that are effective in reducing behavior without having been previously paired with any other punisher. Examples of such would include electric shock or time-out from positive reinforcement. *Conditioned* punishers are stimuli that, in the past, have been paired with previously established punishers, gain their "punitive power" from such pairings, and, as a result, demonstrate a reductive effect on behavior they follow. Examples would include loss of money (i.e., fining) and reprimands.

There are two different types of punishment procedures, Type I and Type II. Positive punishment (Type I) is the presentation of a stimulus (presumed to be aversive or unpleasant) following a behavior that decreases its future probability of occurrence. For example, if a child bites other children, the parent could deliver a stern reprimand after each biting episode. If the child viewed the reprimand as unpleasant or aversive, then in the future, the child would bite less often. Negative punishment (Type II) is the removal of a stimulus contingent upon a target behavior that reduces its future frequency of occurrence. Examples of negative punishment techniques include time-out from positive reinforcement (loss of access to reinforcement for certain amount of time), planned ignoring (loss of attention), and response cost (loss of earned reinforcement). For example, time-out from positive reinforcement could be used with the child biting his peers. In this case, the parent could place the child in a chair for a set time period (e.g., 3 min) and access to preferred items prevented. The child would learn that biting leads to loss of access to social and tangible rewards. Future occurrences of biting should decrease.

Historical Background

Punishment has been used over the past several decades as an intervention for behavior deemed inappropriate. It is a technique used in behavior modification based on operant

behavior/conditioning principles developed by B.F. Skinner in the 1950s. Operant behavior is any behavior whose future frequency is influenced by its consequences; the fundamental description of the influences on operant behavior is known as the three-term contingency. The three-term contingency consists of the discriminative stimulus (antecedent or environmental cue), operant response (specific behavior), and the consequence (action following the response). For example, a student is sitting in class during school. The teacher asks a question (discriminative stimulus), and immediately the student yells out the answer without raising his hand (operant response). The teacher then verbally reprimands the student for shouting out the answer and not raising his hands (consequence). If the reprimand functions as a punisher, then in the future, the student is less likely to yell out without raising his hand. Over time, the student's behavior (not raising hand and shouting the answer) would be influenced by its past history of consequences (being verbally reprimanded). It is important to recognize that all operant behavior is influenced by the consequences that immediately follow it. Punishment is a consequence that leads to a reduction in rates of behavior.

Historically, some of the earliest research in this area was conducted in laboratory settings using animals such as rats or pigeons as subjects. Skinner and other researchers used different forms of punishment to influence the occurrence of the animal's behavior. For example, researchers exposed rats to brief electrical shocks contingent upon lever pressing; lever pressing reduced in rate. The earliest studies examined various components of punishment such as the intensity, immediacy, and schedule. Numerous experiments have shown the effectiveness of punishment in decreasing behaviors. This basic research led to the discovery that human behavior was influenced via the same mechanisms.

These earliest studies provided the foundation for further research on punishment with different clinical populations. Beginning in the late 1950s and early 1960s, researchers began using punishment with individuals with autism and other developmental disorders. Many of these individuals displayed a variety of challenging behaviors, such as physical aggression, self-injurious behavior (hitting, kicking, biting self), noncompliance, property destruction, sexual assault, pica (ingesting nonedible items), and stereotypy (repetitive behaviors – rocking, hand flapping, grinding teeth, etc.). Practitioners in schools were responsible for managing these behaviors in order to ensure the safety of individuals, in addition to providing an adequate education. Initially, the goal in many of these situations was to control the individual's behavior and immediately reduce the occurrence of the problematic behavior. A quick reduction in the targeted behavior was often necessary and desired due to the potential for injury if left untreated. Research, in both laboratory and applied settings, showed that punishment provided an immediate suppression of challenging behavior. Providers used a variety of punishment techniques to achieve these reductions.

In the 1970s, ethical concerns about the use of punishment began to surface. Although the research clearly showed that punishment could terminate or reduce targeted behaviors, there often were abuses of its use. Reports of staff and other providers abusing individuals with developmental disabilities were made public. One of the earliest scandals was in 1971 at a residential facility for persons with developmental disabilities. Individuals were subjected to punishments without consent or supervision. Many were placed in seclusion for long hours, deprived of food, physically restrained, and subjected to cruel and inhumane treatments. This scandal led to the creation of a Blue Ribbon Panel that advocated for more stringent rules regarding the treatment of individuals with developmental disabilities. The concerns about the unethical and illegal use of punishment led to legislation at both the state and federal levels to ensure that future abuses would not occur. This resulted in a marked decrease in the study of punishment and the types of punishers examined. Additionally, the number of studies using potentially harmful aversive stimuli (electric shock, restraint, etc.) decreased as well. There became a greater

awareness and need to find safer, more acceptable, and effective interventions. With the passing of the Individual with Disabilities Education Act in 1990, the federal government provided guidelines that caregivers perform functional behavior assessments and rely on more positive practices. The technology of functional assessment became more widespread and focused on the cause of the challenging behavior. By identifying the maintaining cause, caregivers concentrated on interventions directed at the function and relied less on punishment. This approach differed considerably from the goal of previous research on punishment, which was to control the behavior, rather than study the reasons for the challenging behavior occurring. Punishment was still explored, but there were far more stringent ethical guidelines regarding its use.

Punishment has continued to be studied, although the focus of this research has changed. Many of the punishment studies in recent years have used relatively mild aversive stimuli that dramatically reduced the potential for physical or emotional harm. Oftentimes, these studies have paired mild aversive stimuli with reinforcement or some other form of positive strategies. Typically, researchers and practitioners have used punishment as a last resort, and more specifically, punishment has, in fact, become the default technology that is only recommended to be used when all other interventions have failed. The use of punishment has been highly regulated in both federal and state legislation, with many agencies providing oversight of its use. The general template describes three or more levels of approved aversive stimuli that can be used with varying levels of consent. For example, procedures such as verbal reprimands, response cost, and planned ignoring tend to be much lower level (and thus, more acceptable requiring less levels of consent) of aversive stimuli when compared to overcorrection, noxious stimuli (foul smells, water mist, shocks, etc.). Most often, the less aversive stimuli are used. Only in special cases when people are putting themselves or others in significant danger are the more aversive stimuli seriously considered.

Current Knowledge

Behavioral researchers have used a wide range of aversive stimuli as Type I punishment to decrease problem behaviors in students with autism. It is important to recognize that there are drastic differences in the qualitative properties of the aversive stimuli that have been used in the research. These range from relatively mild to severely aversive stimuli. Mildly aversive stimuli include reprimands and response blocking. The potential risk of either physical or psychological harm from these mildly aversive stimuli is considered minimal. In contrast, there is a much greater risk for harm to the individual when more severely aversive stimuli are used, such as physical or mechanical restraint, ammonia capsules, loud noises, air blasts, noxious tastes (lemon juice), facial mist, and contingent electric shocks. Studies have shown that both the mild and more severe aversive stimuli can function as successful punishers to reduce a wide range of challenging behavior.

Type II (negative) punishment involves the removal or loss of a stimulus contingent upon a response that leads to a reduction of that response. An example of negative punishment often used is "planned ignoring." The general assumption is that attention is a positive reinforcer for most individuals (however, best practice would require a confirmation of this hypothesis for each individual). Planned ignoring, then, is a punishment procedure in which attention is purposefully denied or removed contingent upon the targeted undesirable behavior. Planned ignoring could include the withholding of social reinforcers including attention, verbal interaction, and physical contact for a brief period of time. Another example of negative punishment is called "response cost." This is a form of punishment where a specific amount of reinforcement previously earned by the individual is lost or removed contingent upon problematic behavior. This loss of reinforcement results in a decreased probability of the future frequency of the behavior. This procedure includes "fines" or loss of money, tokens, and time with preferred activities contingent upon the target behavior.

There is individual variation with regard to what functions as effective punishment. Some people will find particular stimuli or consequences punitive, while other people will not. Just as individuals vary in terms of what functions as positive reinforcement for them, so it is with punishment. Knowledge of what is and is not aversive or punitive to an individual is essential in determining how and what type of punishment is to be applied.

Once a consequence has been determined to be an effective punisher, there are a number of variables that must be taken into account in order to assure that the most effective and least restrictive procedure is being used. One factor that must be considered is the immediacy of the application of the punisher. The quicker (in time) the punishment follows the occurrence of the undesired behavior, the more effective the punisher will be in reducing future rates of that behavior. For example, a punisher applied within a few seconds of the occurrence of the target behavior should result in quicker and greater progress than delivering the punisher 1 min after the target behavior occurred. Another important factor that will influence the effectiveness of a punisher is its intensity or magnitude (i.e., how much of the punisher is applied). There is a potential danger in applying a punisher at a low intensity. "Habituation" occurs when the punishing consequence loses its reductive effect due to its application at a low intensity. When using punishment, it is better to use a higher intensity of a punisher to assure that the stimulus will achieve the reductive effect. For example, a student misbehaves in the classroom and the teacher uses the punishment of sitting at desk being quiet with head down. A 5-s duration would be considered potentially less effective than 3 min. A third important factor to consider procedurally is the schedule with which the punisher is applied. Schedule refers to how often and when a punishment is to be used. The typical procedure is to implement the punishment contingent upon each occurrence of the targeted problem behavior. This "continuous" schedule of punishment is considered to provide the most suppressive effect. However, another option is for an "intermittent" schedule of punishment, in which the person applying the contingency does not punish each target response, but rather punishes on a fixed or random schedule (e.g., every third target response). A denser schedule is more effective in rapidly reducing a problem behavior; however, a variable schedule can be used should the continuous application of the consequence require too much time or resources to effectively implement. This schedule of intermittent punishment is not recommended as the effects may take longer to show, and it is not always true that a variable schedule is effective.

Another issue related to the implementation of a punishment procedure focuses on the simultaneous use of reinforcement strategies. A punishment procedure should always be implemented with a positive reinforcement procedure targeting the increase of incompatible or appropriate behavior that will replace the target problem. For example, if a student is hitting herself in the head to gain the attention of a teacher (assuming a level of severity that requires a punishment procedure), a treatment may be put into place that would punish this behavior while simultaneously teaching the student how to request attention appropriately and reinforcing this new behavior. In addition to the reinforcement for the replacement behavior, it is important that there is an attempt to remove all reinforcement that is being received for the problem behavior that is being punished. Another and a more recent advance in the field is to conduct a punishment assessment to determine the effectiveness of the treatment prior to its application. This requires a clinician, usually in a controlled "test" environment, to expose an individual to a variety of potential punishers to see which has the most suppressive effect.

There are two components that are essential and required before attempting to implement any punishment procedure. First, there should be a definitive plan that describes all of the components of the punishment procedure. The plan should clearly define the behavior that is targeted for punishment, what the punisher is and its intensity, how often it is or is not to be applied, and a standard by which progress will be assessed, including conditions under which the procedure

will be removed for health and safety. These details should be scripted clearly so that the training of staff is most efficient, and continued monitoring of the staff employing this procedure can be done most efficiently. Secondly, prior to the application of any punishment procedure, the service provider must gain parental consent. It is recommended that the parents be exposed to the punishment procedure so that they can experience what their child will be experiencing.

Finally, current best practice dictates that the implementer of a punishment procedure take regular data (i.e., per use, daily, etc.) on both the use of punishment and the rate of the undesired behavior both before (i.e., baseline or preintervention) and during the application of the punishment program. With the inclusion of frequent collection and regular review of the data, it is possible to assure clinicians will not only know if their treatment is effective, but, more importantly, they will know when it is not. This is important to discern, since it may be unethical to continue a punishment program if it is not reducing the targeted behavior. If the treatment team confirms, through data review, that the targeted undesired behavior is failing to reduce, the team will likely stop the punishment so that it is not being inappropriately applied.

Before implementing punishment procedures, one must be aware of its potential side effects. The first and most likely is a possible negative reaction, either emotionally or physically, from the individual being punished. In some cases, the use of a punisher could elicit reactions such as crying, avoiding the person who delivers the punishment, or aggressing toward that person. Other possible side effects are that the individual could begin to exhibit escape and avoidant behavior. This could be demonstrated by the individual refusing to do work, lying, cheating, and staying away from the person(s) who administer the punishment or the environments in which the punishment was delivered. An additional side effect of punishment is termed "behavioral contrast." This means that a behavior punished and suppressed in one context could increase in rate in a different context in which that same behavior is *not* punished. For example, if a particular response is punished in school, but not at home, then there could be an increase in the unwanted response in the home. In addition to the possibility that there may be increases in the behavior under different conditions, there is also the chance that the use of punishment may in fact serve as a model for the punished child for how to deal with undesired behavior in the future. For example, a child on whom punishment was used could be more likely to use punishment in the future, as that was the type of discipline that was used with the child. Although this is not always true, it is possible that spanking a child could result in teaching that individual aggressive behavior, regardless of the intention of the original intervention, is tolerated and a way to deal with unwanted behavior. Finally, the act of punishing a behavior has the potential to reinforce the individual providing the punishment. Since punishment is often effective in obtaining an immediate effect of stopping the punished behavior, the person using the punishment will see an immediate effect, which could reinforce the use of this approach. If one loudly reprimands a child because she is spilling something and the spilling immediately stops, it is likely that punishment will be used again in the future. To prevent this from occurring, it is important that a strict schedule and set of rules be determined on a case by case basis, carefully describing when, how long, and how often a punisher will be applied to assure that an individual is not overexposed or harmed by the unnecessary application of a punisher.

Future Directions

While previous research has shown that punishment has been successful in reducing problems behaviors, there remain several different areas that require further exploration. One relates to the magnitude of punishment. The magnitude of a punisher refers to size or intensity of the aversive stimulus used contingent upon behavior. For example, if parents were to place their child in a time-out chair for 10 min, then the magnitude of the punishment would be 10 min. These results could be compared to the effects that 15 min have

on the rate of the child's behavior. This research would be significant to the applied field because it would provide practitioners the ability to identify and use the least intense or smallest magnitude of aversive stimuli that is effective in reducing the behavior. With this information, practitioners could implement an aversive stimulus that was just "strong enough" to decrease the behavior. This would help minimize the risk to individuals in that only the necessary magnitude of the stimulus that was needed to reduce behavior would be used.

The schedule of punishment is another area that needs further study. Research in this area has shown that punishment is most effective when it is implemented after every occurrence of the targeted behavior. Oftentimes, implementing the punisher after every occurrence can become cumbersome and difficult for practitioners. The goal of most interventions including reinforcement and punishment is to ultimately fade or gradually remove the intervention. A select number of studies in the late 1970s examined this topic and showed that an intermittent schedule of punishment may be sufficient in some circumstances to reduce problem behavior to a socially acceptable level. However, further research is needed to provide a better understanding of the conditions under which an intermittent schedule could be effective. This knowledge would ultimately help practitioners completely remove the intervention over time.

The identification of stimuli that will function as an effective punisher is another area in need of investigation. There are only a few studies in the literature that describe procedures to systematically identify stimuli that would potentially serve as effective punishers. These punisher assessments typically involve presenting various potentially aversive stimuli and measuring levels of compliance, resistance, and negative affect. The development of these assessments may give practitioners a way to determine the most effective punisher for an individual, and allow for quicker identification of possibly aversive stimuli that could then be implemented, should the need arise.

A related area of research would be to investigate if more mild and socially acceptable stimuli could function as effective punishers. Punishment does not necessarily need to involve physically painful or noxious stimuli. Research could be conducted to identify if daily activities that an individual found unpleasant (or not preferred), but not physically uncomfortable, could serve as a punisher. For example, if a child did not enjoy coloring and found it aversive, then would coloring serve as an effective punisher when implemented contingent upon a targeted behavior? If these activities were effective, then this may allow practitioners to use more socially acceptable and presumably safer stimuli as punishers should caregivers need to resort to procedures more intrusive than reinforcement.

Punishment is a complex process. The majority of research regarding punishment was conducted many years ago in laboratory settings. Such research allowed for the tight control of numerous variables that is nearly impossible to achieve in applied real-life situations. Clinicians have recognized a need to examine the practical applications of punishment in field settings and with populations such as persons with autism. It is important to determine how effective punishment techniques can be used in educational settings where environmental variables may not be as clear or under as much control. Although legislation does afford needed protection of persons with whom punishment may be used, the abolishment of punishment may not be the answer for safe-guarding individuals receiving behavior support. One key solution to preventing abuse through improper punishment is to understand the conditions and guidelines under which punishment has been proven both safe and effective. These standards have been researched and are well understood, and provide a guide by which punishment can be an appropriate and useful treatment option for those in need of behavior modification.

Punishment should be studied further and its components understood to allow for a richer knowledge of the factors that influence its effectiveness, and the conditions under which the clinical use of punishment is warranted. With this information, clinicians and providers will have the knowledge to use these interventions most

effectively. An increased understanding will help assure that individuals with autism receive the safest and most effective treatment possible. It is important that researchers continue to explore the use of punishment in an effort to provide practitioners with the most effective interventions for their clinical use.

See Also

- ▶ Behavior Modification
- ▶ Challenging Behavior
- ▶ Consequence-Based Interventions
- ▶ Informed Consent
- ▶ Overcorrection
- ▶ Response Cost
- ▶ Response Interruption/Redirection
- ▶ Time-Out

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Purdue Pegboard

Pamela Ventola
Yale Child Study Center, New Haven, CT, USA

Description

The Purdue Pegboard test measures two types of dexterity: one involving finger dexterity and the other involving the movement of arms, hands, and fingers. The test itself is small, can be administered quickly (about 10 min including all necessary instructions and modeling), and is relatively simple to administer and perform, making it a useful instrument for a wide variety of populations and clinical and industrial settings.

The test consists of a pegboard with 2 rows of 24 holes and 4 cups at the top of the board for storage of the pegs. The test is comprised of four elements: dominant hand, nondominant hand, both hands, and assembly. For the dominant hand portion, the subject inserts small pegs into holes on the board using only the dominant hand. The examiner instructs the subject to only pick up one peg at a time. The examiner then times the subject for 30 s and counts the number of inserted pegs. For the nondominant hand aspect, the procedure is the same, but the subject is asked to only use the nondominant hand. Regarding the both hands element, the subject places two pegs simultaneously, one with each hand, in two rows on the pegboard. The subject is told to only pick up one peg at a time with each hand. The examiner times the subject and counts the number of pairs of pegs inserted after 30 s. For assembly, using both hands, the subject assembles sequences of peg,

collars, and washers. The examiner instructs the subject to utilize an alternating approach, placing the peg in the hole with the dominant hand while using the nondominant hand to pick up the collar and then, while placing the collar, using the dominant hand again to place the washer. The examiner times the subject for 60 s and records the number of parts placed.

After all three conditions are completed, the examiner compares the raw score (number of pegs or assembly parts) for each element to the normative data in order to derive the subject's standardized scores.

Historical Background

The Purdue Pegboard test was first developed in 1948 by Joseph Tiffin, Ph.D., industrial psychologist, of Purdue University. He developed the test as a means of measuring manual dexterity for the purpose of selecting employees for industrial and assembly line jobs. In the seminal paper on the Purdue Pegboard test, Tiffin and Asher (1948) wrote that one of the most important aspects of the test was that it was standardized under conditions in which groups of employees could be tested together; one examiner using a battery of 10 peg boards could test 50 people an hour, making it an efficient means of measuring the manual dexterity of potential assembly line and factory workers. The initial normative data for the Purdue Pegboard was obtained from thousands of students and employees working a variety of industrial jobs and divided into five groups: college men and women, veterans, and industrial men and women. Tiffin and Asher (1948) also reported on the reliability and validity of the instrument. The test-retest reliability was high. The validity was calculated against industrial job performance, and the validity coefficients varied indicating the importance of determining the validity of the Purdue Pegboard separately for each job its use was being considered.

Since its development in 1948, the Purdue Pegboard test has become one of the preeminent tests of dexterity in clinical, research, and vocational settings. It has been utilized to investigate the relationship between cognitive constructs and motor dexterity as well as to examine the relationship between motor dexterity and pathology. For example, the initial studies on the Purdue Pegboard indicated a significant relationship between intelligence as measured using the Wechsler Adult Intelligence Scale (WAIS) and manual dexterity in individuals with cognitive impairment (Phillips & Holden, 1967). Additionally, the Purdue Pegboard test was able to discriminate between individuals with brain injuries and controls, indicating its potential use as a screen for brain injury (Vega, 1969). Performance on the Purdue Pegboard test also discriminated between children with reading disabilities and typically developing children (Leslie, Davidson, & Batey, 1985). Lastly, performance on the Purdue Pegboard test was related to future factory workshop capability in individuals with moderate to severe levels of mental retardation (Presnall, 1979). More recently, the Purdue Pegboard test has been used as a measure of motor functioning in a variety of clinical groups, including autism, Tourette's syndrome, schizophrenia, and Parkinson's disorder. Refer to the Clinical Uses section for further information.

Psychometric Data

Normative Data

Tiffin and Asher (1948) collected the initial normative data on college students, veterans, and factory workers. Additional normative data on a variety of populations has also been collected. Gardner and Broman (1979) collected normative data on over 1,300 school-age children. Hamm and Curtis (1980) also reported normative data on 340 adolescent/adult candidates for vocational rehabilitation who were suspected of having a cognitive or physical disability. Wilson, Iacoviello, Wilson, and Risucci (1982) presented normative data on over 20 preschool-age children (2–5 years).

Reliability

The reliability of the Purdue Pegboard test has been widely studied and is generally considered to be adequate to strong. Test-retest reliabilities from the first edition of the Purdue Pegboard manual ranged from .60 to .71 for one trial and .82 to .91 for three trials. For the three-trial approach, each subject was administered the conditions three times, and the means of the scores were obtained (Tiffin, 1968; Tiffin & Asher, 1948). More recently, Buddenberg and Davis (2000) evaluated the test-retest reliability of the Purdue Pegboard with 1 week between administrations. For the one-trial administration, reliabilities ranged from poor to adequate (.37–.70) with the highest reliability for the combined score. The reliability was higher with a three-trial administration, with all of the reliability scores being excellent (>.80).

Validity

Tiffin and Asher (1948) initially reported on the validity of the Purdue Pegboard test based on a compilation of several studies that compared the performance on the test with factory job performance. The validity coefficients ranged drastically from .07 to .76 depending on the type of job to which performance on the pegboard was compared, indicating that the validity of the Purdue Pegboard should be individually determined based on the job for which its use was being considered.

A study on the intercorrelation of the Purdue Pegboard tests (dominant hand, nondominant hand, both hands, and assembly) found that the peg placement elements were more strongly correlated with each other than with the assembly element. These results led the authors to conclude that the Purdue Pegboard measured two factors: finger dexterity or the "ability to make rapid, skillful, controlled manipulative movements of small objects, where the fingers were primarily involved" and manual dexterity as defined as the "ability to make skillful, controlled arm-hand manipulations of larger objects" (Fleshman & Ellison, 1962).

The Purdue Pegboard also has strong discriminate validity, as for example, when using criteria established by Costa, Vaughan, Levita, and Farber (1963), performance on the pegboard discriminated between patients with brain damage and controls with about 90% accuracy, and it was also possible to indicate the laterality or diffuseness of brain damage in about 70% of cases. Costa et al. (1963) criteria are published in the examiners manual.

The Purdue Pegboard also discriminated between typically developing children and children with a wide range of psychological/neurological conditions (Rapin, Tourke, & Costa, 1966). In this seminal validity study, almost all of the typically developing children achieved scores within the normal range, but just over 20% of the children with brain injury or intellectual disability achieved scores in the normal range. The Purdue Pegboard test was also reported to be sensitive to "non-motor brain damage, including the syndrome of clumsiness, hyperactivity, and visual motor dysfunction."

Clinical Uses

The Purdue Pegboard was initially designed as an industrial psychological instrument for the purpose of assessing the manual dexterity of factory workers as a means of predicting productivity. Since its inception in 1948, it has been widely used in employment settings but also as a measure of motor functioning in clinical research.

The Purdue Pegboard has been used to measure motor functioning in a wide variety of clinical populations. For example, the Purdue Pegboard has been instrumental in demonstrating the subtle motor impairments associated with individuals with Tourette's syndrome (TS) and tic disorders, and performance on the Purdue Pegboard has been used to predict outcome in individuals with TS (Bloch, Sukhodolsky, Leckman, & Schultz, 2006). Impaired motor skills in children with attention deficit hyperactivity disorder (ADHD) has also been demonstrated using the Purdue Pegboard test, and

performance on the Purdue Pegboard is correlated with attention, more generally, in typically developing individuals (Strenge, Niederberger, & Seelhorst, 2002; Sukhodolsky, Landeros-Weisenberger, Scahill, Leckman, & Schultz, 2010). Furthermore, children with ASD often have poor motor skills, and this finding has been confirmed in studies using the Purdue Pegboard test (Mandelbaum et al., 2006). Lastly, the Purdue Pegboard test has been used extensively in schizophrenia research to assess motor functioning, as motor deficits are commonly seen in individuals with schizophrenia.

Clinical researchers also have widely used the Purdue Pegboard as a measure of motor functioning in treatment studies. Notably, Aman et al. (2008) used the Purdue Pegboard test as part of a battery to assess the cognitive effects of risperidone in children with ASD. Similarly, the Purdue Pegboard test has been used to measure the cognitive impact of antipsychotic medications in schizophrenia, and it has been utilized as an outcome measure to assess the efficacy of treatments for Parkinson's disease.

Overall, the Purdue Pegboard was developed to assess dexterity in factory workers, but over its 60-year history, it has proved to be a valuable tool for assessing manual motor dexterity more broadly and has been utilized extensively in clinical research with a wide variety of clinical populations.

See Also

- ▶ Fine Motor Development
- ▶ Motor Control
- ▶ Psychomotor
- ▶ Visual-Motor Function

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Purines and Related Compounds

Ito Tetsuya
Department of Neonatology and Pediatrics, Graduate School of Medical Sciences, Nagoya City University, Aichi, Japan

Definition

Purines and pyrimidines are compositional units of DNA and RNA. They play important role not only for genetic information but also for many metabolic steps as formation of coenzyme and intermediates.

Disorders of purine metabolism such as Lesch-Nyhan syndrome are well known and described elsewhere, but defect of pyrimidine metabolism is known comparatively recently. The final product of purine metabolite in human is uric acid, which is easily detected and measureable, but there is no equivalent compound in pyrimidine metabolism. So, many patients with pyrimidine metabolism defect may be followed as unexplained diseases.

Deficiency of dihydropyrimidine dehydrogenase (DPD) which is the first enzyme of pyrimidine degradation pathway causes increase levels of uracil and thymine in blood and urine. The patients of this deficiency show very wide spectrum of clinical symptoms. Almost half of the patients have convulsion, mental and/or motor retardation and growth retardation, microcephaly, and dysmorphy, and ocular abnormalities are seen in smaller part. Autism is also observed 18% of the patients with DPD deficiency. Etiology is unknown, but DPD deficiency is one of the related disorders of autism.

See Also

▶ Intellectual Disability
▶ Neurochemistry

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Purkinje Cells

Ilanit Gordon
Child Study Center, Yale University, New Haven, CT, USA

Definition

Purkinje cells are large neuronal nerve cells that occupy the middle layer of the cerebellar cortex (also known as the Purkinje layer). These cells were discovered in 1837 by Czech anatomist Jan Evangelista Purkinje who identified and described them. Structurally, Purkinje cells are characterized by a long axon and numerous and intricate dendritic spines branching from the cell soma. Purkinje cells regulate coordinated motor activity by releasing the neurotransmitter GABA (gamma-aminobutyric acid) projecting to deeper cerebellar nuclei and exerting inhibitory influences upon the receiving cells. Purkinje cells have a large deal of control over the refinement of motor activities as they have an essential part in the cerebellum's role in receiving information from the cerebrum and planning coordinated activity in response. Damage to Purkinje cells can result in certain neurological diseases. The loss of Purkinje cells has been observed in children with autism.

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Putamen

Sarah Shultz
Department of Psychology, Yale University, New Haven, CT, USA

Structure

The putamen is a subcortical structure situated at the base of the forebrain between the lateral medullary lamina of the globus pallidus and the external capsule. The putamen, caudate nucleus, globus pallidus, and amygdala form the basal ganglia. The rostral portion of the putamen is continuous with the caudate nucleus, forming the dorsal striatum.

Function

The putamen and other structures of the basal ganglia play an important role in many motor and cognitive functions, such as initiating, regulating, and monitoring movements. The putamen also plays a role in learning and memory, specifically in the acquisition of stimulus–response associations over time.

Pathophysiology

Putamen dysfunction is thought to be associated with repetitive behaviors in individuals with ASD (Hollander et al., 2005; Estes et al., 2011). While repetitive behaviors are reportedly correlated with basal ganglia dysfunction, studies of putamen volume in ASD report no difference between typically-developing individuals and individuals with ASD (Hardan, Kilpatrick, Keshavan, & Minshew, 2003; Sears et al. 1999; Langen, Durston, Staal, Palmen, & van Engeland, 2007; Estes et al., 2011).

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PVL

► Periventricular Leukomalacia

PVSP

► Prosody-Voice Screening Protocol

Pyknolepsy

► Petit Mal Seizure

Pyramidal System

Martha D. Kaiser and Randi Bennett
Child Neuroscience Laboratory, Yale Child Study Center, New Haven, CT, USA

Definition

Pyramidal cells are neurons with a pyramid-shaped cell body, one large apical dendrite, and several smaller dendrites at their base. They are mainly located in the gray matter of the cerebral cortex, corticospinal tract, and the hippocampus. Their axons may have local collaterals, but they are also able to project outside their cortical region. The development of normal motor control is dependent upon the development of connections between the axons of the pyramidal cells in the corticospinal tract and the spinal cord.

See Also

► Cerebral Cortex

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