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The Autism Spectrum

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Autism was first delineated as a syndrome of childhood onset by Leo Kanner in the United States in the 1940s (Kanner, 1943). Long before that—at the turn of the 18th century—classic autism cases had been described by John Haslam in the United Kingdom and Jean Itard in France. The word autism (from the Greek autos for self) was introduced by Eugen Bleuler to depict the self-cantered thinking believed to be typical of schizophrenia. Believed by Kanner to be a discrete disease entity, early infantile autism was conceptualized as an extremely rare disorder, and one that would be easy to identify and diagnose. It was only in the early 1980s that the concept of an autism spectrum was introduced by Wing (Waterhouse, Wing, & Fein, 1989; Wing, 1981, 1988) and Gillberg (Gillberg & Steffenburg, 1987). Wing put forward the notion of a fairly specific triad of impairments of social, communicative, and imaginative functioning as being at the basis of all autism spectrum disorders. She also coined the term Asperger's syndrome for the kind of "high-functioning" autism spectrum disorder originally described by Hans Asperger (1944) (who used the term *autistic psychopathy*) at about the same time that Kanner described his more "low-functioning" variant of autism.

CLASSIFICATION

Terminology in the field of autism spectrum disorders is problematic. Diagnostic manuals do not use the term autism spectrum, but instead refer to pervasive developmental disorders (PDD). PDD is a misnomer in that not all autism spectrum disorders are pervasive. Furthermore, profound learning disability (a.k.a. mental retardation in the United States), the most

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pervasive of all developmental disorders, is not considered a PDD. In clinical practice, autism spectrum disorders remain the preferred term. However, some authorities in the field speak of autism *and* autism spectrum disorders, whereas others include the core syndrome of autism (childhood autism or autistic disorder) as a subgroup *within* the autism spectrum disorders. The latter definition is used here. Under this model, autism spectrum disorders and PDD can be seen as synonymous concepts. Both the ICD-10 (World Health Organization [WHO], 1992) and DSM-IV (American Psychiatric Association [APA], 1994) list five different subtypes of PDD: the core syndrome of *autism, Asperger syndrome, childhood disintegrative disorder, atypical autism or PDD Not Otherwise Specified (PDD-NOS),* and *Rett syndrome*. The inclusion of Rett syndrome as one specific variant of autism spectrum disorder makes little sense as Rett syndrome is one of the many medical disorders that are often associated with autistic symptomatology. It belongs instead on the medical disorder axis of the multiaxial classification system.

ICD-10 and DSM-IV Criteria

The ICD-10 category for the core syndrome of autism is *childhood autism*. The DSM-IV *autistic disorder* is virtually identically defined. The definition is based upon the simultaneous presence of all three of the *triad of severe impairment of reciprocal social interaction, severe impairment of reciprocal communication (including but not exclusive to problems with language use), and severe restriction of imagination and behavioral repertoire.* The problems need to be at a level that is out of keeping with the child's overall chronological and developmental age. Problems must have been present before age 3 years. In ICD-10 there is also an exclusion criterion that leads to diagnostic confusion if strictly adhered to and prevents clinicians from making appropriate diagnoses and interventions for comorbid problems (such as Attention Deficit and Hyperactivity Disorder [ADHD]). This criterion is less stringent in the DSM-IV. The exclusion criterion should be disregarded in clinical practice.

The ICD-10 and DSM-IV category of *Asperger syndrome* or *Asperger's disorder* is a theoretical construct not consistent with clinical realities. For instance, Asperger's own cases do not meet criteria for this category. The criteria for social and behavioral impairments are the same as for childhood autism. Nothing is said about the communication impairment (so striking in the typical case of Asperger syndrome). The major problem with this set of criteria resides in the requirement for normal development in the first 3 years of life, something almost unheard of in autism spectrum disorders. In clinical practice, the criteria by Gillberg and Gillberg (1989) are the ones most commonly used. Many individuals meet criteria both for autism and Asperger syndrome. It is often best in such cases to make the diagnosis of autism but equally to provide the information that it is the variant referred to as Asperger syndrome.

Childhood disintegrative disorder is an autism spectrum disorder with the typical clinical presentation emerging only after a period of a few or several years of normal or near-normal development.

Atypical autism is an autism spectrum disorder that cannot be classified as childhood autism, Asperger syndrome, or Childhood disintegrative disorder. The corresponding terminology of the DSM-IV is *PDD-NOS*.

Comments

"High-functioning autism" is a term often applied to cases meeting ICD-10 or DSM-IV criteria for autism and who test at near-normal, normal, or superior levels of IQ. Most clinicians would argue that such cases fit Asperger's description, particularly if the level of spoken language is superior. The term "high functioning" is inappropriate because it suggests that the affected individual is "well functioning," which is almost never the case in an individual with a clinically diagnosed autism spectrum disorder. The individual with this "diagnosis" is usually *relatively* high functioning as regards overall IQ, but in respect of the autism symptomatology, functional disability is often major.

In clinical practice it would seem reasonable to diagnose children and adolescents as having an *autism spectrum disorder* if and only if there are severe problems in at least two of the three triad domains or if there are mild to moderate problems in two domains and severe problems in a third domain. Subgrouping according to ICD-10 or DSM-IV could then be achieved for autism, childhood disintegrative disorder, and atypical autism or PDD NOS. If the clinical gestalt of Asperger syndrome is invoked, then thorough review of the Gillberg criteria might be helpful before concluding that this category is applicable. The word autism (such as in autism spectrum disorder) should always be mentioned in the diagnostic formulation. Many countries require this diagnostic specification for the provision of adequate services.

EPIDEMIOLOGY

Autistic disorder and the other conditions referred to the autism spectrum disorder or PDD category are much more common than was suspected until the 1990s. The prevalence for all autism spectrum disorders is in the range of 0.5–1.0% of the general school age population (Wing & Potter, 2002). Core autism cases account for about one-third of this proportion and Asperger syndrome or atypical autism for the vast majority of the remainder. Childhood disintegrative disorder is extremely rare. Most of the available evidence suggests that the relatively high rates now reported for autism spectrum disorders are due to increased awareness, new autism concepts and diagnostic criteria, and "diagnostic overshadowing" (i.e., if there is already a diagnosis of, e.g., epilepsy, learning disability, or

tuberous sclerosis, an additional diagnosis of autism is less likely to be made) rather than to any real increase in the population.

Sex Ratios

Clinical studies show a very high boy:girl ratio for autism. This drops to considerably lower levels (around 1.5–3:1) in the general population. Girls with autism spectrum disorders are probably underdiagnosed and may receive other diagnoses such as depression, personality disorder, or eating disorder. Girls may also be less likely than boys to be referred for help at an early age. Girls in the general population show less of hyperactive and violent behaviors (commonly encountered in autism spectrum disorders and often part of the reason for referral) and talk more and at an earlier age. Therefore, it would require a more severe variant of an autism spectrum disorder to produce the "full-blown" clinical picture manifested by boys at an early age. Girls who receive an early diagnosis of autism are often among those most severely affected, with major signs of brain dysfunction including epilepsy. More moderate and mild variants are the ones most likely to be missed or misdiagnosed.

CLINICAL PICTURE

The triad of impairments typical of all autism spectrum disorders affect social, communicative (including language), and behavioral or imaginative functioning (Gillberg & Gillberg, 1989; Wing, 1996). There are usually additional symptoms, including a range of perceptual abnormalities, but these are not currently considered necessary features for the diagnosis.

The Severe Impairment of Reciprocal Social Interaction

The severe impairment of reciprocal social interaction may be observed in the staring, fixed or "wide-open" gaze—often directed at the lower portion of the face rather than the eyes—which is not used to regulate social interaction, the reduced ability to take the cognitive and emotional perspective of another person, disregard for needs of age-peers and adults alike, a complete lack of turn-taking in social interactions or games, and failure to understand the need for social overtures. Many are perceived as lacking in empathy, even though this does not necessarily imply "coldness." Many have strong affects, but with their problems understanding the perspective of the other person, they misinterpret social signals, as, in turn, others misunderstand their affects. Some are "sweet," "naive," and "easy to love" so long as demands are kept to a minimum or within an accepted routine. Social "style" may vary from complete "aloofness" and autistic aloneness, through a "friendly and passive" interactive style to an impulsive, intruding "active but odd" pattern of interaction. The group showing the active but odd style (and sometimes those who are aloof) may be severely hyperactive from a very early age. They may receive a diagnosis of ADHD or hyperkinetic

disorder, and it is only when this has come under control with treatment or at a later age that the underlying severe social interaction impairment of autism comes to attention.

The child with an autism spectrum disorder usually has no "real" friend, even though some may be passive members of a group where very little interaction is demanded. The lack of concern about the absence of friends is sometimes the most striking feature, even though, in other cases or at a later age, the person with an autism spectrum disorder may have come to realize that it is "normal" for young people to have friends and therefore may worry about "not being normal" because there are no friends. Some may insist that their parents call up a "friend and bring him over" and will go on and on about the time the friend will arrive, only to ignore the "friend" completely once he or she has arrived in the house.

The Severe Impairment in Reciprocal Communication

The severe impairment in reciprocal communication can present as complete muteness or the reduction of spoken language down to a few words or sentences, but it may equally show as extremely repetitive complex language. About one-third of those with the core syndrome of autism never speak in communicative phrases. Some acquire single word skills at the expected time but then do not progress beyond this stage for many months or years. This is often perceived as a "set-back" even in cases where there have been some documented abnormalities in the social domain at an earlier age. Even those with the clinical presentation of Asperger syndrome (who often progress to a stage of elaborate, even "perfect" language) often go through such a stage of a language development plateau and may be perceived as very late speakers (particularly perhaps as compared with brothers or sisters), only to "explode" in their acquisition of spoken language skills around age 3–5 years, when, within a period of only some months they go from "almost mute" to "adult type" expressive language. The vast majority—even those with the clinical presentation of Asperger syndrome—have great difficulty understanding the meaning of what other people tell them or ask them in conversation, even when they themselves are able to speak in grammatically perfect sentences. Again, their reduced capacity for taking the other person's cognitive and emotional perspective is severely limiting for their ability to grasp the meaning of communication.

The Severe Restriction in the Behavioral Repertoire

The severe restriction in the behavioral repertoire is seen by many to reflect the *lack of flexible imaginative skills*. In children with marked degrees of learning disability, repetitive motor behaviors (e.g., stereotypies such as hand flapping, finger flickering, body rocking, and head banging) are the rule. Such behaviors may occur in those with higher IQ as well, but usually to a less conspicuous degree. Fixation on routines, rituals, pedantry, and a variety of symptoms that might equally be described as obsessive-compulsive are almost universal, but may be obscured or lacking

in those with severe comorbid inattention and hyperactivity. Some throw extreme tantrums when routines are broken or demands of any kind are made. In older individuals, these are often referred to as "violent outbursts" (or even "aggressiveness," a term that should usually not be employed, because it is very difficult to determine whether the violence is intentional or not). Play is usually rigid, stilted, or lacking altogether. Hard objects are often much preferred over soft and cuddly things. Because, at least when very young, they do not seem to appreciate the existence of other people's minds, they do not go to them for comfort or for sharing positive or negative experiences.

Many have elaborate routines involving feeding behaviors (e.g., will only eat one particular type of food and only if seated on a particular stool with one elbow resting on the table) and bathroom activities (e.g., can only brush teeth in front of mirror at home, cannot manage in front of other mirrors in other bathrooms). Those with IQs in the normal or superior range very often develop narrow interests (e.g., in meteorology, dinosaurs, opera singers, Chinese pottery, Rommel's desert wars, the Paris Metro system, train time tables, telephone directories, or computers) that come to occupy so much of their time that there is little left over for any other kind of meaningful activity. They tend to talk endlessly about these special interests and appear to be unaware that others may not share them. Many are extremely interested in details and are very astute in memorizing matters concerned with the observable world. They may remember in the most astounding detail what people were wearing 10 years ago or the particulars of a building not visited for more than a few minutes many years previously. Those with the highest levels of IQ are often expert at picking up other people's "weak spots." They may also have "emotional radar" and observe minute change in social atmosphere even while not being able to make the slightest sense of what is going on. Such skills may lead the clinician to exclude erroneously even considering a diagnosis in the autism spectrum.

Not part of the triad but extremely common in autism are perceptual distortions or abnormalities of various kinds. One or more of oversensitivity to touch, certain sounds, smells, tastes, or visual stimuli is an almost universal phenomenon. Abnormal reactions to auditory stimuli (e.g., strong reactions to barely audible sounds and little or no reaction to loud noise) are often among the presenting symptoms of autism in the first year of life. Decreased pain sensitivity is another common symptom, which may or may not be accompanied by a variety of self-injurious behaviors. These behaviors can be the most debilitating problem in the set of symptoms shown by a child with autism. As already mentioned, hyperactivity, often amounting to full symptomatic diagnostic criteria for ADHD or Hyperkinetic Disorder, is a very common handicapping symptom, especially in the preschool child. In other cases hypoactivity can be the major problem with lack of initiative, lack of interest in new things (which may be shown, for example, in relation to gifts that may trigger extreme temper tantrums), and "resistance to change and learning." Sleep problems are also very common, and constitute a handicapping problem in about one in three of all preschool children with one or other of the autism spectrum disorders.

Subjectively, children with autism spectrum disorders may be extremely psychologically frustrated by overstimulating environments, perceptual overreactions, verbal interactions, common demands for social interaction, and, in some cases, demands of any kind. In a structured, calm environment with predictable routines, they are usually "happy," although they tend not to share this experience with others in a spontaneous fashion. Some of those with very high IQ seem to have little memory of around—perhaps—age 7, 8, or 9 years. Others appear to have the opposite problem of not being able to forget anything they ever experienced.

The early course and clinical presentation of autism spectrum disorders differ quite considerably from one case to another. About two in three of all cases have shown some social, communicative, or typical behavioral change before their first birthday. Others appear to develop normally up until 12–24 months of age and then suffer real or seeming regression, sometimes, but not always in temporal association with onset of seizures. Until recently, it was considered very rare for autism not to present with the full-blown clinical picture before age 5 years, but new studies of adults and follow-up studies of children with atypical autistic features and language disorders in early childhood indicate that not infrequently autism emerges more clearly only after the first years. Children with very early onset extreme hyperactivity and motor control problems constitute other risk groups in whom the clinician must be prepared to assess features of autism at later follow-up.

DIFFERENTIAL DIAGNOSIS AND COMORBIDITY

Many problems of differential diagnosis in the field of autism include those pertaining to differentiating between the various forms of conditions within the spectrum. The most common comorbid or overlapping *syndromes* are ADHD, Developmental Coordination Disorder (DCD), tic disorders, depression, bipolar disorder, anxiety disorders, and eating disorders (Gillberg & Billstedt, 2000). Common associated *symptoms* are perceptual abnormality, violent outbursts, self-injury, and sleep problems, which have been briefly dealt with already. Medical disorders are very commonly associated with autism spectrum disorders and should be coded on a separate diagnostic axis.

Attention Deficit and Hyperactivity Disorder

Hyperactivity, inattention, and handicapping impulsiveness are almost universally occurring problems in all autism spectrum disorders. When, from the point of view of symptom threshold, they amount to combined ADHD (and especially when symptom criteria for Hyperkinetic Disorder are met), a separate diagnosis for this category should be considered. Many children with autism spectrum disorders, perhaps particularly those with IQs above 50, may benefit from the same type of intervention approaches that are advantageous for other children with ADHD. Children with the

combination of ADHD and DCD have a relatively high risk of also meeting criteria for an autism spectrum disorder. It is not always appropriate to give the autism spectrum disorder diagnosis priority over ADHD. The syndrome that, from the point of view of treatment need, is the most handicapping should be named as the primary diagnosis. Thus, one child might correctly receive the diagnosis of ADHD at age 3 years, of ADHD with atypical autism at age 4 years, and Autistic disorder with ADHD at age 9 years.

Developmental Coordination Disorder

In the past children with autism were believed to be exceptionally talented in the field of motor performance. This is now known to be a mistaken notion. To the contrary, the vast majorities have mild, moderate, or severe motor control problems, and many meet criteria for DCD. Mild DCD problems are part of the Asperger syndrome diagnosis, but when the motor control problems are moderately or severely debilitating, they may require specific intervention and a separate diagnosis of DCD should be made.

Tic Disorders

Tics are very common in children in the general population, but are definitely much overrepresented among those with autism spectrum disorders. They may be motor tics (in which case they can be very difficult to separate from motor stereotypies), vocal tics, simple or complex (in which case they can be indistinguishable from complex stereotypies or stereotyped utterances), transient or chronic. When motor and vocal tics occur together and are handicapping in their own right (as separate from autism), a diagnosis of Tourette syndrome might be warranted. Having said this, it also needs to be added that tics are only rarely severely handicapping.

Depression

Depression is common in teenagers with autism spectrum disorders. A change in behavior (such as hyperactivity turning to hypoactivity), loss of appetite, or severely disrupted sleep patterns may all indicate depression in autism. Interpersonal loss and bullying are common precipitants of depression in autism spectrum disorders. For instance, the death of a parent might not seem to affect the child with autism at all early on. However, as weeks pass and the child gradually realizes that the routine of having someone catering to his or her particular and peculiar needs has disappeared, depressive symptoms set in. As in the case of the child being victimized by bullies, he or she is unlikely to communicate anything about his feelings to other people, and the depressed mood may therefore go unnoticed or undiagnosed for longer periods.

Bipolar Disorder

It seems likely that bipolar disorder is overrepresented in families who have children with autism and clinical experience suggests that bipolar

disorder is a common comorbidity in both autism and Asperger syndrome. Mood swings, periods of extreme hyperactivity, "intermittent explosive behaviors," and abrupt sleep disturbance are all possible indicators of bipolar disorder, especially in the presence of a positive family history for such a disorder.

Anxiety Disorders

Children with autism spectrum disorders are often anxious, particularly in situations when they do not know what is expected of them. "Panic attacks" amounting to confused states are often seen in settings of perceptual overload such as in the middle of a busy street or in crowds of people making all sorts of verbal demands. The individual with autism might then cover his ears and start screaming, hitting himself, or running out in front of oncoming vehicles. DSM-IV Panic Disorder or Generalized Anxiety does occur occasionally and is most commonly diagnosed in those with higher IQ, but it is unclear whether the rate of such problems is increased over and above that of the general population. *Selective mutism*—often categorized as an anxiety disorder—is strongly associated with autistic features.

Eating Disorders

Food fads, food refusal, and overeating are all common, perhaps almost universal phenomena in autism spectrum disorders. *Anorexia nervosa* has been shown to be associated with autism spectrum disorders. Ten to twenty percent of a general population group of adolescent girls with anorexia nervosa meet full criteria for an autism spectrum disorder. Such cases are usually missed cases of early onset autism or Asperger syndrome who develop extreme routines and rituals around food in teenage (as part of a life-long proclivity for rituals and routines), and who do meet diagnostic criteria for anorexia nervosa, but will not benefit from interventions unless the underlying autistic problems are acknowledged.

Other Developmental, Psychiatric, and Personality Disorder Diagnoses

During the young adult years, many individuals with autism spectrum disorders apply for help within adult psychiatric services. It is then very common for them to receive diagnoses of "schizophreniform disorder" or of "personality disorder." The underlying autism diagnosis may be disregarded or may have been missed altogether.

Semantic Pragmatic Disorder

Semantic pragmatic disorder is a diagnostic term used mostly by speech-language therapists (Rapin & Allen, 1983). Many individuals in the autism spectrum suffer from semantic pragmatic disorder or, at least, pragmatic disorder. It is unclear what proportions of those with so-called

semantic pragmatic disorder meet some or all criteria for an autism spectrum disorder.

Nonverbal Learning Disability

Nonverbal learning disability is a neuropsychological concept used in cases with much poorer results on performance than on verbal portions of IQ-tests (e.g., who score 20 points or more lower on the performance than the verbal part of the WISC—Rourke, 1988). This test profile is quite common in Asperger syndrome. It is believed often to reflect right hemisphere dysfunction.

Medical Disorders

In classic autism in the general population, as many as one in four individuals may have a medical disorder which, in one way or another is strongly associated with the autistic symptomatology (Gillberg & Coleman, 1996). In specialized autism clinics, to which those with an already "overshadowing" medical disorder diagnosis (such as tuberous sclerosis or fragile X syndrome) are less likely to be referred, the rate may be lower, but it is certainly not negligible there either (Rutter, Bailey, Bolton, & Le Couteur, 1994). This means that all individuals with a diagnosis of an autism spectrum disorder will need a medical assessment by a clinician well trained in the field, who knows which disorders to look out.

Epilepsy is very common in childhood autism and in atypical autism cases with mental retardation, occurring in 25–40% of all cases depending on the duration of follow-up. Slightly under half of this proportion is contributed by cases with seizure onset in the first 5 years of life. The epilepsy in such cases is often severe and presents with a combination of several different types of seizures. The majority of the remainder has adolescent onset of seizures, which are usually of a more benign type. A small number of additional cases of epilepsy emerge in early adult life. Epilepsy is much rarer in Asperger syndrome, but it does occur at rates considerably higher than in the general population.

Moderate hearing deficits occur in about 10% of all individuals with childhood autism and complete deafness is present in a few percent (which is much higher than in the general population). Extreme acoustic hypersensitivity is very common and occurs in 30–50% of all cases. Visual deficits are also much overrepresented. Certain kinds of congenital blindness with brain damage (e.g., retinopathy of prematurity) are strongly associated with autism spectrum disorders.

Tuberous sclerosis, the fragile X syndrome, and the partial tetrasomy 15 syndrome are probably the most commonly encountered specific brain disorders in autism cases with an IQ of about 50 and below. Together they account for 10–15% of all such cases. Other relatively common medical conditions in autism spectrum disorders, across the board of intellectual functioning, are Moebius syndrome, 22q11 deletion syndrome, and sex chromosome aneuploidies.

DIAGNOSTIC INSTRUMENTS

Rating scales for autism can be subdivided into those that have been developed for screening typical cases, and those that are geared rather toward finding cases of "high-functioning" autism, Asperger syndrome, and atypical autism. The most widely used rating scales for people in the autism spectrum with IQ under 70 is the Autistic Behavior Checklist (ABC—Krug, Arick, & Almond, 1980) which provides a good measure of the level of symptoms and severity. There is also a brief Autism Screen based on the ADI-R (see Berument, Rutter, Lord, Pickles, & Bailey, 1999). A mixture of observation and interview is usually required for the completion of the Childhood Autism Rating Scale-Revised (CARS-R—Schopler, Reichler, & Renner, 1988). This scale, which takes about 45 min to complete, is the most widely empirically studied instrument in the autism field. It provides a summary score in the range of 15–60, with cutoff for a preliminary diagnosis of autism at 30 and for severe variants of autism at 36. For individuals in the autism spectrum with an IQ of about 60 and above, the best validated screening instrument in school age children is the Autism Spectrum Screening Questionnaire (ASSQ) for completion by parents or teachers in less than 10 min (Ehlers & Gillberg, 1993). Finally, there is the Asperger Syndrome Diagnostic Interview (ASDI—Gillberg, Rastam, & Wentz, 2001) that takes about 40 min to complete and provides a good indication whether or not diagnostic criteria for Asperger syndrome (or another "high-IQ autism spectrum disorder") are met.

Detailed clinical interview with a close carer (usually one of the parents) is the most important single measure of any in the diagnostic process. This is often best accomplished by using a structured or semistructured psychometrically tested diagnostic interview. One of the best clinical interviews of this kind is the Diagnosis of Social and Communication Disorders-10th Revision (DISCO-10—Wing, Leekam, Libby, Gould, & Larcombe, 2002) which covers not only autism spectrum disorders but many of the overlapping or comorbid conditions as well, as providing a detailed picture of the individual's early development. The Autism Diagnostic Interview- Revised (ADI-R—Lord, Rutter, & Le Couteur., 1994) is an excellent interview for tapping into classic autism cases, but has been developed specifically for research, not clinical, purposes, and does not cover all of the spectrum disorders or comorbidities. Use of the DISCO-10 and ADI-R require diploma training.

Observation of the child's behavior is the most important component of the diagnostic process. The Autism Diagnostic Observation Schedule (ADOS) and the Pre-Linguistic ADOS (PL-ADOS—DiLavore, Lord, & Rutter, 1995) are excellent research instruments for structured rating of social interaction and communication behaviors in the child, but again have been developed for research, rather than clinical purposes. Observation of the child in a naturalistic setting (such as in preschool or school, at home or in the playground) may sometimes be the best, and only way of definitely determining whether he or she actually meets criteria for autism or not.

Psychological tests are not required for the diagnosis of autism as such, but they are necessary components of the diagnostic evaluation. One of the Wechsler scales for estimation of IQ (or the Leiter scale in nonverbal children) should be tried in all cases. Occasionally in children with severe mental retardation, one has to settle for an estimate of overall functioning based on Vineland Adaptive Behavior Scale interview (Sparrow, Balla, & Cicchetti, 1984).

ASSESSMENT

The multifactorial nature of autism makes it mandatory to perform an expert medical evaluation by a doctor (e.g., child neuropsychiatrist, child neurologist, or developmental pediatrician) with state-of-the-art skills in syndromology, learning disability, autism, and the comorbidities so often associated with it.

Psychometric evaluation, including a measure of the child's overall intellectual level of functioning, must be done in all cases. The clinical medical-neurological examination (which must always include head circumference, height, weight, and evaluation of minor physical anomalies, skin abnormalities, and hearing and visual problems) is crucial for deciding on what further laboratory investigations need to be performed (e.g., karyotyping, DNA tests, MRI scanning, and EEG being the tests most commonly indicated). The clinical examination must also include a systematic psychiatric screen for ADHD, tics, motor control problems, sleep disorders, self-injurious behaviors, and the other common comorbidities listed in the foregoing. The results of the medical and psychiatric examination and the tests performed should be conveyed to all concerned both orally and in writing.

CAUSES AND RISK FACTORS

There are multiple causes of autism spectrum disorders (Gillberg & Coleman, 2000). Genetic factors are very important (Turner, Barnby, & Bailey, 2000). The sibling rate for the core syndrome given a child with core syndrome autism is about 5%, but the rate for an autism spectrum disorder in such cases is probably of the order of 15–25%. Twin studies have shown concordance rates of 60–89% in monozygotic twins and under 5% in dizygotic twins (similar to nontwin siblings), suggesting a heritability of close to 100% in cases that are not associated with specific medical disorders. It is not clear exactly what it is that is inherited, but it now seems likely that aberrant or variant genes (such as neuroligin and glutamate genes) may act in concert that more than 30 different genes are likely to be involved, and that the individual genes may increase liability for a particular autism *feature* rather than for the full syndrome of autism.

The frontotemporal portions of the brain are often dysfunctional in autism (bilaterally or, typically in more "high-functioning" cases, in the

right hemisphere). The brainstem and cerebellum have also been shown to be abnormal in relatively large subgroups of individuals with autism. Dysfunction of the fusiform gyrus might be specifically related to the unusual processing of faces and facial features so often encountered in autism. Autopsy studies have revealed abnormalities in the amygdala and cerebellum, in particular. Megalencephalus is much overrepresented in autism spectrum disorders, apparently more so among those with IQs above 70. Hyperserotonemia in the blood, dopamine and endorphin dysfunction, and excess of glial fibrillary acidic protein in the cerebrospinal fluid have all been shown to be associated with autism in group studies, but it is not clear what relevance, if any, these "markers" may have for the understanding of autism etiology (Gillberg & Coleman, 2000).

It has been demonstrated convincingly in many case studies that certain acquired brain lesions, such as in connection with herpes encephalitis, can cause autism without there being any known genetic susceptibility. However, many of the associated medical disorders that are currently believed to be etiologically related to autism (such as tuberous sclerosis) are themselves genetic. In addition, some studies suggest that even when there is an associated medical disorder that is believed to be important in the pathogenetic chain of events, interaction with autism susceptibility genes may occur. It has been suggested that in certain cases there might have been genetic predisposition for a "mild autistic-like condition" but that additional (prenatal or possibly perinatal) brain damage has led to the full-blown syndrome of autism. It is unlikely that psychosocial factors themselves cause autism, but conditions with some similar symptoms have been reported in children exposed to severe emotional and psychosocial deprivation in the first years of life. If such factors play a role in some autism cases, they would do so by impinging (perhaps irreversibly) on brain systems that are crucial for social and communicative functioning. It is likely that autism spectrum disorders will be shown to be the "final common behavioral presentation" of a multitude of different etiologies, and that only after more sophisticated subgrouping than can currently be achieved, will it be possible to find *the* cause in an individual case.

COGNITIVE NEUROPSYCHOLOGY

Neuropsychologically, children in the autism spectrum usually have *executive function deficits* showing clinically as poor planning ability, low motivational level, and difficulty with time concepts. Sustaining attention may be very difficult, and there appear to be general problems with shifting of attention from one object of focus to another. *Mentalizing ("theory of mind") deficits* occur almost universally, particularly in preschool children. These deficits are connected to lack of empathy and inability to take the cognitive and emotional (though not necessarily perceptual) perspective of other people. There is also usually a *decreased drive for central coherence*, meaning that individuals with autism may have no difficulty remembering details or amassing concrete factual knowledge about the observable world

(at which they actually be better than individuals without autism at similar IQ levels), but may have major problems fitting the details into a coherent "whole" or to make sense of all the facts (Frith & Happe, 1994). On cognitive tests (Ehlers et al., 1997; Gillberg, 1999), those with a diagnosis of childhood autism (and of atypical autism) usually fall below an IQ of about 80, whereas the majority of those with Asperger syndrome test at or above IQ 70. The former group frequently does better on performance than verbal parts of tests, whereas the opposite pattern is more likely to be encountered in those with Asperger syndrome. On the Wechsler scale, core autism cases often have relatively better results on the subtest of Block Design, while showing a trough on the Comprehension subtest. Those with a diagnosis of Asperger syndrome often show a similar pattern when young (although, unlike those with classic autism, the better result on Block Design may well be coupled with a poor result on Object Assembly), but as they grow older, they tend to do progressively better on the Comprehension subtest. Slow processing appears to be typical of Asperger syndrome. Many individuals with this diagnosis would pass on most tasks if they were not timed.

INTERVENTIONS

The evidence base for interventions in autism spectrum disorders is limited (Howlin, 1998). No one treatment will lead to a cure and it is unlikely that a single mode of intervention will ever dominate the arena, given the multifactorial contribution to autism pathogenesis. A child with a diagnosis within the autism spectrum and his or her family will need the continued support of an expert team consisting of a medical doctor, psychologist, and a special education expert (at the very least) for many years, usually throughout childhood and into adult life. It is usually to be preferred that this service is offered within a slightly broader child neuropsychiatric or developmental pediatric clinic rather than in a highly specialized autism center, in which the experts may not have enough skills in the neighboring fields of comorbidity.

Education

Those with childhood autism and an IQ of 70 or under almost always need to attend specialist autism classrooms, whereas those with Asperger syndrome may well benefit from attending a mainstream classroom. Nevertheless, in this intellectually better functioning group it is important to be able to offer a choice, and some, for instance, many of those who are victims of bullying, will do much better and have a better quality of life in a classroom for intellectually normal, able, or gifted children with autism spectrum disorders. Others may do better in mixed special education classrooms. The most important considerations pertain to the knowledge of autism on the part of the teachers. All children in the autism spectrum will need a considerably greater amount of structure, concreteness, and systematic, well-planned skills training (both as regards school day structure

and overview and in all individual subjects) than is usually considered to be required (or even helpful) for other children.

Specific education programs, such as that developed under the acronym of TEACCH (*T*reatment and *E*ducation of *A*utistic and *C*ommunication handicapped *C*hildren—Schopler, 1990), are available and provide a very good basis for training teachers and parents to become proponents for and providers of an "autism-friendly" environment (rich in structure, concreteness, and, usually, though not always, including much more visual material than ordinarily provided in education). Continuity as regards time, place, and people is the most important aspect of autism education, and one, which is strongly emphasized in the TEACCH philosophy.

Psychological Interventions

Psychoeducation is perhaps the most important part of any intervention scheme for autism spectrum disorder. Parents, siblings, and, depending on the intellectual capacity, the affected individual, all need detailed up-to-date information about autism, its causes, prognosis, and possible intervention strategies. They need to be well informed about relevant support groups, books, pamphlets, conferences, Internet addresses, and other ways to access information. *Applied behavior analysis* (ABA) has been shown to reduce effectively some problem behaviors in autism and to improve social and communication skills (Department of Health, 1999; National Research Council, 2001; Smith, Groen, & Wynn, 2000). Some parents want to have their children in a stringent ABA-protocol for 40 hr a week or more, and seem to find this very helpful. Others would not be happy with such a demanding and time-consuming intervention, and would rather have their child involved for 10–15 hr a week, or in a behaviorally orientated education program of the TEACCH variant.*Individual talks* with teenagers with autism spectrum disorders of the Asperger variant can be beneficial so long as the psychologist or doctor is well acquainted with the basic problems typical of autism. Psychoanalytically orientated psychotherapies have little place in the overall intervention program for people in the autism spectrum.

Neuropsychopharmacology

No currently known drugs are likely to affect the ultimate outcome of autism spectrum disorders. However, many pharmacological interventions are available for symptoms associated with autism spectrum disorders (van Buitelaar & Willemsen-Swinkels, 2000).

Severe ADHD will sometimes respond favorably to typical stimulant treatment in autism spectrum disorder cases with IQs above 50. In those with severe and profound learning disability, a positive response is not excluded, but the odds are not very favorable. Severe hyperactivity when combined with violent behaviors and self-injury is more likely to respond to an atypical neuroleptic, such as risperidone (often in doses of 0.5–3.0

mg/day in one dose for children under 12 years, increasing to about 1.0–4.5 mg/day for older individuals).

In depression and social withdrawal, particularly in autism spectrum disorder with normal IQ, and especially when there is also a high degree of obsessionality or ritualism, a trial of a serotonin reuptake inhibitor such as fluoxetine (10–40 mg/day in one dose for those under 12 years, 20–80 mg/day for those of about 13 and above) may be valuable. Associated bipolar disorder, not exceedingly rare in autism, is often best treated with risperidone in doses as suggested, followed by the addition of a mood stabilizer such as valproic acid, or, in some cases, lithium. Tics only rarely require separate pharmacologic intervention in autism, but if they are extreme, risperidone, again, is quite likely to be effective. Sleep disorders are difficult to treat. Melatonin (3 mg half an hr before projected sleep onset) can be very effective in inducing sleep, but if used on a regular basis, tends to lose its effect. After a "drug holiday" of a few months, parents report that the drug can be used again with good effect for a similar amount of time.

Those with epilepsy should be treated for their seizure disorder in close collaboration with a child neurologist. Lamotrigine and valproic acid sometimes appear to have beneficial effects not only on the seizure disorder, but also on mood swings and violent behavior. Carbamazepine is probably the antiepileptic drug most widely used in the treatment of epilepsy in autism (Gillberg, 1991). It is often effective, but there is a tendency for perseverative symptoms to become more pronounced in some individuals.

Information to Parents and Patients

As has already been outlined information to all those concerned is extremely important. Very often the easiest way of accessing good information about autism is through a support group such as the National Autism Society (NSA) in the United Kingdom or the Autism Society of America (ASA), or Families for Early Autism Treatment (FEAT) in the United States. Having said that, it is also important to be aware that some information about autism is unscientific and, occasionally, outright unhelpful, spreading myths about the causes and cures. Rather than trying to persuade parents to avoid such information, one should inform them of their existence, so that, when they come across it, they may be better prepared to form their own opinion, distance themselves from it, or come back asking about it.

OUTCOME

Diagnoses of conditions within the autism spectrum are stable over the shorter term. In the very long-term perspective they are also stable, even though conditions diagnosed as atypical or as falling just outside the spectrum are more likely to be considered typical at later evaluation. Of those with classic autism, it is likely that, in adult life, the majority will continue to be dependent on other adults for work, activities, and dwelling (Billstedt,

Gillberg, & Gillberg, submitted). Even the most recent follow-up studies, in which, at least partly adequate interventions have been provided from early childhood, suggest that only a few percent of all affected individuals will be completely independent at age 20–40 years. However, these studies also suggest that with good early programs, the number needing medication or long-term stay in psychiatric hospitals may be greatly reduced. Quality of life in an autism-friendly environment can be good even when independence has not been achieved. Mortality is increased in the classic group. Mortality can usually be attributed to epilepsy, a severe associated medical disorder, or accidents (including drowning). Nevertheless, the vast majority of all with autism will live to old age.

Outcome in Asperger syndrome is much less well understood (Szatmari et al., 2000). However, it varies enormously, with some people doing very well indeed in adult life, who have made excellent careers for themselves, living with a partner, and even having children. Unfortunately, some of these children themselves have autism spectrum disorders. A large subgroup of those with Asperger syndrome has major psychiatric and academic problems in adult life.

Many people (as many as one in three) with autism spectrum disorders show severe symptom aggravation around the time of adolescence. About half of this proportion actually deteriorates, and may never again attain the level of functioning they had reached before puberty.

Prognostic Factors

It has long been recognized that IQ above 70 and some communicative speech at early school age are the strongest predictors of a relatively better outcome in autism (Howlin, 1997). An associated severe medical disorder and the presence of epilepsy, particularly if of early childhood onset, tend to predict a worse outcome. It is likely that an early diagnosis will help increase the odds for a positive outcome.

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