Evidence-Based Models of Treatment

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Abstract

Evidence-based treatments are interventions that have been validated through methodologically sound studies and shown to produce significant and/or clinically meaningful effects on behavior. There are many treatments for autism spectrum disorders (ASD); however, only a handful of these treatments are evidence based. This chapter discusses the main components of several evidence-based treatment models for individuals with ASD including (a) Early Intensive Behavioral Intervention, (b) Pivotal Response Treatment, (c) Early Start Denver Model, (d) Learning Experiences and Alternative Program for Preschoolers and their Parents, and (e) Treatment and Education of Autistic and Communication Handicapped Children.

3.1 Evidence-Based Treatments

Across fields, there is a consistent gap between findings from published studies and implementation of practices. For example, Kazdin (2000) reported that fewer than 10% of mental health treatments for children and adolescents have been systematically evaluated. Said another way, interventions that do not have any demonstrated efficacy are more likely to be implemented in practice. Due to the prevalence of this research-to-practice gap (e.g., Goodman, 2003; Kodak, Cariveau, LeBlanc, Mahon, & Carroll, 2018), many fields have implemented policies to increase the use of evidence-based practices.

One aspect of evidence-based practice is the implementation of evidence-based treatments. Evidence-based treatments are interventions that have been evaluated in methodologically sound studies and shown to produce significant and/or clinically meaningful effects on behavior. Many studies documenting the efficacy of interventions were conducted using randomized controlled trials and large sample sizes. These studies provide empirical support for an intervention when the outcomes of individuals assigned to the treatment group are statistically significant from the outcomes of individuals assigned to the control group. In autism research, interventions often are evaluated using single-subject designs, which allow for an experimental demonstration of intervention effects with fewer participants. Due to differences in methodology and sample size, methods to identify well-supported treatments utilizing single-subject research design have been developed (e.g., Horner et al., 2005; Reichow, Volkmar, & Cicchetti, 2008). These methods

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allow professionals from within and outside of the field of applied behavior analysis (ABA) to evaluate the strength of evidence for behavior-analytic interventions. One of the primary methods for evaluating the evidence for an intervention is a meta-analysis. Meta-analyses evaluate the effectiveness of a specific intervention by synthesizing data from relevant studies and serve as a mechanism by which professionals can identify evidence-based treatment. A meta-analysis collects data from all relevant studies on a topic, recodes data to identify the effect size, and conducts statistical analyses on aggregated data. The results of the meta-analysis, in combination with objective criteria, are used to determine if an intervention has sufficient support to characterize the intervention as an evidence-based treatment. For example, in a meta-analysis of the literature on comprehensive applied behavior analytic (ABA) intervention for young children with autism, the results showed that comprehensive ABA intervention produced positive outcomes in multiple domains (e.g., language, adaptive behavior, and intellectual functioning) for children with ASD (Virués-Ortega, 2010).

Evidence-based treatments are particularly important to identify for individuals with ASD, because an abundance of treatments have been developed and marketed to this population; yet, only a proportion of treatments have been scientifically evaluated to determine the efficacy of the intervention (see Chap. 6 for an in-depth discussion of nonevidence-based approaches). Caregivers of children with ASD may be likely to select nonevidence-based treatments (Green et al., 2006) because many of these interventions claim to cure ASD and/or may require little effort. In addition, caregivers may not be familiar with the distinction between scientific evidence and testimonials nor are they likely to investigate the evidence for putative claims of efficacy made on websites or in promotional materials. Thus, "fad" treatment developers make false claims for their products that may be difficult to distinguish from claims of evidence-based treatment from reputable sources (see Chap. 6).

The use of nonevidence-based treatments can be harmful. For example, allocating considerable time and resources to a treatment that is unlikely to result in an improvement in behavior or reduction in symptoms may prevent the individual from receiving other, effective interventions. When resources are limited, it is ideal to maximize the likelihood of benefit to the individual by selecting a treatment that has been shown to produce improved outcomes with similar populations. Also, some nonevidence-based treatments have produced physical harm to individuals, including those with ASD. For example, holding therapy (Welch & Chaput, 1988), which is a treatment that involves an adult physically restraining a child until the child engages in emotional responding, at which point the adult provides nurturing, has been used with children with ASD and other diagnoses. This therapy is based on the premise that the parent and child have a broken bond and holding therapy repairs this bond. Several children have died during the implementation of this intervention, leading numerous organizations to write position statements describing forms of coercive interventions as contraindicated (e.g., American Academy of Child and Adolescent Psychiatry, 2003).

Delaying the onset of evidence-based treatment through the use of nonevidence-based treatments may prevent children from achieving the best possible outcome. For example, if a young child with ASD does not receive evidence-based treatment until he or she is enrolled in elementary school, there may be a large gap between his or her skills and those of his or her typically developing peers. In this case, treatment will need to be highly effective as well as efficient in order to resolve this gap. Further, the child may have a several-year history of engaging in problem behavior to communicate his or her basic wants and needs rather than using appropriate forms of communication. Thus, additional behavioral concerns may need to be addressed, which could have been avoided had he or she received evidence-based treatment that targeted functional communication at an earlier point in his or her development. Similarly, concurrent use of evidence-based treatment and nonevidence-based treatment also may prevent positive outcomes because this combination may slow a child's

progress and make it difficult to determine the aspects of intervention that are leading to positive treatment outcomes.

There are several ways that caregivers, practitioners, researchers, and community stakeholders can identify evidence-based treatments for individuals with ASD. We review these here; however for additional guidance please see Chap. 6. Organizations have developed rigorous criteria to assess the quality of evidence used to determine the efficacy of an intervention and published their findings on websites. For example, National Professional Development Center (NCPD) on Autism Spectrum Disorder (http://autismpdc.fpg.unc.edu/) lists 27 interventions that they identified as evidence based for individuals with ASD. The website provides a summary of each treatment, step-by-step instructions to implement the treatment, and a list of references that demonstrate the evidence for the intervention.

Reports from agencies investigating the efficacy of treatment for individuals with ASD are also available to the public and can be used by laypeople and professionals to determine whether an intervention has sufficient evidence to support its use. For example, the National Autism Center's National Standards Project (National Autism Center, 2009) produced a report on the status of the evidence for interventions from research published within specific timeframes, which is available to download from their website (http://www.nationalautismcenter.org/reports/).

Researchers seeking to determine the evidence for treatment can apply criteria developed to analyze the methods and outcomes provided by studies. Criteria for identifying evidence-based treatment using single-subject research have been developed, due to the prevalence of this type of research in certain fields (e.g., behavior analysis, speech therapy) and with specific populations (e.g., children with ASD). For example, Horner et al. (2005) describe the criteria for evidence-based practice in single-subject research. The provision of specific definitions and criteria for determining evidence-based treatments is beneficial to the field, as they allow other researchers and practitioners to use these criteria as guidelines for determining the evidence for treatments not yet subjected to scrutiny based on these criteria.

3.1.1 Comprehensive Treatment Models for Children with ASD

Treatments based on principles and practices from the field of ABA are among the most effective interventions for individuals with ASD (Rogers & Vismara, 2008; Smith & Iadarola, 2015). Based on the specific goals of treatment, intervention is typically characterized as either focused or comprehensive. Focused intervention typically addresses one or a small number of treatment goals (e.g., the reduction of problem behavior, increasing peer interaction) and occurs over a relatively short duration with a lower level of intensity (e.g., 6 months of intervention with 6 h of intervention per week). In comparison, comprehensive intervention addresses multiple domains (e.g., social skills, communication, cognitive skills) and has an extended duration of services that occur at a high level of intensity (e.g., 3 years of intervention with 40 h of intervention per week). Approximately 40% of children who are diagnosed with ASD receive behavioral intervention prior to and during their early elementary school years (Zablotsky et al., 2015). Although comprehensive intervention is defined in terms of its range of targeted goals and treatment intensity, the model of comprehensive service delivery for children with ASD may vary depending on their treatment provider.

Smith and Iadarola (2015) reviewed comprehensive treatment models for children with ASD. These models have key similarities as well as unique characteristics. The models are similar in that they all include individualization of programming based on the needs of the child; thus, the programs are designed to be implemented with a degree of flexibility. In addition, all models introduce intervention at the earliest possible age, operate on a full-year basis, have services directed by at least one doctoral-level professional with expertise in the treatment of ASD, have systems of ongoing assessment of child

progress, have a custom-designed curriculum, and acknowledge that caregivers play a crucial role in treatment and include caregivers in intervention. Differences in these treatment models relate to the specific needs addressed within intervention, the theoretical approach upon which these models are based, and the role of the clinicians in the intervention. A proportion of the treatment models reviewed by Smith and Iadarola are described in more detail in the remainder of this chapter.

3.1.1.1 Early Intensive Behavioral Intervention (EIBI)

Based on the University of California at Los Angeles Young Autism Project model (UCLA YAP; Lovaas, 1981, 1987, 2003), EIBI is a widely investigated, frequently used, and commonly requested model of intervention for children with ASD (Stahmer, Collings, & Palinkas, 2005). This model of treatment is considered intensive (e.g., 25–40 h of intervention per week) and occurs over several years. Intervention is based on principles of operant conditioning (e.g., stimulus control, reinforcement) and targets acquisition of adaptive skills as well as reductions in problem and stereotyped behavior. A number of treatment manuals have been developed to guide the sequence of skills targeted during EIBI (e.g., Leaf and McEachin, 1999; Lovaas, 2003; Maurice, Green, & Foxx, 2001). The focus and structure of intervention change as treatment progresses within this model. In the first year of treatment, complex skills are broken down into component skills which are targeted through carefully arranged and highly structured instruction that includes repeated learning opportunities (e.g., discrete trial instruction). Intervention typically occurs in a one-to-one format and is delivered by therapists who work in the child's home or school, or in a clinic. The initial goals of intervention are to decrease challenging behavior and barriers to learning, build functional communication and language, teach imitation, establish early play behavior, and teach pre-academic skills. The second year of intervention continues with the development of skills through structured teaching and also incorporates naturalistic teaching procedures and group instruction. Intervention goals expand to teaching more advanced language, teaching adaptive skills, following classroom rules, developing friendships, and imaginative toy play.

The initial success of studies investigating EIBI (Lovaas, 1987; McEachin, Smith, & Lovaas, 1993) led to further investigation of this model and widespread dissemination of these practices. Studies have demonstrated the efficacy of EIBI in settings other than the child's home, such as in schools (Eikeseth, Klintwall, Jahr, & Karlsson, 2012; Eikeseth, Smith, Jahr, & Eldevik, 2002) and treatment centers (Cohen, Amerine-Dickens, & Smith, 2006). In addition, meta-analyses of the EIBI literature have investigated factors correlated with better treatment outcomes, which include parent training (Makrygianni & Reed, 2010), a longer duration of treatment (Makrygianni & Reed, 2010; Virués-Ortega, 2010), more intense treatment (Makrygianni & Reed, 2010; Virués-Ortega, 2010), and supervisor training with the UCLA model (Reichow & Wolery, 2009).

3.1.1.2 Pivotal Response Treatment (PRT)

PRT is a naturalistic behavioral intervention that uses procedures from ABA and developmental approaches. In comparison to traditional ABA treatment approaches (e.g., EIBI), which tend to be adult directed, PRT takes a child-directed approach to intervention by using a child's motivation to present learning opportunities in the natural environment (Koegel & Koegel, 2006; Koegel, O'Dell, & Koegel, 1987). The hallmark of PRT is a focus on teaching *pivotal responses*, which once learned might produce widespread and rapid treatment gains across other non-targeted behaviors (Koegel, Koegel, Harrower, & Carter, 1999). Common pivotal areas that are targeted during PRT include (a) motivation, (b) responsivity to multiple cues, (c) self-initiations, and (d) self-management (Koegel, Openden, Fredeen, & Koegel, 2006).

PRT incorporates a number of strategies to enhance a child's motivation to learn (e.g., Koegel, Singh, & Koegel, 2010). First, during

PRT a teacher incorporates the child's choice into learning opportunities (e.g., letting the child choose the order in which they complete academic tasks). Second, during PRT direct and natural reinforcers are used (e.g., if a child correctly labels a toy he or she is given access to that toy). Third, mastered tasks are interspersed with acquisition tasks during a teaching session and multiple skills are targeted during a single teaching session. Finally, a teacher reinforces a child's attempts to respond correctly, instead of only providing reinforcement if the child engages in the exact target behavior.

Responding to multiple cues in the environment is another pivotal area targeted during PRT for children with ASD who display abnormalities in attention, characterized by responding to only a subset of cues in the environment (i.e., stimulus over-selectivity; Lovaas & Schreibman, 1971; Reith, Stahmer, Suhrheinrich, & Schreibman, 2015). Stimulus over-selectivity can interfere with an individuals' development of important social, language, and academic skills. For example, when teaching a child to label clothing items, the child with ASD may overly focus on an irrelevant aspect of the skill being taught, such as the color of the clothing items. Thus, the child may learn to label a red shirt "shirt" or a black hat "hat"; however, correct responding may decrease once the child is presented with a blue shirt and a white hat. Commonly used strategies to teach children with ASD to respond to multiple cues include (a) within-stimulus prompts, which consist of exaggerating the relevant components of a stimulus and gradually fading out those prompts (e.g., when teaching a child to discriminate between the letters "p" and "b" the teacher may initially make the stem of each letter bold with a large font and then gradually fade the prompt); (b) orienting cues, which consist of requiring a child to make an overt response to demonstrate that he or she is attending before making a target response (e.g., when teaching a child to discriminate between a picture of a dog and a cat the teacher may present the instruction, "touch dog," and require the child to say "dog" before making a target response); and (c) direct treatment of over-selectivity (e.g., teaching a child a series of discriminations that require the child to respond to multiple stimulus components; Dunlap, Koegel, & Burke, 1981).

Another important pivotal skill that is taught to children with ASD through PRT is self-management skills. Children are taught to identify and record the occurrence or nonoccurrence of a specific target behavior (e.g., social behaviors; Koegel, Koegel, & Parks, 1992; Koegel & Frea, 1993). For example, Koegel and Frea (1993) taught two adolescents with autism to identify and record the occurrence of their own appropriate or inappropriate social behaviors (e.g., intensity of voice volume) while talking to a communication partner. Following training in the self-management procedures, both participants showed an immediate increase in appropriate social behavior. The treatment also led to improvements in untargeted social behavior (e.g., eye gaze).

The effectiveness of PRT as a treatment model for ASD has been demonstrated in numerous single-case design studies as well as in larger clinical trials (Duifhuis et al., 2017; Hardan et al., 2015; Mohammadzaheri, Koegel, Rezaei, & Bakhshi, 2015; Mohammadzaheri, Koegel, Rezaee, & Rafiee, 2014; National Autism Center, 2009; Smith, Flanagan, Garon, & Bryson, 2015). In a randomized controlled trial, Mohammadzaheri et al. (2014) compared outcomes for two groups of children with ASD ($N = 30$; 6–11 years) who received either PRT or structured ABA in a school setting. Participants in both groups received two 60-min sessions twice weekly over a 3-month period (i.e., total of 24 h of treatment). For all participants the target behavior consisted of increasing the participants' mean length of utterance (MLU) when asked to describe a series of pictures. The two interventions were identical with the exception of four procedural differences. First, in the structured ABA sessions, the teacher chose the instructional materials; in the PRT sessions, the child chose the instructional materials or activities. Second, in the structured ABA sessions, the teacher worked exclusively on the target behavior; in the PRT sessions, the teacher interspersed work on the target behavior with maintenance

tasks. Third, in the structured ABA sessions, the teacher provided reinforcers during the session that were not related to the target behavior (e.g., if the child correctly labeled a teddy bear, he or she would be given praise and a favorite food or toy); in the PRT sessions, the teacher used reinforcers that were directly related to the target behavior (e.g., if the child correctly labeled a teddy bear, he or she would be given praise and access to the teddy bear). Finally, in the structured ABA sessions, the teacher only provided a reinforcer for utterances that were successively longer than previously reinforced utterances; in the PRT sessions, the teacher provided reinforcers for both long and short utterances. Following the intervention, children in the PRT group demonstrated statistically significant improvements in both targeted (MLU; $F(1, 27) = 6.97$, $p = 0.01$) and untargeted areas (i.e., pragmatic language skills; $F(1, 26) = 6.38$, $p = 0.01$) relative to the children in the structured ABA group.

Parent involvement is a critical part of the effectiveness of PRT; however, Mohammadzaheri et al. (2014) did not incorporate caregivers into the treatment. In comparison, Hardan et al. (2015) conducted a randomized controlled trial examining the effects of PRT taught to caregivers in a group format. Caregivers and their child with ASD were assigned to one of the two groups, a pivotal response treatment group (PRTG; 25 subjects completed the study) or a psychoeducation group (PEG; 22 subjects completed the study). Caregivers in both groups received training once a week for 12 weeks. Parents in the PRTG group received training based on a standard set of PRT training materials. Training consisted of eight parent-only group sessions and four individual training sessions with the parent-child dyad and a clinician. Caregivers in the PEG group received training based on materials from an existing autism parenting education program. Training consisted of ten parent-only group meetings and two individual training sessions with the parent-child dyad and a psychologist. One of the primary outcome measures in this study was the child's frequency of utterances obtained during 10-min observations of the caregivers and child during baseline, week 6, and week 12 of the intervention. The results of this study showed that children from the PRTG group showed a significantly higher frequency of utterances during both the 6- and 12-week observations when compared to children from the PEG group ($F(2, 43) = 6.12$, $p = 0.005$). Additionally, a significant treatment effect was observed for the Vineland-II Communication scale (Sparrow, Cicchetti, & Balla, 2005), with children from the PRTG group showing greater improvements in communication compared to children from the PEG group ($F(2, 19) = 3.08$, $p = 0.041$). The findings from this study were consistent with those of Mohammadzaheri and colleagues and support the use of group-based parent PRT training methods.

3.1.1.3 Early Start Denver Model (ESDM)

The ESDM is a comprehensive treatment model that integrates empirically supported ABA techniques with relationship-based, developmental, and play-based approaches (Rogers & Dawson, 2010). Several approaches have influenced the underlying principles and practices of the ESDM including (a) the original Denver model (Rogers, Hall, Osaki, Reaven, & Herbison, 2000), (b) Rogers and Pennington's (1991) model of interpersonal development in autism, (c) the model of autism as a disorder of social motivation (Dawson et al., 2004), and (d) pivotal response training (Koegel & Koegel, 2006).

The ESDM was designed for young children between the ages of 12 and 60 months, and is a manualized treatment with a curriculum that covers all domains of development (Rogers & Dawson, 2010). In the ESDM, children's skills are regularly assessed using the ESDM Curriculum Checklist, which includes specific skills sequenced developmentally within domains that are critical to early social learning (e.g., nonverbal and verbal communication, joint attention, imitation, social development, and play). Teaching is individualized for each child by selecting specific learning objectives based on the results of the ESDM Curriculum Checklist. Clinicians typically embed teaching within play activities and use established teaching strategies

from ABA (e.g., prompting, prompt fading, shaping, chaining), techniques from pivotal response training (e.g., following the child's lead, turn taking), and developmentally oriented strategies to promote positive emotional exchanges between children and adults. Finally, there is a focus on parent and family involvement with the ESDM. Caregivers are trained to incorporate the strategies and techniques outlined in the ESDM manual throughout their child's waking hours.

The ESDM is currently the only comprehensive treatment model that has been empirically evaluated with children under the age of 30 months (Dawson et al., 2010). In a randomized controlled trial, Dawson and colleagues assigned 48 children with ASD between 18 and 30 months of age to one of the two groups. One group received 2 years of intervention using the ESDM, and the other group received 2 years of intervention using services commonly available in the community. The results showed that participants provided with the ESDM showed statistically significant improvements on outcome scores from baseline to 2 years on the Mullen Scales of Early Learning (MSEL; $F = 4.31$, $p = 0.044$), adaptive behavior ($F = 7.05$, $p = 0.011$), and diagnostic status (Fisher's exact test, $p = 0.041$) when compared to the community intervention group. Cognitive abilities were measured by the MSEL composite standard score, and children in the ESDM showed an average increase of 17 points compared to an average of 7 points in the community intervention group. Additionally, only 56% of the children from the ESDM group retained their diagnosis of autistic disorder following 2 years of intervention, as compared to 71% of children in the community intervention group. The original randomized control trial on the ESDM was conducted in a university clinic setting; more recent studies suggest that this model may also be effective when implemented in community-based group settings (e.g., Vivanti et al., 2014) and when implemented by trained caregivers in the home (e.g., Vismara et al., 2016).

3.1.1.4 Learning Experiences and Alternative Program for Preschoolers and Their Parents (LEAP)

The LEAP Preschool Model, founded in 1981 by Phillip Strain, is one of the only evidence-based inclusion models for educating children with ASD in a public school setting. This treatment model was one of the first to include children with autism in a classroom with typically developing peers. The typical LEAP classroom consists of a minimum of a 2:1 ratio of typically developing peers to children with autism. The theoretical and conceptual foundation of LEAP is based on ABA and developmental theory. The LEAP program is based on the premise that the primary learning difficulty for children with ASD is with the generalization of newly acquired skills across appropriate settings or people. Thus, this approach incorporates multiple learning opportunities across settings and across service delivery agents in the natural environment.

The key components of the LEAP model include (a) peer-mediated social skill instructions, (b) selection of functional goals and treatment objectives for each child, (c) embedding learning opportunities into typical preschool routines (e.g., circle time, snack time, free play), (d) ongoing data collection and progress monitoring, (e) use of a broad array of evidence-based behavioral interventions (e.g., errorless learning, picture exchange communication system (Frost and Bondy, 2002), pivotal response training), f) a transdisciplinary model of service delivery (i.e., collaboration among all professionals working with a particular child), and (g) a structured parent skill training curriculum (Strain, 1987a; Strain & Bovey, 2011).

A unique feature of the LEAP model is the use of peer-mediated instructional strategies. With this model, typically developing children as young as 36 months receive comprehensive social skill instruction that prepares them to facilitate the social and language skills of children with ASD (Goldstein & Wickstrom, 1986; Strain

& Bovey, 2008; Strain & Danko, 1995). For example, in an early study conducted by Goldstein and Wickstrom (1986), two typically developing preschoolers were taught to use strategies to promote communicative interactions with three of their classmates with intellectual disabilities. Specifically, the typically developing preschoolers were taught how to initiate interactions, establish eye contact, establish joint attention, respond to the speech of a peer, prompt the peer to request items or activities, and redirect a peer's play to a joint play activity. The results showed that the typically developing preschoolers learned to implement the teaching strategies independently with peers with intellectual disabilities. Additionally, all three children with intellectual disabilities engaged in higher rates of communicative interactions (i.e., responding to a peer and initiating an interaction with a peer) after the typically developing peers were taught how to promote communicative interactions. Overall research findings suggest that peer-mediated instructional strategies result in higher rates of communicative and social interactions for the preschoolers with ASD (e.g., Goldstein & Wickstrom; Kohler & Strain, 1992; Strain, 1987b). In addition to the positive outcomes for the individuals with ASD, research findings demonstrate that the typically developing preschoolers who serve as peer trainers also experience positive outcomes (Strain, 2001). Specifically, when compared to similar children, who did not participate in the peer-mediated interventions, peer trainers have been shown to engage in fewer disruptive or inappropriate behaviors, be more socially competent with other typically developing peers, and be more positive and accepting of disabilities.

There has been extensive research conducted demonstrating the effectiveness of specific components of LEAP (e.g., Cordisco & Strain, 1986; Goldstein & Wickstrom, 1986; Odom, Hoyson, Jamieson, & Strain, 1985; Sainato, Strain, Lefebvre, & Rapp, 1987) as well as large-scale randomized controlled trials (Strain & Bovey, 2011; Strain & Hoyson, 2000). In one of the largest randomized controlled trials of an intervention for children with autism to date, Strain and Bovey (2011) examined outcomes for 177 children with ASD in a LEAP training classroom compared to 117 children with ASD in comparison classrooms. After receiving 2 years of LEAP, Children in the treatment classroom made significantly greater progress than the comparison class on all measures with statistically significant effect sizes ranging from 0.59 to 1.22 ($p < 0.05$). Children in the treatment classrooms made, on average, twice the developmental gains on measures of cognitive and language development as compared to the children in the comparison classrooms. When compared to children in the comparison classrooms, children in the treatment classrooms also showed greater reductions in the severity of autism symptoms and problem behavior and showed more gains on standardized measure of social behavior growth. Following the 2-year intervention period, lead teachers in each of the intervention classrooms were asked to complete a social validity questionnaire that assessed their satisfaction with LEAP. Overall, teachers rated their experiences with implementing LEAP very high, and they attributed positive changes in child behavior to the LEAP program.

3.1.1.5 Treatment and Education of Autistic and Communication Handicapped Children (TEACCH)

TEACCH is a comprehensive treatment approach, based out of the University of North Carolina Chapel Hill, which was started in 1972 by Dr. Eric Schopler. The TEACCH model provides intervention to individuals with ASD of all ages and ability levels. The main components of TEACCH include (a) understanding and appreciating the commonalities of people with ASD (i.e., a "culture of autism"), (b) individualization of goals and teaching strategies based on ongoing assessment of an individuals' strengths and weakness, and (c) use of caregivers as co-therapists.

The "culture of autism" refers to a set of neuropsychological strengths and weaknesses that individuals with autism share (Mesibov & Shea, 2010; Mesibov, Shea, & Schopler, 2005). Common characteristics of a culture of autism

include (a) strengths in visual processing relative to auditory processing, (b) strengths in detail-focused attention versus integrating multiple details to derive meaning, (c) variability in attention (i.e., distractible at times and highly focused with difficulty shifting attention at other times), (d) communication deficits (e.g., impairments in the social use of language), (e) difficulties with concepts of time, (f) difficulties with generalizing skills to novel settings, (g) intense interests in preferred activities with difficulties transitioning to new activities, and (h) unusual response to sensory stimulation (Mesibov & Shea).

Intervention goals and teaching strategies used during TEACCH are individualized for each person with ASD based on an understanding of a "cultural of autism" and the use of ongoing assessments (Mesibov et al., 2005; Schopler, Lansing, Reichler, & Marcus, 2005). Structured teaching is the primary educational method used during TEACCH (Schopler, Mesibov, & Hearsey, 1995). The underlining principles of structured teaching include (a) organizing the physical environment to improve learning (e.g., limiting distractions, incorporating visual cues), (b) including a predictable sequence of activities so an individual knows what activities are coming up next and when an activity is done, (c) use of visual schedules to communicate a sequence of upcoming activities, (d) teaching individuals with ASD routines (in addition to visual schedules) for daily activities, (e) use of work/activity systems that tells an individual how to complete a specific work task independently (e.g., visual cues for completing a toothbrushing routine), and (f) incorporating a visual component into all activities to clarify expectations (Mesibov et al., 2005). A number of research studies have been conducted examining the effectiveness of different components of structured teaching (e.g., Bennett, Reichow, & Wolery, 2011; Hume & Odom, 2007; MacDuff, Krantz, & McClannahan, 1993). For example, Bennett and colleagues evaluated the use of a structured work system on engagement, task completion, stereotypic behavior, and escape attempts for three preschoolers with ASD or a developmental delay. The structured work system included three plastic baskets (baskets for the activities and a "finished basket") and a visual activity schedule with photographs of each activity to be completed (e.g., puzzle, sorting task, matching game). Participants were taught to complete the steps of the visual activity schedule using a graduated guidance prompting procedure. During structured teaching, task completion increased for all participants, and participants engaged in fewer escape attempts and lower levels of stereotypic behavior.

Family collaboration is an important component of the TEACCH model. Caregivers of individuals with ASD are viewed as experts on their children and the information gathered from caregivers is used by professionals to design individualized interventions. TEACCH was one of the first treatment approaches that used caregivers as co-therapists (Schopler, Brehm, Kinsbourne, & Reichler, 1971). Previous research has demonstrated that caregivers can be successfully trained to teach their children a range of skills (e.g., Probst & Glen, 2011; Short, 1984). Additionally, including caregivers as co-therapists has been shown to decrease parental stress and improve parent-child interactions (D'Elia et al., 2014).

There have been a number of studies conducted that evaluate the effectiveness of individual components of TEACCH (e.g., structured teaching, visual schedules), as well as studies evaluating the TEACCH approach as a whole. Virues-Ortega, Julio, and Pastor-Barriuso (2013) conducted a meta-analysis of intervention studies using the TEACCH program. The meta-analysis included 13 studies with 172 individuals with ASD. The results showed that TEACCH effects on adaptive behavior, communication, activities of daily living, and motor skills were of small magnitude. In comparison, there were moderate-to-large gains in social and maladaptive behaviors. Additionally, the effects of the intervention across all outcome measures were moderate, and adults with ASD received the greatest benefits from participating in the TEACCH program. Overall, the results of the meta-analysis suggest that TEACCH may lead to modest positive outcomes in some domains (e.g., social behavior); however, as noted by the authors additional studies are needed to help identify any factors that

might be driving the magnitude of intervention effects with TEACCH (e.g., intensity of the intervention).

3.2 Summary

Clinicians and caregivers need to take special care when identifying treatments to use with individuals with ASD. Using nonevidence-based treatments has the potential to slow progress and cause harm to an individual with ASD. In this chapter, we reviewed evidence-based comprehensive treatment models for individuals with an ASD. These models vary in relation to the specific needs addressed within the treatment, the theoretical approach, and the role of clinicians and caregivers within the treatment. However, these effective evidence-based treatments for ASD share common core components, including starting the intervention with the child as soon as he or she receives a diagnosis of an ASD, providing intensive intervention (e.g., 25 h a week, 12 months a year), individualization of treatment goals based on the needs of the child and family, use of comprehensive assessment-based curricula, ongoing measurement and assessment of a child's progress, and inclusion of caregivers in the intervention. Overall, ongoing research is needed to evaluate the effectiveness of proposed treatments for ASD.

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