

SECTION I

DIAGNOSIS AND CLASSIFICATION

The paired processes of diagnosis and classification are fundamental to research and intervention. The diagnostic *process* includes all of the activities in which a clinician engages in trying to understand the nature of an individual's difficulty. The result of this process is often a narrative account—a portrait of the individual's past, the current problems, and the ways in which these problems can be related to each other and to possible, underlying causes. A useful diagnostic process also suggests methods for being helpful, including specific treatments. In the course of the diagnostic process, a clinician will learn about the patient's history, talk to others about the patient, observe the patient, engage in specialized examinations, and use laboratory and other methods for helping define patients' problems and their causes. The clinician will integrate the findings from these activities, based on specialized, scientific knowledge. Often, a patient will have several types of problems; the diagnostic process may lead to a narrative that links these to an underlying, common cause or may separate the problems on the basis of their differing causes or treatments. Often, more than one clinician may be involved in the diagnostic process; then, the final clinical, diagnostic formulation will integrate the pooled information into a coherent and consensual narrative that reflects the varied information.

One component of the diagnostic process is the assignment of the patient's difficulties—his or her signs, symptoms, pains, troubles, worries, dysfunctions, abnormal tests—to a specific class or category of illness or disorder. Through classification, the patient's individualized,

unique signs and symptoms are provided a context. They are given a more general meaning. For example, the clinician will assign the patient's coughing and fever to the category *pneumonia*. This categorical diagnosis is placed within the narrative of the patient's life and current problems. It may be related to the patient's family or genetic background, experiences, exposures, vulnerabilities, and the like, and it will be used to explain why the patient has come for help and what type of treatment may be useful.

The diagnostic process is based on current knowledge, technologies, and skills; it can sometimes be quite brief (as in the diagnostic processes for an earache) or remarkably extensive (as in the diagnostic process for autism). Diagnostic classifications, also, are based on available knowledge and laboratory methods; they also embody conventions, the consensus among clinicians and experts about a *useful* way for sorting illnesses and troubles.

New knowledge and methodologies change the diagnostic process as well as the classification system. The advent of methods such as molecular genetic testing, magnetic resonance imaging of the brain, and structured, formal assessment of cognitive processes have changed the diagnostic process and classification and will continue to do so in the future.

The skillful diagnostic process, and the resultant account about the patient and his illness, often is broad-based, nuanced, and individualized. The clinical formulation, the full statement of findings, may capture the many dimensions of a person's life, including his or her competencies as well as specific

impairments and difficulties. However, a diagnostic categorization—a label or classification of specific troubles and their designation as a *syndrome*, *disorder* or *disease*—is delimited. Providing the label of a specific disease delimits its individuality for the sake of being able to utilize general knowledge gained from scientific study and experience with others with similar problems. In this important respect, it is useful to think that *individuals are engaged in the process of diagnosis and symptoms and signs are classified* and labeled. A diagnostic label is not able or meant to capture the fullness of an individual. Diagnostic classification systems and specific assignment to a disease or disorder category are tools, which when combined with other tools should lead to helpful understanding and treatment.

The newer methods of classification of developmental, psychiatric, behavioral, or mental disorders respect the distinction between diagnosing an individual and classifying his or her problems. They are also multidimensional and elicit information about other domains of the patient's life, in addition to areas of leading impairment. This approach shapes and has been shaped by the two international systems of classification in which autism and pervasive developmental disorders are included: the *Diagnostic and Statistical Manual of Mental Disorders* of the American Psychiatric Association and the *International Statistical Classification of Diseases and Related Health Problems* of the World Health Organization (WHO). The introductions to the recent editions of these two systems (*DSM-IV*, American Psychiatric Association, 1994; and *ICD-10*, WHO, 1992) provide helpful overviews of the goals of classification and the roles of diagnostic categories in clinical understanding.

A new diagnostic term was introduced in the *DSM-III* in 1980: the concept of pervasive developmental disorder (PDD). The umbrella term PDD gained broad popularity among professionals from various disciplines as well as with parents and advocates. Without a previous history in psychiatry, psychology, or neurology, the novel term PDD had the advantage of not carrying excessive theoretical baggage or controversy. It also had a broad inter-disciplinary appeal and a nice emphasis on *development* and *disorders of development*. No specific diagnostic

criteria were provided for PDD, but the clinical description conveyed a sense of the contour of its clinical territory. To be a citizen of this territory, a child had to exhibit difficulties from the first several years of life involving several domains (social, language, emotional, cognitive) and with significant impairment of functioning. In 1980, and again when *DSM-III* was revised in 1987 (*DSM-III-R*), the only example of a specifically defined example of PDD was autism. Indeed, autism remains the paradigm or model form of PDD. From 1980 to 1994, other children whose difficulties were captured by the sense of PDD, but who were not diagnosed as having autism, were described as having “pervasive developmental disorder that is not otherwise specified” (PDD-NOS). Although not an official diagnostic term, the phrase autism spectrum disorder (ASD) is now in widespread use and is synonymous with the term PDD.

The 1994 edition of the *Manual of Mental Disorders (DSM-IV)*, based on new evidence and international field testing, refined the diagnostic criteria for autism and formalized three new classes or types of pervasive developmental disorders: childhood disintegrative disorder, Asperger's disorder, and Rett's disorder. Also, a consensus was reached between the two major systems, *DSM* and *ICD*, for the system of classification and specific diagnostic criteria. Thus, for the first time, there is happily an internationally accepted, field-tested, diagnostic system for the most severe disorders of development. The *DSM-IV* and *ICD-10* systems form the epistemological backbone of this *Handbook*.

The chapters in this section of the *Handbook* describe current frameworks for classification, the four forms of pervasive developmental disorders for which specific criteria are provided in *DSM-IV*, and the kinds of disturbances that remain within the territory of pervasive developmental disorders that are not further classified. This section also provides a review of studies of natural history and outcome.

It is our expectation that advances in understanding the pathogenesis of pervasive developmental disorders will continue to have a major impact on the diagnostic and classification processes. Thus, in any discussion about diagnosis and nosology, it is important to recognize

their provisional nature. Advances in knowledge may lead to changes in diagnostic approaches. It is also critical to remember the importance of balancing categorical approaches to diagnosis with a fuller understanding of the many dimensions of individual children and adults, that is, as whole people.

REFERENCES

- American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington, DC: Author.
- American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed., rev.). Washington, DC: Author.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- World Health Organization. (1992). *International classification of diseases* (10th ed.). Geneva, Switzerland: Author.

CHAPTER 1

Issues in the Classification of Autism and Related Conditions

FRED R. VOLKMAR AND AMI KLIN

Clinicians and researchers have achieved consensus on the validity of autism as a diagnostic category and the many features central to its definition (Rutter, 1996). This has made possible the convergence of the two major diagnostic systems: the fourth edition of the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, 1994)* and the 10th edition of the International Classification of Diseases (*ICD-10; World Health Organization [WHO], 1992*). Although some differences remain, these major diagnostic systems have become much more alike than different; this has facilitated the development of diagnostic assessments "keyed" to broadly accepted, internationally recognized guidelines (Rutter, Le Couteur, & Lord, 2003; see Chapter 28, this *Handbook*, Volume 2). It is somewhat surprising that, as greater consensus has been achieved on the definition of strictly defined autism, an interesting and helpful discussion on issues of "broader phenotype" or potential variants of autism has begun (Bailey, Palferman, Heavey, & Le Couteur, 1998; Dawson et al., 2002; Pickles, Starr, Kazak, Bolton, Papanikolaou,

et al., 2000; Piven, Palmer, Jacobi, Childress, & Arndt, 1997; Volkmar, Lord, Bailey, Schultz, & Klin, 2004).

Today, autism is probably the complex psychiatric or developmental disorder with the best empirically based, cross-national diagnostic criteria. Data from a number of research groups from around the world have confirmed the usefulness of current diagnostic approaches, and, even more importantly, the availability of a shared clinical concept and language for differential diagnosis is a great asset for clear communication among clinicians, researchers, and advocates alike (Buitelaar, Van der Gaag, Klin, & Volkmar, 1999; Magnusson & Saemundsen, 2001; Sponheim, 1996; Sponheim & Skjeldal, 1998). In the future, the discovery of biological correlates, causes, and pathogenic pathways will, no doubt, change the ways in which autism is diagnosed and may well lead to new nosological approaches that, in turn, will facilitate further scientific progress (Rutter, 2000). Simultaneously, considerable progress has been made on understanding the broader range of difficulties included within the autism

The authors acknowledge the support of the National Institute of Child Health and Human Development (CPEA program project grant 1PO1HD3548201, grant 5-P01-HD03008, and grant R01-HD042127-02), the National Institute of Mental Health (STAART grant U54-MH066494), the Yale Children's Clinical Research Center, and of the National Alliance of Autism Research, Cure Autism Now, and the Doris Duke Foundation as well as the Simons Foundation. We also gratefully acknowledge the helpful comments of Professor Michael Rutter on an earlier version of this manuscript.

spectrum; that is, as our knowledge of autism has advanced, so has our understanding of a broader range of conditions with some similarities to it. Table 1.1 lists categories of pervasive developmental disorders (PDDs) as classified by *ICD-10* and *DSM-IV*.

In addition to the international and cross-disciplinary agreement about diagnostic criteria for autism, a consensus has emerged about other issues that were once debated. Today, there is broad agreement that autism is a developmental disorder, that autism and associated disorders represent the behavioral manifestations of underlying dysfunctions in the functioning of the central nervous system, and that sustained educational and behavioral interventions are useful and constitute the core of treatment (National Research Council, 2001).

In this chapter, we summarize the development of current diagnostic concepts with a particular focus on autism and on the empirical basis for its current official definition. We address the rationale for inclusion of other nonautistic PDDs/autism spectrum disorders (ASDs), which are discussed in detail in other chapters in this section. We also note areas in which knowledge is lacking, such as the relationships of autism to other comorbid conditions and the ongoing efforts to provide alternative approaches to subtyping these conditions.

**DEVELOPMENT OF AUTISM AS A
DIAGNOSTIC CONCEPT**

Although children with what we now would describe as autism had probably been described much earlier as so called wild or feral children (Candland, 1993; Simon, 1978) it was Leo Kanner who first elaborated what today would be termed the syndrome of childhood autism.

**Kanner’s Description—Early
Controversies**

Kanner’s (1943) seminal clinical description of 11 children with “autistic disturbances of affective contact” has endured in many ways. His description of the children was grounded in data and theory of child development, particularly the work of Gesell, who demonstrated that normal infants exhibit marked interest in social interaction from early in life. Kanner suggested that early infantile autism was an inborn, constitutional disorder in which children were born lacking the typical motivation for social interaction and affective comments. Using the model of inborn errors of metabolism, Kanner felt that individuals with autism were born without the biological preconditions for psychologically metabolizing the social world. He used the word *autism* to convey this self-contained quality. The term

TABLE 1.1 Conditions Currently Classified as Pervasive Developmental Disorders Correspondence of *ICD-10* and *DSM-IV* Categories

<i>ICD-10</i>	<i>DSM-IV</i>
Childhood autism	Autistic disorder
Atypical autism	Pevasive developmental disorder not otherwise specified (PDD-NOS)
Rett syndrome	Rett’s disorder
Other childhood disintegrative disorder	Childhood disintegrative disorder
Overactive disorder with mental retardation	No corresponding category with stereotyped movements
Asperger syndrome	Asperger’s disorder
Other pervasive developmental disorder	PDD-NOS
Pervasive developmental disorder, unspecified	PDD-NOS

Sources: *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition, by American Psychiatric Association, 1994, Washington, DC: Author; and *International Classification of Diseases: Diagnostic Criteria for Research*, tenth edition, by the World Health Organization, 1992, Geneva, Switzerland: Author.

was borrowed from Bleuler (1911/1950), who used *autism* to describe idiosyncratic, self-centered thinking. Autism for Kanner was intended to suggest that autistic children, too, live in their own world. Yet, the autism of individuals with autism is distinct from that of schizophrenia: It represents a failure of development, not a regression, and fantasy is impoverished if present at all. The sharing of the term increased early confusion about the relationship of the conditions.

In addition to the remarkable social failure of autistic individuals, Kanner observed other unusual features in the clinical histories of the children. Kanner described the profound disturbances in communication. In the original cohort, three of the children were mute. The language of the others was marked by echolalia and literalness, as well as a fascinating difficulty with acquiring the use of the first person, personal pronoun (“I”), and referral to self in the third person (“he” or by first name). Another intriguing feature was the children’s unusual responses to the inanimate environment; for example, a child might be unresponsive to parents, yet overly sensitive to sounds or to small changes in daily routine.

While Kanner’s brilliant clinical accounts of the unusual social isolation, resistance to change, and dysfunction in communication have stood the test of time, other aspects of the original report have been refined or refuted by further research.

A contentious issue early in the history of autism research concerned the role of parents in pathogenesis. Kanner observed that parents of the initial cases were often remarkably successful educationally or professionally; he also appreciated that there were major problems in the relations between these parents and their child. In his initial paper, he indicated that he believed autism to be congenital, but the issue of potential psychological factors in causing autism was taken up by a number of individuals; this issue plagued the history of the field for many years. From the 1960s, however, it has been recognized that parental behavior as such played no role in pathogenesis. Yet, the pain of parents having been blamed for a child’s devastating disorder tended to linger in the memories of families, even those whose

children were born long after the theory was dead; unfortunately, this notion still prevails in some countries.

Two types of information went against the psychogenic theories. It is now known that children with autism are found in families from all social classes if studies control for possible factors that might bias case ascertainment (e.g., Wing, 1980); while additional data on this topic are needed, more recent and rigorous research has failed to demonstrate associations with social class (see Chapter 2, this *Handbook*, this volume, for a review). A more central issue relevant to psychogenic etiology concerns the unusual patterns of interaction that children with autism and related conditions have with their parents (and other people as well). The interactional problems of autistic individuals clearly can be seen to arise from the side of the child and not the parents (Mundy, Sigman, Ungerer, & Sherman, 1986) although parents may be at risk for various problems (see Chapter 15, this *Handbook*, this volume). Probably most important, data support the role of dysfunction in basic brain systems in the pathogenesis of the disorder (see Volkmar et al., 2004). Today, the data appear to support the concept that biological factors, particularly genetic ones, convey a vulnerability to autism; as Rutter (1999) has noted, the issue of interaction between genetic and environmental vulnerabilities of all types remains an important one relevant to a host of disorders in addition to autism.

Kanner speculated that autism was not related to other medical conditions. Subsequent research has shown that various medical conditions can be associated with autism (see Chapter 2, this *Handbook*, this volume) and, most importantly, that approximately 25% of persons with autism develop a seizure disorder (Rutter, 1970; Volkmar & Nelson, 1990; see also Chapters 18 & 20, this *Handbook*, this volume). With the recognition of the prevalence of medical problems, some investigators proposed a distinction between “primary” and “secondary” autism depending on whether associated medical conditions, for example, congenital rubella (Chess, Fernandez, & Korn, 1978), could be demonstrated. As time went on, it became apparent that, in some basic

sense, all cases were “organic,” and designations such as primary and secondary autism are no longer generally made.

Kanner also misconstrued the relation between autism and intellectual disability. His first cases were attractive youngsters without unusual physical features, who performed well on some *parts* of IQ tests (particularly those that test rote memory and copying, such as block design, rather than comprehension of abstract, verbal concepts). Kanner felt that autistic children were not mentally retarded, and he, and many psychologists after him, invoked motivational factors to explain poor performance. Autistic individuals were called “functionally retarded.” Decades of research have now shown that when developmentally appropriate tests are given in their entirety, full-scale intelligence and developmental scores (IQ and DQ scores) are in the mentally retarded range for the majority of individuals with autism (Rutter, Bailey, Bolton, & Le Couter, 1994) and maintain stability over time (Lockyer & Rutter, 1969, 1970). Kanner’s impression of potentially normal intelligence, even in the face of apparent retardation, was based on what has proven to be a consistent finding on psychological testing. Children with autism often have unusually scattered abilities, with nonverbal skills often significantly advanced over more verbally mediated ones (see Chapter 29, this *Handbook*, Volume 2); at the same time, children with autism differ in their pattern of behavior and cognitive development from children with severe language disorders (Bartak, Rutter, & Cox, 1977). On the other hand, when the focus shifts from autism, strictly defined, to the broader autistic spectrum, a much broader range of IQ scores is observed (Bailey et al., 1998).

The severity of the autistic syndrome led some clinicians in the 1950s to speculate that autism was the earliest form of schizophrenia (Bender, 1946). Clinicians during the first decades of the study of autism tended to attribute complex mental phenomena such as hallucinations and delusions to children who were, and remained, entirely mute (Volkmar & Cohen, 1991a). In the 1970s, research findings began to show that these two conditions are quite disparate in terms of onset patterns, course, and family genetics (Kolvin, 1971; Rutter, 1972).

Other Diagnostic Concepts

In contrast to autism, the definition of *autistic-like* conditions remains in need of more clarification (Rutter, 1996; Szatmari, 2000; Szatmari, Volkmar, & Walther, 1995). Although the available research is less extensive than that on autism, several of these autistic-like conditions were well enough studied, broadly recognized, and clinically important enough to be included in *DSM-IV* and *ICD-10*. We anticipate that further studies will improve the definition of these conditions and that new disorders may well be delineated within the broad and heterogeneous class of PDD.

Diagnostic concepts with similarities to autism were proposed before and after Kanner’s clinical research. Shortly after the turn of the century, Heller, a special educator in Vienna, described an unusual condition in which children appeared normal for a few years and then suffered a profound regression in their functioning and a derailment of future development (Heller, 1908). This condition was originally known as *dementia infantilis* or *disintegrative psychosis*; it now has official status in *DSM-IV* as childhood disintegrative disorder (see Chapter 3, this *Handbook*, this volume). Similarly, the year after Kanner’s original paper, Hans Asperger, a young physician in Vienna, proposed the concept of autistic psychopathy or, as it is now known, Asperger’s disorder (Asperger, 1944; see Chapter 4, this *Handbook*, this volume). Although Asperger apparently was not aware of Kanner’s paper or his use of the word autism, Asperger used this same term in his description of the marked social problems in a group of boys he had worked with. Asperger’s concept was not widely recognized for many years, but it has recently received much greater attention and is now included in both *DSM-IV* and *ICD-10*. Another clinician, Andreas Rett, observed an unusual developmental disorder in girls (Rett, 1966) characterized by a short period of normal development and then a multifaceted form of intellectual and motor deterioration. Rett’s disorder is also now officially included in the PDD class (see Chapter 5, this *Handbook*, this volume).

The descriptions proposed by some other clinicians have not fared as well. For example,

Mahler, a child psychoanalyst, proposed the concept of symbiotic psychosis (Mahler, 1952) for children who seemed to fail in the task of separating their psychological selves from the hypothesized early fusion with their mothers. This concept now has only historical interest, as does her view of a “normal autistic phase” of development. In contrast, Rank (1949), also working from the framework of psychoanalysis, suggested that there is a spectrum of dysfunctions in early development that affects children’s social relations and their modulation of anxiety. Her detailed descriptions of atypical personality development are of continuing interest in relation to the large number of children with serious, early-onset disturbances in development who are not autistic. These ideas were developed by Provence in her studies of young children with atypical development (Provence & Dahl, 1987; see also Chapter 6, this *Handbook*, this volume).

In the first (1952) and second (1968) editions of the American Psychiatric Association’s Diagnostic and Statistical Manuals only the term *childhood schizophrenia* was officially available to describe autistic children. Much of the early work on autism and related conditions is, therefore, difficult to interpret because it is unclear exactly what was being studied. As information on life course and family history became available (Kolvin, 1971; Rutter, 1970), it became clear that autism could not simply be considered an early form of schizophrenia, that most autistic individuals were retarded, that the final behavioral expression of the autistic syndrome was potentially the result of several factors, and that the disorder was not the result of deviant parent-child interaction (Cantwell, Baker, & Rutter, 1979; DeMyer, Hingtgen, & Jackson, 1981). These findings greatly influenced the inclusion of autism in the third edition of *DSM* (American Psychiatric Association, 1980), to which we return later.

ISSUES IN CLASSIFICATION

Systems for classification exist for many different reasons, but a fundamental purpose is to enhance communication (Rutter, 2002). For researchers, this is essential to achieve reliability and validity of findings from research

studies, to share knowledge among investigators, and to encourage the development of a body of knowledge. For clinicians and educators, classification helps guide selection of treatments for an individual and the evaluation of the benefits of an intervention for groups of individuals with shared problems (Cantwell, 1996). For the legal system, government regulation, insurance programs, and advocates, classification systems define individuals with special entitlements. If a diagnostic classification system is to be effective in these varied domains, the system must be clear, broadly accepted, and relatively easy to use. Diagnostic stability is an important goal; difficulties arise if diagnostic systems are changed too rapidly, for example, interpretation of previous research becomes a problem. A classification system should provide descriptions that allow disorders to be differentiated from one another in significant ways, for example, in course or associated features (Rutter, 1996). Official classification systems must be applicable to conditions that afflict individuals of both sexes and of different ages; at different developmental levels; and from different ethnic, social, and geographical backgrounds. Finally, a system must be logically consistent and comprehensive (Rutter & Gould, 1985). Achieving these divergent goals is not always easy (Volkmar & Schwab-Stone, 1996).

The clinical provision of a diagnosis or multiple diagnoses is only one part of the *diagnostic process* (Cohen, 1976). The diagnostic process provides a richer description of a child or adult as a full person; it includes a historical account of the origins of the difficulties and changes over time, along with other relevant information about the individual’s development, life course, and social situation. The diagnostic process highlights areas of competence, as well as difficulties and symptoms; it notes the ways the individual has adapted; it describes previous treatments, available resources, and other information that will allow a fuller understanding of the individual and his or her problems. Also, the diagnostic process may suggest or delineate biological, psychological, and social factors that may have placed the individual at risk, led to the disorder, changed its severity, or modified the symptoms and course. The result of the diagnostic

process should be a rich formulation—an account that will be elaborated with new knowledge, including the response of the individual to intervention. It cannot be overemphasized that while the diagnostic label or labels provide important and helpful information, they do not substitute for a full and rich understanding of the individual's strengths and weaknesses and life circumstances. Thus, programs should be designed *around individuals* rather than labels.

A diagnostic formulation, based on an extended diagnostic process, is provisional and subject to change with new information and experience. In this sense, it is a continuing activity involving the individual, family, clinicians, and educators. The diagnostic process, as a clinical activity, depends on a body of scientific knowledge and is enriched when there is a common diagnostic language used for clinical and research purposes. Information provided by this process is useful at the level of the individual case but also has important public health and social policy implications, for example, in formulating intervention strategies and allocating resources.

Diagnostic systems lose value if they are either overly broad or overly narrow. The classification system must provide sufficient detail to be used consistently and reliably by clinicians and researchers across settings. When they achieve “official” status, as is the case for *ICD* and *DSM*, classification schemes have important regulatory and policy implications. Sometimes, there may be conflicts between scientific and clinical needs, on one hand, and the impact of definitions on policy, on the other. For example, there may be good scientific reasons for a narrowly defined categorical diagnosis that includes only individuals who *definitely and clearly* have a specifically defined condition and excludes individuals where there is less certainty. From the point of view of service provision, however, broader diagnostic concepts may be most appropriate. Unfortunately, there has often been a failure to recognize the validity of these two tensions around aspects of diagnosis.

Classification schemes of an “official” nature may have unintended, but important, implications, for example, in terms of legal mandates for services; this is particularly true in the United States where federal regulations

may be tied to specific diagnostic categories (Rutter & Schopler, 1992). Such an approach tends, unfortunately, to emphasize the diagnostic *label*, rather than the diagnostic *process*. On the other hand, if a governmental body adopts a broad diagnostic concept, the available resources may be diluted and individuals most in need of intensive treatment may be deprived while those with less clearly definable service requirements are included in programs (Rutter & Schopler, 1992).

There are many misconceptions about diagnosis and classification (see Rutter, 1996; Volkmar & Schwab-Stone, 1996; Volkmar, Schwab-Stone, & First, 2002). For example, *DSM-IV* and similar systems of classification are organized around dichotomous categories; in these systems, an individual either has or does not have a disorder. Yet, classification can also be dimensional, in which an individual has a problem, group of problems, or dysfunction to a certain degree. Dimensional approaches offer many advantages, as exemplified by the use of standard tests of intelligence, adaptive behavior, or communication; in many ways, such approaches have dominated in other branches of medicine and frequently coexist with categorical ones (see Rutter, 2002, for a review). Not only can the disease process (e.g., hypertension) be dimensional but also various risk factors may be dimensional, and a dimensional focus has important advantages for advancing knowledge in this regard. On the other hand, at some point qualitative and dimensional changes (as in blood pressure) may lead either to functional impairment or specific symptoms (e.g., a high blood pressure can lead to angina), and the categorical approach is needed to address this important implication of what is basically a dimensional phenomenon. Depression is a relevant example from psychiatry; for example, all of us have the experience of mood fluctuations during the course of our daily lives, but when depression becomes so significant that it begins to interfere with functioning or causes impairment in other ways, we can consider use of specific treatments for depression.

Dimensional and categorical classification systems are not incompatible. It is possible to set a boundary point along a dimension that can be used to define when a disorder is diagnosed. This boundary can be determined by

empirical studies that indicate that an important threshold has been crossed that will influence functional status or impairment; or the boundary can be defined by convention reached by clinicians, researchers, those who establish policy, or some combination of factors. For example, disorders such as depression are readily amenable to dimensional definitions. To some extent, all of us have experience of the symptoms of depression, yet, for the clinical syndrome of depression, a threshold must be surpassed: There must be a sufficient number and range of symptoms that cause suffering, interfere with daily functioning, and persist (see Rutter, 2002; Chapter 28, this *Handbook*, Volume 2).

For studies of autism and associated conditions, various dimensional approaches have been employed. Some instruments used for purposes of screening or diagnostic assessment focus on behaviors or historical features (or both) that may be highly suggestive of a diagnosis of autism. Such approaches have not (with some notable exceptions—see Chapter 28, this *Handbook*, Volume 2) typically tried to relate in a straightforward way with categorical approaches. Given the issues of focusing on highly unusual behaviors, other problems are posed in the development and standardization of such instruments. At the same time, such instruments have had a very significant role in research as well as clinical work, for example, in screening for persons likely to have autism (see Chapter 27, this *Handbook*, Volume 2).

Another example of the dimensional approach is embodied in the use of traditional tests of intelligence or communicative ability (see Chapters 29 & 30, this *Handbook*, Volume 2). For such instruments, the provision of good normative data is an important benefit. A growing body of work has focused on the dimensional metrification of social competence using the Vineland Adaptive Behavior Scales (see Chapter 29, this *Handbook*, Volume 2).

The role of theory in guiding development of classification systems is a source of confusion. Many assume that a classification system must be based on a theoretical model. To some degree, all accounts of an event, process, clinical set of findings, or disorder relate to a “theory” (or what more probably might be called a hypothesis or theory in the making). Such prototheories focus on what to the viewer is the

most important thing to convey about a phenomenon or set of observations. Such notions provide us with a sense of orderliness or narrative coherence. However, there is no truly naive form of description or a naive description of what clinicians and researchers mean by symptoms of a disorder. Even the decision about what to consider a disorder of an individual presupposes a theory of what should be considered a disorder or dysfunction.

The boundaries of the nosology for *DSM-IV* and *ICD* reflect a history of the professions of neurology, psychiatry, and general medicine as well as preconceptions of where the current lines should be drawn. For example, the inclusion of Rett’s disorder in *DSM-IV* raised the question of why a disorder with such clear neurological aspects should be classified within the PDDs (Gillberg, 1994). However, neurological factors play a strong role in many disorders (including autism), but that does not mean that they are *only* neurological. Much of the issue of where disorders such as autism or Rett’s are placed has to do with a practical issue of usage (see Rutter, 1994, for a discussion). A similar argument could be had about Alzheimer’s disease, which clearly falls within the professional purview of both psychiatrists and neurologists. One important effect of the decision to include Rett’s disorder has been the ability to focus specifically on this group in terms of genetic mechanisms (see Chapter 5, this *Handbook*, this volume).

No nosology, including *DSM-IV* or *ICD-10*, can be totally free of theory, although there are good reasons for current psychiatric systems to aspire to be as atheoretical and descriptive as possible. This is illustrated in the earlier versions of *DSM* (American Psychiatric Association, 1952, 1968) where theory was so much part of definition that research work was impeded. Theoretically oriented classification systems often are difficult to use since there may be differences even among those who share a theoretical perspective. Since 1980, the trend in psychiatry has been toward descriptive, operational definitions that emphasize observable behaviors and discrete clinical findings (Frances, Widiger, & Pincus, 1989); indeed, such an approach is represented, in many respects, by Kanner’s original description of autism. Such an approach to diagnosis

is often called *phenomenological* although this term is confusing, since phenomenology is a branch of philosophy that concerns the underlying structures of experience and the modes of learning about mental and psychological phenomena (including the use of introspection and dense description). Phenomenology represents a theoretical approach to diagnosis that has an important history in psychology and psychiatry. When contemporary researchers and clinicians speak of *phenomenological* systems, they usually mean something quite different: descriptions of the surface (signs and symptoms) or accounts of observable phenomena. In any event, *DSM-IV* and *ICD-10* attempt to avoid all encompassing, grand theories of pathogenesis and concepts that require adherence to a particular viewpoint about the functioning of the mind or the origins of psychopathology. In this sense, they attempt to provide a relatively common language and framework that can be used by adherents of different theoretical points of view.

Another misunderstanding is that classification systems require etiologies and causes. Here, too, the trend within psychiatry has been toward systems that recognize that the causes of most psychiatric, developmental, and emotional disorders remain uncertain and complex (Rutter, 1996). Also, there is a realization that many different causes may lead to the apparently very similar clinical condition while one specific cause may be associated with various conditions. Scientific studies will reveal new causes for old diseases, and there often are surprises as different underlying factors are revealed for what has appeared to be a simple, homogeneous clinical condition. The increasing knowledge and the disparity between *genotype* (underlying cause) and *phenotype* (clinical presentation) indicate the importance of not basing a classification system only on purported causes. However, as etiologies are elucidated, it makes sense to consider including them within a diagnostic framework. In *DSM-IV*, a causal framework is most clear in the definition of posttraumatic stress disorder (PTSD), a condition in which a clear precipitant (a traumatic experience) is related to a range of persistent symptoms. For autism, a causal nosology is not yet available, although genetic, neuroimaging, behavioral, or other

findings during the next years may make this more feasible in diagnosing and subtyping autism.

Like other human constructions, classification systems can be misused (Hobbs, 1975). One misuse is to confuse the person with the diagnostic label. A person with a disorder is a person first: An individual with autism is not an “autistic.” A label does not capture the fullness of the person, nor his or her humanity. There is a risk that categorical terms may minimize the tremendous differences among persons who have a particular condition. The very broad range of syndrome expression in autism requires the provision of multiple kinds of information in addition to the categorical diagnosis, for example, level of communicative speech, intellectual abilities, interests, and capacity for independent living.

Another misuse of a categorical diagnosis occurs when it is elevated to the status of being an *explanation* or when its use obscures lack of knowledge. In Moliere’s plays, the physician would mystify and impress the patients with long Latin terms that were offered as explanations but were merely redescriptions of the patient’s symptoms. For many diagnoses, this is still the case. For example, it is helpful to parents to know that their 2-year-old child is not talking because he or she has a disorder. However, it is different when this disorder is deafness—which may explain the muteness, at some interesting level of understanding—than when the disorder is autism. The diagnosis of autism clarifies some aspects of the nature of an individual child’s muteness by placing this child within a class of individuals about whom a great deal of valuable information about treatment and course has been learned. But the classification does not really explain the language disorder any more than the diagnosis of attention deficit/hyperactivity disorder explains a child’s overactivity and frustration intolerance. When a label is mistaken for an explanation, areas of ignorance may be covered over and the search for underlying causes may end prematurely.

The final misuse of classification is the potential for stigmatization. Parents and advocates are anxious about the ways in which classification may negatively skew how the child or adult is seen by others or the

limitations and adversities that may follow upon being labeled. Unfortunately, this danger is real. When a child has been classified as mentally retarded or intellectually disabled, this has sometimes meant removal from the mainstream of education and a lifelong reduction of opportunity. The diagnosis of schizophrenia has had negative connotations associated with madness and danger. Autism, too, has had its social disadvantages; for example, at one time it may have implied a particular view of etiology in which parents were placed at fault. A diagnostic label may exclude individuals from programs or reduce chances in purchasing insurance. For these reasons, parents and advocates have sometimes felt that inclusion of autism as a mental disorder may imply that autism is the result of some type of emotional upset within the child or family—when it clearly is not—or that it stigmatizes the child. Dealing with these issues is a continuing process, and there have been major advances in destigmatization over the past years. Public education, professional awareness of the potential abuse of diagnostic labels, and legal imperatives are all important in reducing prejudice against individuals with handicaps and disabilities. These issues also have had important implications for studies of epidemiology and service planning, particularly when the available data related to labels are used for educational or intervention purposes; in such contexts, parents might, for example, choose to utilize the term *autism* to entitle their child to additional services even if full criteria for autism are not met or when the child might just as readily receive another label for service provision (a problem referred to as diagnostic substitution—see Chapter 2, this *Handbook*, this volume). Conversely, the well-intentioned attempt to destigmatize a child by describing his or her disability simply as a different style of learning or being has the potential to reduce entitlements and services and opportunities for the gains associated with treatment (National Research Council, 2001).

In summary, categorical diagnoses organize professional experience and data, promote communication, and facilitate the provision of suitable treatments and interventions. They are always open to improvement. They derive their full meaning within the context of a continuing

diagnostic process. They may also be misused. However, they can be helpful in clarifying the nature of an individual's difficulties and thus suggest care and indicate course.

THE ROLE OF RESEARCH

Initial descriptions of disorders such as autism and related conditions were invariably made by a clinician-investigator who noticed some seeming element(s) of commonality among children with very complex developmental difficulties. Although modifications in early descriptions of these conditions have, not surprisingly, often been made over time, there usually has been a fundamental continuity of basic aspects of definitions with the historical definition. Over the past several decades, empirical research has assumed a progressively greater role in refining diagnostic criteria and categories. In this regard, even when empirical research suggests that some feature or features are central to the definition, these need not, necessarily, have a central etiological role. Conversely, features less critical for purposes of definition may have major importance for intervention. In autism, the unusual pattern of social deficit originally described by Kanner (1943) remains the central defining core of the condition (Klin, Jones, Schultz, & Volkmar, 2003); stereotyped motor mannerisms, on the other hand, do not as clearly separate autism from other conditions with severe and profound mental handicap (Volkmar, Klin, Siegel, Szatmari, Lord, et al., 1994). Similarly, unusual sensory experiences are commonly observed in individuals with autism; they, too, may be a focus of intervention, but they are not a robust, defining feature of the condition (see Chapter 32, this *Handbook*, Volume 2, and Rogers & Ozonoff, in press, for reviews). Other symptoms may be highly predictive of the presence of autism, but they are of such low frequency that they are not included in usual definitions. For example, a child's unusual attachment to a physical object—such as a string or a frying pan—is highly suggestive of the diagnosis of autism, but this preoccupation is not included in official diagnostic criteria because the behavior is not invariably present and even when present tends to be observed only in younger individuals.

Developmental aspects of syndrome expression are particularly important in autism and related conditions. A developmental approach to classification views specific behaviors within the context of normative development. For example, the echolalia of autistic individuals is similar in some respects to the repetitions observed in the speech of typically developing 2- and 3-year-olds (see Chapter 30, this *Handbook*, Volume 2). From this perspective, echolalia is not simply a symptom but also is seen among typical children at a particular phase of development; when an older, mute, autistic child begins to use echolalia, it may be a sign of progress in language development. On the other hand, as originally noted by Kanner, some aspects of the functioning of individuals with autism are fundamentally not developmentally appropriate at any age (see Chapters 28, 30, & 32, this *Handbook*, Volume 2). This is specifically true of the social dysfunction and lack of engagement. Even infants are engaged socially. The typical aloofness of autism and lack of reciprocity are distinctly abnormal at any age and appear especially so when these social disabilities are far out of proportion to the individual's functioning in other domains of daily living (see Chapter 11, this *Handbook*, this volume).

Behavioral deviance, such as lack of social reciprocity or abnormal preoccupations, is often the focus of the criteria used in defining a categorical diagnosis. Such deviance is also a focus of rating scales and other assessment instruments used in relation to autism. This diagnostic approach may be combined with an assessment of how the individual compares to typical children and adults, for example, in relation to language use. The multiaxial system of *DSM-IV* is an attempt to systematically convey the value of considering an individual from multiple perspectives. This includes assessment of the individual's personality, educational and social resources, ongoing stresses, medical problems and diseases, and adaptive functioning as well as impairment (Rutter & Schopler, 1992). Multiaxial diagnostic approaches are especially helpful in understanding individuals who have disorders that start during childhood and are persistent, like autism, and have major impact on all spheres of development and increase the

child's vulnerability to other difficulties (Rutter, Shaffer, & Shepherd, 1975). Multiaxial systems help to ensure that in the search for a single, encompassing, categorical diagnosis, the rich and multifaceted diagnostic process is not undervalued.

APPROACHES TO CATEGORICAL DEFINITIONS OF AUTISM

In contrast to many conditions in child psychiatry, strictly defined autism does not "shade off" into normalcy in the usual sense (Rutter & Garmezy, 1983) and thus represents one of the more robust disorders for purposes of categorical diagnosis; at the same time, the body of genetic research has raised the important issue of a "broader" phenotype, that is, of a continuum of social and related vulnerabilities (Volkmar et al., 2004).

Even for strictly defined autism, there are problems in the development of explicit definitions. These include the tremendous range in syndrome expression and change in symptoms over the course of development. Since the person with autism may not always be able to provide a direct, verbal report, the reports of parents or caregivers must be relied on, as with very young children, raising other potential problems including reliability and validity of historical information. Methods have been proposed for diagnosis that focus on very early development. These methods, which sometimes use dimensional ratings scales (see Chapter 28, this *Handbook*, Volume 2), may be problematic in relation to providing a categorical diagnosis for an adolescent or adult with autism. In the absence of an accepted measure of diagnostic pathophysiology, one would wish to consider both the historical information as well as course and current functioning in conferring a diagnosis of a severe developmental or psychiatric disorder. Yet, the use of development and history raises practical problems for categorical diagnostic systems. In general, history has been overlooked in the current official nosologies (with the exception of noting the age of onset)—a topic to which we return later.

There are interesting and relevant questions, too, about what should be included in a categorical diagnostic set of criteria. Should

such a set emphasize only those symptoms and signs that most clearly differentiate one condition from another, or should the set of criteria also include important symptoms (e.g., rushes of panic and anxiety or overactivity and impulsiveness) that are also found among other conditions? Should the criteria capture the largest number of children who may have the condition or be more selective? What about symptoms that may be infrequent but of great clinical importance when they occur, such as self-injurious behavior? To what degree should diagnostic criteria also be fuller descriptions of the condition?

Investigators began to propose more explicit categorical definitions of autism in the 1970s as a consensus on the validity of autism emerged. This was parallel to attempts in adult psychiatry to provide better definitions of psychiatric disorders for research purposes (Spitzer, Endicott, & Robins, 1978). The importance of a multiaxial or multidimensional approach to diagnosis became increasingly appreciated (Rutter et al., 1975). Rutter (1978) synthesized Kanner's original report and subsequent research in a highly influential definition of autism as having four essential features: (1) early onset by age 22 years, (2) impaired social development, (3) impaired communication, and (4) unusual behaviors consistent in many ways with Kanner's concept of "insistence on sameness" (resistance to change, idiosyncratic responses to the environment, motor mannerisms and stereotypes, etc.). Rutter specified that the social and communication impairments were distinctive and not just a function of associated mental retardation. In contrast, the National Society for Autistic Children (NSAC; Ritvo, 1978) in the United States proposed a definition that included disturbances in (1) rates and sequences of development, (2) responses to sensory stimuli, (3) speech, language-cognition, and non-verbal communication, and (4) the capacity to relate appropriately to people, events, and objects. This definition also emphasized the neurobiological basis of autism. While clinically providing more detail, the Ritvo-NSAC definition proved rather less influential than the Rutter synthesis, probably because the latter seemed conceptually clearer and closer to Kanner's original description.

DSM-III

DSM-III (1980) was a landmark in the development of psychiatric taxonomy based on research findings and emphasizing valid, reliable descriptions of complex clinical phenomena. Autism was included along with several other disorders in a newly designated class of childhood onset disorders, Pervasive Developmental Disorders (PDD). Other disorders included residual infantile autism, childhood onset pervasive developmental disorder (COPDD), and residual COPDD. A subthreshold condition was included as well, atypical PDD. The class name *pervasive developmental disorder* was newly coined and was meant to convey that individuals with these conditions suffered from impairment in the development and unfolding of multiple areas of functioning. The term also was meant to avoid a theoretical presupposition about etiology, and it quickly achieved broad acceptance. Subsequently, the choice of the term PDD has been debated (see Gillberg, 1991; Volkmar & Cohen, 1991b), and other terms, for example, autism spectrum disorder (ASD), have also come into common usage; the two terms are used synonymously here.

The *DSM-III* system was a major advance. It extended official recognition to autism, discarded the earlier presumption of a relation between autism and childhood schizophrenia, and provided a useful definition largely reflecting Rutter's (1978) approach. The use of a multiaxial system also facilitated research. However, some shortcomings with this system were relatively quickly apparent. The rationale for the inclusion of COPDD was apparently to account for those relatively rare children who developed an autistic-like disorder after age 30 months (Kolvin, 1971); this disorder was not, however, meant to be analogous with the concept of Heller's syndrome (disintegrative psychosis) since it was assumed (incorrectly) that the latter was invariably a function of some related general medical condition (Volkmar, 1992). The definition of autism itself was rather sparse and tended, perhaps not surprisingly given the official name of the disorder (infantile autism), to focus very much on autism as it is exhibited in younger children. The use of the term *residual autism* was

included to account for cases where the child once met the criteria for infantile autism but no longer did so; this seemed, at some level, to imply that the individual no longer had autism. The term *atypical PDD* was used for subthreshold conditions, that is, for a constellation of difficulties that appeared to most appropriately be placed within the PDD class but which did not meet criteria for infantile autism or another explicitly defined condition, unintentionally suggesting Rank's earlier (1949) concept. Individuals with hallucinations and delusions were specifically excluded from the PDD diagnoses. While it is unlikely that many persons with autism will develop schizophrenia, it might be anticipated that individuals with autism would develop schizophrenia at least as often as other individuals in the general population, a hypothesis that seems to be sustained by available evidence (Volkmar & Cohen, 1991a).

The multi-axial placement of disorders in *DSM-III* also was a source of controversy; that is, autism and other PDDs were placed on Axis I as was mental retardation although other specific developmental disorders were listed on Axis II of the multi-axial system. The problems with *DSM-III* were widely recognized, and a major revision was undertaken for *DSM-III-R* (American Psychiatric Association, 1987).

DSM-III-R

Preparations for the revision of *DSM-III* began soon after it appeared. What started as revision soon became a major renovation. Radical changes were introduced into the concept of autism in *DSM-III-R* (American Psychiatric Association, 1987; see Waterhouse, Wing, Spitzer, & Siegel, 1993, for discussion of these changes). The rapid revision of the official nosology posed problems for researchers who were required to rediagnose their patients if they wished to remain *au courant*.

The definition of autistic disorder in *DSM-III-R* was more consistent with that of Wing (Wing & Gould, 1979) and others who advocated a somewhat broader view of the diagnostic concept (see Chapter 21, this *Handbook*, this volume). Three major domains of dysfunction were still included, with specific criteria provided for each domain: qualitative impairment in reciprocal social interaction, qualita-

tive impairment in verbal and nonverbal communication and in imagination, and restricted repertoire of activities and interests.

A small national field trial was conducted to finalize scoring rules for the *DSM-III-R* definition of autism (Spitzer & Siegel, 1990). Sixteen proposed criteria for autistic disorder were grouped into the three broad categories. Based on this field trial, the diagnosis of autism required that an individual child or adult had to exhibit at least 8 of these 16 criteria, in total, with a specified distribution over the three areas of disturbance. This requirement for an early onset of the condition was dropped in *DSM-III-R* because of the wish to provide a generally applicable criterion set, regardless of age, and partly for the philosophical reason that the age of onset should not be considered a diagnostic feature, that is, that clinicians should rely on present examination rather than history in making the diagnosis. This change would make it possible to diagnose autism in children who, for example, appeared to develop autism or something suggestive of it much later in development (Weir & Salisbury, 1980); such cases have never, however, been very common and it seemed problematic that their uniqueness was not flagged in some way (e.g., through diagnostic coding).

DSM III-R was attentive to changes in the expression of autism with age and developmental level. This represented a clear improvement over *DSM-III* (Volkmar, Cicchetti, Cohen, & Bregman, 1992) where the concept of residual autism had been an unsatisfactory attempt to deal with this issue. Criteria in *DSM-III-R* were offered for autistic disorder and were applicable to the entire range of the expression of the syndrome. Thus, an individual could retain the diagnosis of autism even if he or she was functioning at a higher developmental level or had experienced an amelioration of symptoms with age, perhaps as a result of educational intervention or maturation. The name of the condition was changed from infantile autism to reflect these changes. Finally, in *DSM-III-R*, the problematic COPDD category was dropped, leaving those children who had carried this diagnosis suspended in limbo or, in practice, placed within the PDD-not otherwise specified (NOS) category. The term for all subthreshold categories was changed to "Not otherwise specified" (NOS) throughout

DSM. Individuals with autism were no longer, by definition, excluded from also exhibiting schizophrenia.

The ambitious goal of a heuristic definition in *DSM-III-R* was a conceptual advance over *DSM-III*, but carried unforeseen consequences. *DSM-III-R* criteria expanded the diagnostic concept (Factor, Freeman, & Kardash, 1989; Hertzog, Snow, New, & Shapiro, 1990; Szatmari, 1992a; Volkmar et al., 1992). The rate of false-positive cases (if clinician judgment is taken as the standard) diagnosed according to *DSM-III-R* was nearly 40% (Rutter & Schopler, 1992; Spitzer & Siegel, 1990). This tendency to overdiagnose autism in more intellectual handicapped individuals likely also had the inadvertent effect of diverting clinical attention from autism as it appeared in intellectually more able individuals.

Other problems with *DSM-III-R* also were noted. First, the criteria set was more complex and detailed, and the inclusion of specific examples within the actual criteria seemed to limit clinician judgment. The elimination of age of onset as a central diagnostic feature was not consistent with Kanner's original report (1943) nor subsequent research that firmly established that autism was an early-onset disorder (e.g., Harper & Williams, 1975; Kolvin, 1971; Short & Schopler, 1988; Volkmar, Cohen, Hoshino, Rende, & Paul, 1988; Volkmar, Stier, & Cohen, 1985). Probably the main issue with *DSM-III-R*, however, was the major changes introduced in the diagnostic concept. These changes severely complicated the interpretation of studies that used different diagnostic criteria. This issue was particularly acute relative to the pending changes in the classification of autism and similar conditions in the 10th edition of the *ICD-10* (WHO, 1992), since it appeared that *DSM-III-R* markedly overdiagnosed autism relative to the draft *ICD-10* definition (Volkmar, Cicchetti, Bregman, & Cohen, 1992).

FROM *ICD-9* TO *ICD-10*

Since it was first introduced toward the end of the nineteenth century, the *ICD* has undergone many revisions (Kramer, 1968). The limitations of the psychiatric section were increasingly recognized, and extensive revision was undertaken in the eighth edition of

ICD, which appeared in 1968 (see Rutter et al., 1975; Spitzer & Williams, 1980). At the same time, there was general agreement that future refinement would be needed and, over the next decade, a series of steps were undertaken to improve the *ICD* system (Sartorius, 1988). One important aspect was the development of a multiaxial system for the psychiatric disorders of childhood (Rutter et al., 1975). By 1978, the ninth edition of *ICD* appeared and plans for a revision were put into place. The *ICD-9* accorded official recognition to infantile autism as well as disintegrative psychosis (or what would now be termed *childhood disintegrative disorders*); both conditions were included in a category of childhood psychotic conditions—a category that also included other specific psychotic conditions of childhood and unspecified psychotic conditions. This approach reflected the historical view (then beginning to change) that autism represented one of the first manifestations of childhood psychosis.

The plan for revision of *ICD-10* was well underway at the time that *DSM-IV* was being developed. An important aspect of *ICD-10* has been its conceptualization as a group of documents written specifically for different users; for example, in contrast to the *DSM-IV* approach, research criteria for disorders are provided separately from clinical guidelines for primary health care providers. *ICD-10* offers comprehensive descriptions of clinical concepts underlying the disorder, followed by points of differential diagnosis, and then presents the main symptoms that should be present for a diagnosis. As a result, the *ICD-10* system offers, in some important respects, more flexibility to the clinician; this is particularly valuable given the intended international and cross-cultural use of the system.

DSM-IV AND *ICD-10*

The process of revision in the *ICD-10* was closely related to the development of the *DSM-IV* (American Psychiatric Association, 1994). The International (*ICD*) and American (*DSM*) systems are fundamentally related, and by formal agreements must share, to some degree, a common approach to diagnostic coding. There are, however, important general and specific differences between the two major diagnostic systems (Volkmar & Schwab-Stone,

1996). For example, the *ICD-10* system highlighted the importance of an individual's history in making a diagnosis while *DSM-III-R* relied on contemporaneous examination. Also in contrast to *DSM-IV*, *ICD-10* was specifically designed to have one set of research diagnostic criteria and a separate set of clinical guidelines. The American and International approaches would probably have resulted in very different patterns of diagnosis.

Preparations for the creation of the new, fourth edition of *DSM* began very shortly after *DSM-III-R* appeared, partly due to the pending changes in the *ICD-10*. As part of the revision process, work groups reviewed the current classification systems in light of existing research and identified areas both of consensus and controversy. They considered various issues, including clinical utility, reliability, and descriptive validity of categories and criteria as well as coordination with the *ICD-10* revision (Frances et al., 1991). As part of the process of creating *DSM-IV*, clinical investigators conducted literature reviews for each of the potential diagnostic categories. These reviews were particularly helpful for some of the new diagnostic categories. For example, although childhood disintegrative disorder (Heller's syndrome) is apparently much less common than autism, the data supported the view that it differed from autism in a number of important ways (Volkmar, 1992; Volkmar & Cohen, 1989). Asperger's disorder was included in *ICD-10*, but the text indicated that the validity of the syndrome as a disorder, distinct from autism, was not yet fully established (Rutter & Schopler, 1992; Szatmari, 1992a, 1992b). The absence of official or other generally agreed upon definitions for Asperger's disorder had contributed to markedly different uses of the term in clinical and research work (see Chapter 4, this *Handbook*, this volume). With Rett's disorder, the issues revealed by the review process had less to do with the validity of the diagnostic concept and more with the question of whether Rett's should be included in the PDD class rather than as a neurological disorder (Gillberg, 1994; Rutter, 1994; Tsai, 1992). Although the literature identified major gaps in knowledge and persistent issues, the consensus of workers in the field favored the inclusion of additional diagnostic categories within the

PDD class; there was also agreement about the desirability of compatibility of *DSM-IV* and *ICD-10* (Rutter & Schopler, 1992).

In addition to these literature reviews, a series of data reanalyses were undertaken with regard to autism. These reanalyses used previously collected data and indicated that the *DSM-III-R* definition of autistic disorder was overly broad (Volkmar, Cicchetti, & Bregman, 1992). Several issues were identified during this process of analysis of the literature and of available data that needed clarification for *DSM-IV*, including issues of overdiagnosis in the more intellectually challenged and underdiagnosis in more able individuals. Consistent with the empirical principles guiding the creation of *DSM-IV*, the working group decided that the clarification of these and other issues would be based on the findings from a large, multinational field trial (Volkmar, Klin, Siegel, Szatmari, Lord, et al., 1994).

***DSM-IV* Field Trial**

As part of the *DSM-IV* field trial for autism, 21 sites and 125 raters participated from the United States and around the world. By design, the raters had a range of experience in the diagnosis of autism and a range of professional backgrounds. The field trial included information on nearly 1,000 cases seen by one or more raters. In cases where the same case was rated by multiple raters to assess reliability, the rating by one clinician was chosen at random to be included in the main database. The preference for the entire field trial was for cases rated on the basis of contemporaneous examination and not just on review of records. By design, five contributing sites provided ratings on approximately 100 consecutive cases of individuals either with autism or other disorders in which the diagnosis of autism would reasonably be included in the differential diagnosis while the other 16 sites provided ratings of a minimum of about 20 cases. Cases were included only if it appeared that the case exhibited difficulties that would reasonably include autism in the differential diagnosis. The availability of clinical ratings of cases seen at clinical centers around the world was of interest in terms

TABLE 1.2 DSM-IV Autistic Disorder Field Trial Group Characteristics

	Clinically Autistic (<i>N</i> = 454)	Other PDDs (<i>N</i> = 240)	Non-PDD (<i>N</i> = 283)
Sex Ratio (M:F)	4.49:1	3.71:1	2.29:1
Mute	54%	35%	33%
Age	8.99	9.68	9.72
IQ	58.1	77.2	66.9

Notes: Cases grouped by clinical diagnosis. Diagnoses of the “other PDD” cases included: Rett syndrome (13 cases), childhood disintegrative disorder (16 cases), Asperger syndrome (48 cases), PPD-NOS (116 cases), and atypical autism (47 cases). Diagnoses of the non-PDD cases included mental retardation (132 cases), language disorder (88 cases), childhood schizophrenia (9 cases), other disorders (54 cases).

of issues of compatibility between *DSM-IV* and *ICD-10*. Characteristics of the field trial sample are presented in Table 1.2.

Typically, multiple sources of information were available to the rater, and the quality of the information available to the rater was judged to be excellent or good in about 75% of cases. Individuals from a variety of ethnic backgrounds and in various educational settings were included. This approach differed in important respects from that employed in *DSM-III-R* where, for example, children with conduct disorders (without development disorder) were included in the comparison group.

A standard system of coding was used to elicit information on basic characteristics of the case (age, IQ, communicative ability, educational placement), the rater, and various diagnostic criteria. The coding form also provided possible criteria for Asperger’s disorder, Rett’s disorder, and childhood disintegrative disorder, based on the draft *ICD-10* definitions.

The field trial provided data for studying the patterns of agreement among the various diagnostic systems. These results are presented in Table 1.3. As shown, the *DSM-III* diagnoses of infantile autism and residual autism had a reasonable balance of sensitivity and specificity; the use of the residual autism category in *DSM-III* was associated with other problems. In contrast, *DSM-III-R* criteria had a higher sensitivity but lower specificity and a relatively high rate of false-positive cases, especially among individuals with retardation where the rate reached 60%. The *ICD-10* draft definition,

designed to be a research diagnostic system, had, as expected, higher specificity.

As mentioned earlier, one of the major differences between *DSM-III-R* and both *DSM-III* and *ICD-10* was the failure to include history in the diagnostic process, for example, early age of onset as an explicit diagnostic feature. Reported age of onset of autism was examined. The mean reported age at onset for autism was early. The data on reported age of onset are presented in Figure 1.1.

Age at onset had a modest, positive relationship with measured intelligence. Individuals with slightly later onset were more likely to have higher IQ scores. If onset by 36 months was added as an essential feature to *DSM-III-R*, the sensitivity of that system was increased. Thus, inclusion of age of onset as

TABLE 1.3 Table IV-2: Sensitivity (Se)/Specificity (Sp) by IQ Level

By IQ Level	<i>N</i>	<i>DSM-III</i> ^a		<i>DSM-III-R</i>		<i>ICD-10</i> ^b	
		Se	Sp	Se	Sp	Se	Sp
<25	64	.90	.76	.84	.39	.74	.88
25–39	148	.88	.76	.90	.60	.88	.92
40–54	191	.79	.76	.93	.74	.84	.83
55–69	167	.86	.78	.84	.77	.78	.89
70–85	152	.79	.81	.88	.81	.74	.96
>85	218	.78	.83	.78	.78	.78	.91
Overall		.82	.80	.86	.83	.79	.89

^a “Lifetime” diagnosis (current IA or “residual” IA).

^b Original *ICD-10* criteria and scoring.

Adapted from “Field Trial for Autistic Disorder in *DSM-IV*,” by F. R. Volkmar et al., 1994, *American Journal of Psychiatry*, 151, 1361–1367. Used with permission.

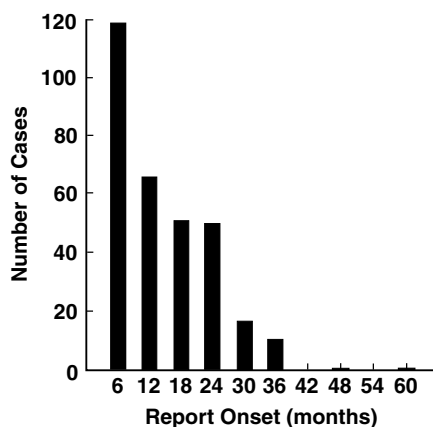


Figure 1.1 Age of onset: Cases with clinical diagnosis of autism.

an essential diagnostic feature for autism was supported and was consistent with the *ICD-10* draft criteria.

Aspects of the reliability of criteria and of diagnoses made by the various diagnostic systems were examined using chance corrected statistics. Since raters with a range of experience had participated in the field trial, it was possible to address rater experience in relation to reliability. In general, the interrater reliability of individual diagnostic criteria was in the good to excellent range. Only one criterion had poor interrater reliability. Typically, the more detailed *ICD-10* criteria had, as expected, greater reliability. Also as expected, experienced evaluators usually had excellent agreement among themselves and were more likely to agree with one another than with less experienced raters. The experience of the raters rather than their professional discipline had the greatest impact on reliability (Klin, Lang, Cicchetti, & Volkmar, 2000).

The temporal stability of ratings was assessed in two ways. A small number of cases for test-retest reliability were collected as part of the field trial; in addition, follow-up information was available on the cohort of 114 cases originally reported earlier (Volkmar, Bregman, Cohen, & Cicchetti, 1988). Criteria and diagnostic assignments were highly stable over relatively short periods of time in the range of less than one year. Findings with the cases followed up by Volkmar et al. (1988) suggested more diagnostic instability for those

individuals who were assigned a diagnosis of autism only by *DSM-III-R*. This instability of diagnostic classification was most apparent for younger children and for individuals with lower IQ.

The field trial data were also analyzed using signal detection methods and principal components analyses. The various approaches to the data suggested that certain items could be eliminated from the *ICD-10* definition, particularly items with low base rates or strong developmental associations (see later discussion). Before final decisions could be made on the *DSM-IV* definition, it was necessary to address the broader issue of whether other explicitly defined disorders would be included in the PDD class in *DSM-IV*. While the *DSM-IV* autism field trial was not primarily focused on the definition (much less the validity) of these conditions, the issues of the definition and validity were relevant to the *DSM-IV* and *ICD-10* definitions of autism. The boundaries for autism and the nonautistic PDD were mutually related: A narrow definition of autism would force some cases into the nonautistic PDD group. The broad definition of autism in *DSM-III-R* had certain advantages, for example, in ensuring access to services; but a narrower definition might be important for research studies that require greater homogeneity.

Definition of Autism in DSM-IV and ICD-10

The field trial data provided an important empirical basis for constructing the definition of autism for *DSM-IV*. The data showed that the *DSM-III-R* definition could be substantially improved by addition of a criterion relating to age of onset and by raising the diagnostic threshold. Similarly, various combinations of *DSM-III*, *DSM-III-R*, and new criteria all could have been used to provide a reasonably balanced diagnostic system. Given the concern about the importance of compatibility with *ICD-10* and the implications for research of a universally accepted definition, the working group of *DSM-IV* considered the benefits of the *ICD-10* system. Possible modifications in the *ICD-10* system were examined. The goal was to establish a definition for *DSM-IV* that balanced clinical and research needs, was reasonably concise and easy to use, provided reasonable coverage over the range of syndrome

expression in autism, and was applicable over the full life span, from early childhood through adulthood.

Of the original 20 *ICD-10* criteria, four were identified for possible elimination. Alternatives to specific criteria were examined, and a modified definition was developed. This modified definition worked well both overall and over different levels of age and associated mental retardation; it also could be readily used by less experienced examiners.

Diagnostic criteria for autism in *DSM-IV* and *ICD-10* are presented in Table 1.4.

For the diagnosis of autism, at least six criteria must be exhibited, including at least two criteria relating to social abnormalities (group one) and one each relating to impaired communication (group 2) and range of interests and activities (group 3). In addition, the onset of the condition must have been prior to age 3 years as evidenced by delay or abnormal functioning in social interaction, language as used in social interaction, and symbolic/imaginative play. In addition, *DSM-IV* accepted the diagnostic convention that the disorder could not better be accounted for by the diagnosis of Rett's disorder or childhood disintegrative disorder (the definitions of these concepts are discussed subsequently).

Qualitative impairment in social interaction can take the form of markedly impaired non-verbal behaviors, failure in developmentally expectable peer relationships, lack of shared enjoyment or pleasure, or lack of social-emotional reciprocity. The stronger weighting of the impairments in socialization was noted during the field trial to be important in avoiding overdiagnosis of autism in more intellectually handicapped persons. This is also consistent with extensive previous clinical work, from the time of Kanner onward (e.g., Rutter, 1978; D. Cohen, 1980; Siegel, Vukicevic, Elliott, & Kraemer, 1989) that highlighted social dysfunction as the critical domain of impairment in autism.

Impairments in communication can take the form of delay or lack of spoken language, impairment in conversational ability, stereotyped language use, and deficits in imaginative play. For persons with autism, the delay or lack of spoken language must not be accompanied by compensations through other communicative means, for example, the use of

gesture. The domain of restricted patterns of behavior, interests, and activities includes encompassing preoccupations that are abnormal either in focus or intensity, adherence to non-functional routines or rituals, stereotyped motor movements, and persistent preoccupation with parts of objects.

The Definition of the Nonautistic PDDs

In contrast to *DSM-III-R*, a number of conditions other than autism and subthreshold autism (i.e., PDD-NOS) are now officially recognized in both *DSM-IV* and *ICD-10*. Given that these are newer disorders (at least in terms of their official recognition), it is not surprising that the substantive body of work on their definitions is less extensive than that for autism.

Rett's Disorder

There were few concerns about the validity of the entity explicated by Rett. It was clear that the transient, autistic-like phase of social withdrawal occurred early in the child's development and presented the primary problem for differentiation from autism (and one of the main arguments for its placement in the PDD class). However, there were some objections to including it in the PDD class (Gillberg, 1994) although it was also clear that it should be included somewhere (Rutter, 1994). The importance of its inclusion has been underscored by the subsequent discovery of a gene involved in the pathogenesis of the disorder (Amir, Van den Veyver, Wan, Tran, Francke, et al., 1999; also see Chapter 5, this *Handbook*, this volume).

Childhood Disintegrative Disorder

Although this condition had been included in *ICD-9* the presumption in *DSM-III-R* was that individuals with childhood disintegrative disorder (also known as Heller's syndrome or disintegrative psychosis) usually suffered from a neurological or other progressive process that accounted for their marked behavioral and developmental deterioration. The literature, however, did not support this association (Volkmar, 1992). While rare, childhood disintegrative disorder appeared to be a disorder that could be distinguished from autism and that was, like autism, of generally unknown etiology. The rationale for including

TABLE 1.4 ICD-10 Criteria for Autism

Childhood Autism (F84.0)

- A. Abnormal or impaired development is evident before the age of 3 years in at least one of the following areas:
- (1) receptive or expressive language as used in social communication;
 - (2) the development of selective social attachments or of reciprocal social interaction;
 - (3) functional or symbolic play.
- B. A total of at least six symptoms from (1), (2) and (3) must be present, with at least two from (1) and at least one from each of (2) and (3)
- (1) Qualitative impairment in social interaction are manifest in at least two of the following areas:
 - (a) failure adequately to use eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction;
 - (b) failure to develop (in a manner appropriate to mental age, and despite ample opportunities) peer relationships that involve a mutual sharing of interests, activities and emotions;
 - (c) lack of socio-emotional reciprocity as shown by an impaired or deviant response to other people's emotions; or lack of modulation of behaviour according to social context; or a weak integration of social, emotional, and communicative behaviors;
 - (d) lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., a lack of showing, bringing, or point out to other people objects of interest to the individual).
 - (2) Qualitative abnormalities communication as manifest in at least one of the following areas:
 - (a) delay in or total lack of, development of spoken language that is *not* accompanied by an attempt to compensate through the use of gestures or mime as an alternative mode of communication (often preceded by a lack of communicative babbling);
 - (b) relative failure to initiate or sustain conversational interchange (at whatever level of language skill is present), in which there is reciprocal responsiveness to the communications of the other person;
 - (c) stereotyped and repetitive use of language or idiosyncratic use of words or phrases;
 - (d) lack of varied spontaneous make-believe play or (when young) social imitative play.
 - (3) Restricted, repetitive, and stereotyped patterns of behaviour, interests, and activities are manifested in at least one of the following:
 - (a) an encompassing preoccupation with one or more stereotyped and restricted patterns of interest that are abnormal in content or focus; or one or more interests that are abnormal in their intensity and circumscribed nature though not in their content or focus;
 - (b) apparently compulsive adherence to specific, nonfunctional routines or rituals;
 - (c) stereotyped and repetitive motor mannerisms that involve either hand or finger flapping or twisting or complex whole body movements;
 - (d) preoccupations with part-objects or non-functional elements of play materials (such as their odour, the feel of their surface, or the noise or vibration they generate).
- C. The clinical picture is not attributable to the other varieties of pervasive developmental disorders; specific development disorder of receptive language (F80.2) with secondary socio-emotional problems' reactive attachment disorder (F94.1) or disinhibited attachment disorder (F94.2); mental retardation (F70-F72) with some associated emotional or behavioral disorders; schizophrenia (F20.-) of unusually early Onset; and Rett's syndrome (F84.12).

F84.1 Atypical autism

- A. Abnormal or impaired development is evident at or after the age of 3 years (criteria as for autism except for age of manifestation).
- B. There are qualitative abnormalities in reciprocal social interaction or in communication, or restricted, repetitive, and stereotyped patterns of behavior, interests, and activities. (Criteria as for autism except that it is unnecessary to meet the criteria for number of areas of abnormality.)
- C. The disorder does not meet the diagnostic criteria for autism (F84.0).

Autism may be atypical in either age of onset (F84.10) or symptomatology (F84.11); the two types are differentiated with a fifth character for research purposes. Syndromes that are typical in both respects should be coded F84.12.

F84.10 Atypicality in age of onset

- A. The disorder does not meet criterion A for autism (F84.0); that is, abnormal or impaired development is evident only at or after age 3 years.
- B. The disorder meets criteria B and C for autism (F84.0).

TABLE 1.4 (Continued)

F84.11 Atypicality in symptomatology

- A. The disorder meets criterion A for autism (F84.0); that is abnormal or impaired development is evident before age 3 years.
- B. There are qualitative abnormalities in reciprocal social interactions or in communication, or restricted, repetitive, and stereotyped patterns of behavior, interests, and activities. (Criteria as for autism except that it is unnecessary to meet the criteria for number of areas of abnormality.)
- C. The disorder meets criterion C for autism (F84.0).
- D. The disorder does not fully meet criterion B for autism (F84.0).

F84.12 Atypicality in both age of onset and symptomatology

- A. The disorder does not meet criterion A for autism (F84.0); that is, abnormal or impaired development is evident only at or after age 3 years.
- B. There are qualitative abnormalities in reciprocal social interactions or in communication, or restricted, repetitive, and stereotyped patterns of behavior, interests, and activities. (Criteria as for autism except that it is unnecessary to meet the criteria for number of areas of abnormality.)
- C. The disorder meets criterion C for autism (F84.0).
- D. The disorder does not fully meet criterion B for autism (F84.0).

DSM-IV Criteria for Autistic Disorder (299.0)

- A. A total of at least six items from (1), (2), and (3), with at least two from (1), and one each from (2) and (3):
 - (1) Qualitative impairment in social interaction, as manifested by at least two of the following:
 - (a) marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction,
 - (b) failure to develop peer relationships appropriate to developmental level,
 - (c) markedly impaired expression of pleasure in other people's happiness,
 - (d) lack of social or emotional reciprocity,
 - (2) Qualitative impairments in communication as manifested by at least one of the following:
 - (a) delay in or total lack of, the development of spoken language (not accompanied by an attempt to compensate through alternative modes of communication such as gestures or mime)
 - (b) in individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation with others
 - (c) stereotyped and repetitive use of language or idiosyncratic language
 - (d) lack of varied spontaneous make-believe play or social imitative play appropriate to developmental level
 - (3) Restricted repetitive and *stereotyped patterns of behavior, interests, and activities*, as manifested by at least one of the following:
 - (a) encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus
 - (b) apparently compulsive adherence to specific, nonfunctional routines or rituals
 - (c) stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole body movements)
 - (d) persistent preoccupation with parts of objects
- B. Delays or abnormal functioning in at least one of the following areas, with onset prior to age three: (1) social interaction, (2) language as used in social communication, or (3) symbolic or imaginative play.
- C. Not better accounted for by Rett's Disorder or Childhood Disintegrative Disorder.

Sources: From *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition, by American Psychiatric Association, 1994, Washington, DC: Author; and *International Classification of Diseases: Diagnostic Criteria for Research*, tenth edition, by the World Health Organization, 1992, Geneva, Switzerland: Author. Reprinted with permission.

this condition had less to do with its potential importance for research, for example, relative to the search for a gene or genes that might be involved, than its frequency. The limited data available also suggested some important potential differences from autism in terms of

course and prognosis (Volkmar & Rutter, 1995) although others (e.g., Hendry, 2000) have questioned the recognition of the category; these issues are discussed in greater detail in Chapter 3, this *Handbook*, of this volume.

Asperger's Disorder

In many ways, the inclusion and definition of this condition have been the source of the greatest continuing confusion and controversy (e.g., Klin, Sparrow, & Volkmar, 1997; see also Chapter 4, this *Handbook*, this volume). Although Asperger's original paper (Asperger, 1944) and his subsequent clinical work (Hippler & Klicpera, 2003) emphasized the presence of circumscribed interests and motor delays, they were technically not required in either the *ICD-10* or *DSM-IV* definition that was eventually adopted. Indeed, in *DSM-IV*, it was emphasized that autism should take diagnostic precedence; difficulties in the use of these criteria were quickly noted (Miller & Ozonoff, 1997, 2000). As a result, final closure on the best definition of this disorder has not yet been achieved.

Given the general dissatisfaction with the definition of Asperger's disorder (see Chapter 4, this *Handbook*, this volume), the unfortunate problem of markedly different approaches to the definition of the disorder has continued complicating comparisons of results across studies.

There are now at least five rather different conceptualizations of Asperger's disorder in addition to those provided by *ICD-10* and *DSM-IV* (Ghaziuddin, Tsai, & Ghaziuddin, 1992; Klin & Volkmar, 1997; Leekam, Libby, Wing, Gould, & Gillberg, 2000; Szatmari, Bryson, Boyle, Streiner, & Duku, 2003; Tsai, 1992; Wing, 1981). Unfortunately, these definitions are not always easy to operationalize. Several major sources of disagreement are apparent. The first issue has to do with the precedence rule, which (in *DSM-IV* and *ICD-10*) excludes an individual from Asperger's if the person ever met the criteria for autism. (As a practical matter, this ends up, largely, revolving around the age at which parents were first concerned about the child's development.) The second issue concerns the approach to language delay (usually operationalized by whether the child spontaneously used meaningful words by 24 months and phrases by 36 months; Howlin, 2003; Klin, Schultz, Pauls, & Volkmar, in press). A third major issue has to do with whether the unusual circumscribed interests originally described by Asperger (1944) must be present for diagnosis; in *DSM-IV* and *ICD-10*, these *may* be present but are

not required. In the *DSM-IV* field trial, the presence of such interest was one of the features that discriminated individuals with clinical diagnoses of autism from Asperger's disorder. The limited available data (see Chapter 4, this *Handbook*, this volume, and Klin et al., in press) suggest, not surprisingly, rather poor overall agreement of these different diagnostic approaches.

To some extent, these disparities in diagnostic approach parallel broader differences in the way the disorder is conceptualized. For example, is Asperger best thought of as a milder form of autism (Leekam et al., 2000), is it characterized by a rather different neuropsychological profile than autism (Klin, Volkmar, Sparrow, Cicchetti, & Rourke, 1995), or are the social difficulties different from autism (Tsai, 1992)? Yet another issue is how and whether motor skills problems are taken into account (Ghaziuddin & Butler, 1998) or whether some other feature, for example, prosody, might differentiate autism and Asperger's disorder (Ghaziuddin & Gerstein, 1996). Perhaps the one thing that can be said with certainty about current diagnostic approaches is that there is general agreement that the current official approach (as in *DSM-IV* and *ICD-10*) has not been easy to operationalize and has not proven useful for research. Miller and Ozonoff (1997) have raised the cogent point that Asperger's own cases likely would not meet current official criteria for the disorder; a recent report (Hippler & Klicpera, 2003) of cases seen by Asperger may help inform the current debate (see also Eisenmajer et al., 1996; Howlin, 2003; Szatmari et al., 2003).

It must, however, also be noted that even given the lack of general agreement on a general diagnostic approach, emerging data are beginning to suggest some important potential differences between Asperger's and higher functioning autism, for example, in terms of neuropsychological profiles (Klin et al., 1995; Lincoln, Courchesne, Kilman, Elmasian, & Allen, 1998), comorbidity with other psychiatric disorders (Klin et al., in press), neuropsychological profiles and family genetics (Volkmar & Klin, 1998) and outcome (Szatmari et al., 2003). The critical issue is whether Asperger's can be shown to differ in important respects from either autism or PDD-NOS on measures other than those used in selecting

cases in the first place; that is, information on the validity of the disorder is needed in areas such as differences in patterns of comorbidity, outcome, response to treatment, family history, or neuropsychological profiles. The relationship of Asperger's disorder to various other diagnostic concepts—for example, schizoid disorder, right hemisphere learning disability, and semantic pragmatic processing disorder—remains an important topic for research (see Klin, Volkmar, & Sparrow, 2000 for a review). Replication of findings based on the same diagnostic criteria used across sites is critical for progress to be made in this area. Until the time when a consensus on the definition of the condition emerges, it will be critical for researchers to employ very clear, operational depictions to allow for replication of findings.

Atypical Autism/PDD-NOS

Somewhat paradoxically, studies of what is undoubtedly the more frequent of the PDDs are uncommon (see Chapter 6, this *Handbook*, this volume). This subthreshold category receives considerable clinical use, and its importance

has been increasingly recognized in research studies (Bailey et al., 1998). *DSM-IV* and *ICD-10* take slightly different approaches to this category with *ICD-10* providing the possibility for more fine-grained distinctions based on the way in which full criteria for autism or another of the explicitly defined PDDs are not met. An unfortunate editorial change in *DSM-IV* produced some difficulties, which have now been rectified in *DSM-IV-TR*. Specifically, prior to *DSM-IV*, an individual had to have problems in social interaction *and* in communication *or* restricted interests. In *DSM-IV*, this criterion was changed leading to an unintended further broadening of the concept.

Table 1.5 provides a concise summary and comparison of the various disorders presently included within the overarching PDD category.

CURRENT CONTROVERSIES IN DIAGNOSIS

Although considerable progress has been made further work is needed in several areas.

TABLE 1.5 Differential Diagnostic Features of Autism and Nonautistic Pervasive Developmental Disorders

Feature	Disorder				
	Autistic Disorder	Asperger's	Rett's	Childhood Disintegrative Disorder	Pervasive Developmental Disorder-NOS
Age at recognition (months)	0–36	Usually >36	5–30	>24	Variable
Sex ratio	M > F	M > F	F (?M)	M > F	M > F
Loss of skills	Variable	Usually not	Marked	Marked	Usually not
Social skills	Very poor	Poor	Varies with age	Very poor	Variable
Communication skills	Usually poor	Fair	Very poor	Very poor	Fair to good
Circumscribed interests	Variable (mechanical)	Marked (facts)	NA	NA	Variable
Family history—similar problems	Sometimes	Frequent	Not usually	No	Unknown
Seizure disorder	Common	Uncommon	Frequent	Common	Uncommon
Head growth decelerates	No	No	Yes	No	No
IQ range	Severe MR to normal	Mild MR to normal	Severe MR	Severe MR	Severe MR to normal
Outcome	Poor to good	Fair to good	Very poor	Very poor	Fair to good

Adapted from “Nonautistic Pervasive Developmental Disorders,” chap. 27.2, p. 4, by F. R. Volkmar & D. Cohen, in *Psychiatry*, R. Michaels et al., eds. Used with permission from Lippincott-Raven Publishers. NA = Not Applicable.

Comorbid Conditions and Autism

The issue of comorbidity with autism has assumed increasing importance in recent years; it is intimately related to the search for subgroups of autism. It appears likely that having any serious disability—such as autism or intellectual disability—increases the risk for other problems, and it is likely that, in the past, autism has tended to overshadow the presence of other difficulties (see Dykens, 2000). Autism has now been reported to co-occur with various other developmental, psychiatric, and medical conditions (Gillberg & Coleman, 2000). However, much of this literature rests on case reports, and this literature fails to address the more central question of whether associations are observed at greater than chance levels and, when this is done, results are generally much less striking (Rutter et al., 1994). An additional problem is that only positive associations are typically reported; for example, it is somewhat surprising that failure to thrive in infancy is so *uncommonly* reported in infants who go on to have autism.

Evolving diagnostic concepts and research findings have sometimes clarified such associations. For example, Kanner's original impression (1943) that persons with autism had normal intellectual potential has been shown to be incorrect; although the pattern of cognitive and adaptive abilities in autism is unusual, for the majority of children with autism, overall scores on cognitive testing are stable within the mentally retarded range (see Chapter 29, this *Handbook*, Volume 2). On the other hand, a substantial minority of persons with autism has cognitive abilities in the average or above-average range. Similarly, it is now well recognized that seizure disorders of various types are associated with autism in about 25% of cases (see Chapter 18, this *Handbook*, this volume). A much smaller proportion of autistic individuals exhibit fragile X syndrome or tuberous sclerosis (see Chapter 18, this *Handbook*, this volume). Apart from these well-recognized associations, the association of autism with other medical and behavioral conditions is much less convincing (Rutter, Bailey, et al., 1994).

Issues relating to comorbidity arise from a major difference between approaches to

diagnosis in *DSM-IV* and *ICD-10*. Both systems are meant to be comprehensive in coverage. However, any system that attempts to move past the level of symptom description must deal with complicated problems of ensuring clinical utility, reliability, and validity. As a practical matter, this leads to decisions, sometimes fairly obvious and sometimes much less so, about relationships between categories, including whether one condition takes precedence over another in a diagnostic hierarchy. The *ICD-10* system reflects a nosological tradition of searching for a single, parsimonious diagnostic label to explain a patient's problems. This top-down approach tends to be concerned with broader, heuristic diagnoses and is less focused on symptoms as such. On the other hand, *DSM-IV* and its immediate predecessors have tended to be more bottom up in orientation. They start with symptoms and move toward broader categories. No single diagnosis is expected to convey the entire range of a patient's major problems, and there is more comfort with multiple categorical diagnoses, each covering a smaller domain of difficulties. In other words, *ICD* may miss some trees, and *DSM* may not capture the forest: Each approach has inherent advantages and limitations (see Volkmar & Schwab-Stone, 1996). The *DSM-IV* approach has some advantages for clinical utility; that is, important symptoms are less likely to be overlooked. It also does not prejudge the issue of comorbid relationships. The *ICD-10* approach has the advantage of providing a more robust big picture less focused on single symptoms and minimizing what are often spurious or meaningless associations.

The issue of comorbidity in relation to autism is further complicated by the nature of the syndrome. While autism is a lifelong disorder and probably one of the best examples of a disorder in psychiatry, symptoms change with age and developmental level. If the approach to diagnosis focuses on symptoms, an individual with autism will receive a large number of additional diagnoses over the course of the life span, including diagnoses that focus on anxiety, language, social problems, and the like. Such a list of additional diagnoses might serve a useful function by cataloging behaviors in need of clinical attention. But the list does not

basically change the fundamental conception that the person has autism.

Given the wide range and severity of the disabilities experienced by individuals with autism, it is not surprising that they are vulnerable to many types of behavioral difficulties, including hyperactivity, obsessive-compulsive phenomena, self-injury and stereotypy, tics, and affective symptoms (Brasic, Barnett, Kaplan, Sheitman, Aisemberg et al., 1994; Ghaziuddin et al., 1992; Ghaziuddin, Alessi, & Greden, 1995; Jaselskis, Cook, & Fletcher, 1992; Nelson & Pribor, 1993; Poustka & Lisch, 1993; Quintana et al., 1995; Realmuto & Main, 1982). Interpretation of the available data is more complex when you move past the level of behavioral observation and try to consider these associations within a causal framework. For example, the diagnosis of Tourette's syndrome requires only the history of motor and vocal tics for a year or more. Do the compulsive behaviors and vocalizations emitted by many individuals with autism and intellectual disability warrant a second diagnosis of Tourette's syndrome? When should obsessive-compulsive disorder be diagnosed in a retarded, autistic individual with many perseverative behaviors?

Diagnostic systems like *DSM-IV* and *ICD-10* strive for logical consistency in their approach to the problem of diagnosis; this usually means that some degree of hierarchical decision must be employed when, for example, features that are part of the definition of autism are observed in other disorders. Thus, since stereotyped behaviors are common in autism and are included as a diagnostic feature in both *DSM-IV* and *ICD-10*, persons with autism cannot also receive a diagnosis of stereotyped movement disorder. Similarly, diagnostic problems arise with difficulties that are commonly observed to be "associated features" of autism, for example, unusual affective responses. On the other hand, mental retardation is not an essential diagnostic feature of autism, and it is thus possible (and important) for this diagnosis and one of autism to be made when both sets of criteria are satisfied.

The task of moving from the level of behavioral problems and symptoms to formal psychiatric/developmental diagnosis is complicated by the nature of autism itself. Half of

autistic persons are largely or entirely mute, and for some disorders, this presents a profound diagnostic problem (Tsai, 1996). For example, early investigators incorrectly assumed continuity between autism and schizophrenia. While persons with autism may also develop schizophrenia (Petty, Ornitz, Michelman, & Zimmerman, 1985), this does not appear to be above the level expected in the general population (Volkmar & Cohen, 1991a). Similarly, the issue of comorbid obsessive-compulsive disorder and autism has been of interest given the use of new pharmacological treatments such as the selective serotonin reuptake inhibitors (SSRIs; see Chapter 44, this *Handbook*, Volume 2; Gordon, Rapoport, Hamburger, State, & Mannheim, 1992; Gordon, State, Nelson, Hamburger, & Rapoport, 1993; McDougle, Price, Volkmar, & Goodman, 1992). While phenomena suggestive of obsessions or compulsions are often observed in adults with autism (Rumsey, Rapoport, & Sceery, 1985), levels of such phenomena vary considerably across samples (Brasic et al., 1994; Fombonne, 1992; McDougle et al., 1995), and response to medication may not be specific to diagnosis. In general, it appears that the ritualistic phenomena of autism and typical obsessions and compulsions cannot simply be equated (Baron-Cohen, 1989).

Stereotyped motor movements and other mannerisms are very common in autism but do not qualify a case for the additional diagnosis of stereotyped movement disorder. However, a number of case reports and some case series have suggested a potentially more interesting association between autism and Tourette's disorder. In the latter condition, the child exhibits persistent motor *and* vocal tics (Burd, Fisher, Kerbeshian, & Arnold, 1987; Leckman, Peterson, Pauls, & Cohen, 1997; Nelson & Pribor, 1993; Realmuto & Main, 1982). It remains to be seen whether such an association is more frequent than would be expected by chance alone, particularly since differentiation of tics and stereotyped motor mannerisms can be confusing for less experienced clinicians.

Affective symptoms are frequently observed in persons with autism. These symptoms include affective lability, inappropriate affective responses, anxiety, and depression.

For higher functioning autistic persons, an awareness of their difficulties may result in overt clinical depression. There is some suggestion that adolescents with Asperger's are at particularly high risk for depression (Klin, Volkmar, & Sparrow, 2000). Bipolar disorders have also been reported and may respond to drug treatment (Gillberg, 1985; Kerbeshian, Burd, & Fisher, 1987; Komoto, Usui, & Hirata, 1984; Lainhart & Folstein, 1994; Steingard & Biederman, 1987).

Given the characteristic difficulties in social interaction and communication, as well as the frequent association of autism with mental retardation, it is not surprising that deployment and sustaining of attention would be problematic for individuals with autism (see Chapter 13, this *Handbook*, this volume). In *DSM-III-R*, the convention was established that autism and attention deficit disorder were made mutually exclusive diagnoses. This was based on the clinical belief that attentional problems in autism were better viewed as an aspect of the autistic condition and developmental level; there was a clinical impression that stimulant medications used in the treatment of attention deficit disorder often led to deterioration in the behavior of individuals with autism. The latter notion has now been called into question (see Towbin, 2003, for a review), and there is little doubt that attentional difficulties are observed in children with autism (Charman, 1998), but the question of whether such difficulties are sufficient to justify an additional diagnosis of attention deficit disorder remains unclear. Attentional difficulties may be intrinsically associated with developmental problems and may reflect broader difficulties in cognitive organization (Iacoboni, 2000) without necessarily implying attention deficit disorder. While some have suggested that attention deficit/hyperactivity disorder should be considered an additional diagnosis and target of treatment in persons with autism (Tsai, 1999), firm empirical data on this issue are lacking.

Barkely (1990) has noted that the issue of attentional problem is of much greater interest in children with PDD-NOS. Such children do not exhibit classical autism but have persistent problems in social interaction and the regulation of affective responses and behavior,

which may suggest disorders of attention. Hellgren, Gillberg, and Gillberg (1994) have described a putative condition characterized by problems in attention, motor control and perception (DAMP) with features of both PDD and attention deficit disorder.

Autistic individuals are not immune to any other known medical conditions (Chapters 16 & 18, this *Handbook*, this volume). Yet, specific associations between autism and general medical conditions generally have not been sustained by formal research. Although some investigators (e.g., Gillberg, 1990) suggest that many different associations are common, studies that employ stringent diagnostic criteria have not supported this view (e.g., Rutter, Bailey, Bolton, & Le Couter, 1994). In one sense, this issue is simply definitional. If you take a very broad view of autism, a large number of persons with profound intellectual disability will be included in samples of autistic individuals; this population has a marked increase in the number of medical conditions that may be significantly involved in the person's developmental difficulties. The difficulties inherent in including such cases among those with more strictly defined autism are exemplified in the early reports about the association of autism with congenital rubella. Children with congenital rubella initially were reported to have many autistic-like features and to be very low functioning; over time, however, the diagnoses of these cases have proven questionable.

Subtypes of Autism

Investigators have used various approaches to subtype autism and the broader PDD class of conditions. Essentially, these attempts have fallen into two broad categories. The more common approach rests on clinical experience and the ability of clinician-investigators to notice features that are then used to delineate a specific diagnostic concept. Kanner's description of autism and the work of Asperger, Rett, and Heller are all examples of this approach. More recent examples include the proposed typology based on social characteristics proposed by Wing and colleagues (Wing & Gould, 1979). The major alternative is to utilize more complex statistical procedures to derive subgroups or subtypes empirically. It might seem

more likely that the latter approach would be more productive, but, somewhat surprisingly, this really has not been the case.

Statistical Approaches to Subtyping

Complex statistical approaches have been helpful in developing and validating screening and assessment instruments, as well as in developing criteria to operationalize diagnostic concepts. Their value in developing *new* diagnostic categories has been limited by several factors. Approaches such as cluster and factor analysis, in the first place, are very dependent on the characteristic of the sample being studied and on the information originally provided; you cannot identify relevant variables or combinations of variables if they are not measured in the sample in the first place. Since our knowledge regarding the underlying neuropathological basis of autism and its relationship to development and behavior remains limited, it is not clear exactly what measures would best be included in such analyses. Another set of issues surrounds a set of interrelated problems: the marked range in syndrome expression associated with age and developmental level and issues related to sample selection and sample size. Nosological research using complex statistical models generally requires large and representative samples of patients. Unfortunately, the samples used in most studies are small and not representative. Results may be highly dependent on the original sample and may not generalize to other samples. This problem is compounded by the fact that the meaning of behaviors may change with age and with developmental level. The diagnosis of autism may be particularly difficult to make in very young children below the age of 3 years. You might assume that the purest form of autism is exhibited at this young age. However, as Lord (1995) has shown, the characteristic symptoms of autism such as repetitive behaviors often do not clearly develop before age 3 years while significant social deficits, suggestive of autism, may markedly improve after the first two years of life (see also Rogers, 2001).

The strong developmental nature of changes in syndrome expression means that variables such as age, developmental level, or IQ themselves become important variables in statistical

analyses. It is a testament to the creativity of engaged clinicians and to the human capacity to notice regularities that at least so far the diagnostic concepts we are presently familiar with have emerged from clinical work and not from complex statistical analyses. On the other hand, such analyses may be helpful in examining current diagnostic concepts and alternative ways to conceptualize syndrome boundaries. It is possible, in the future, that better diagnostic concepts will be derived, for example, within the broad category of PDD-NOS.

Despite these problems, cluster and factor analytic approaches have been used with some frequency. For example, in an early study, Prior and colleagues (Prior, Boulton, Gajago, & Perry, 1975) observed two clusters of cases. One cluster was more similar to Kanner's original syndrome in terms of early onset and clinical features and the other with later onset and more complex features. Similarly, Siegel, Anders, Ciaranello, Bienenstock, and Kramer (1986) identified four possible subgroups in a larger group of children with PDDs. Two groups appeared to correspond roughly to low and higher functioning autism while the other two groups were characterized either by schizotypal features or affective symptoms and behavior problems. Dahl, Cohen, and Provence (1986) identified two clusters of children in the PDD spectrum who had similar behavior problems but somewhat different patterns of language functioning and onset. Depending on sample and range of variables included in the analyses, various numbers of clusters have been derived. The less robust clusters—those with fewer cases and very complex clinical features—are less likely to be observed in subsequent studies. Eaves, Eaves, and Ho (1994) used data from over 150 children with autism spectrum disorders. In their sample, four meaningful subtypes emerged with different behavioral and cognitive profiles. Over half the sample fell into the subtype described as typically autistic; approximately 20% were also autistic but were lower functioning cognitively. The remaining cases formed two subtypes: One was a higher functioning group with similarities to Asperger's and another with less severe difficulties. Fein, Waterhouse, Lucci, and Snyder (1985) identified eight cognitive profiles that could be

related to handedness (Soper et al., 1986) but not to more usual autistic features. More recently, Waterhouse and colleagues (1996) studied a relatively large group of children with some form of PDD not associated with an overt medical condition; they suggested that at least two overlapping continua were present, corresponding roughly to lower and higher functioning autism.

Methods other than cluster and factor analysis have been employed as well in the search for subgroups. For example, I. Cohen, Sudhalter, Landon-Jimenez, and Keogh (1993) utilized a novel system of pattern recognition (neural networks) as well as discriminant analyses; they argued that the neural network procedure was superior in correctly identifying whether autism was or was not present. In a well-controlled study by Cicchetti, Volkmar, Klin, and Showalter (1995), however, the neural networks procedure was not as effective as the simple diagnostic algorithm proposed in *ICD-10* and *DSM-IV*.

Multivariate methods have also been utilized to validate existing diagnostic groupings and new possible subgroups, for example, within the broad PDD-NOS category (see also Chapter 6, this *Handbook*, this volume). Van der Gaag et al. (1995) utilized a multivariate cluster analysis and demonstrated differences between cases with autistic disorder and a specific subtype of PDD-NOS (multiplex or multiple complex developmental disorder) on the basis of clinical and developmental features.

Clinical Approaches to Subtyping

The issue of subtypes has also been approached from a clinical standpoint. Wing and Gould (1979) proposed a classification scheme based on the nature of observed patterns of social interaction (aloof, passive, active-but-odd; see also Chapter 7, this *Handbook*, this volume). Other classifications have focused on cognitive profiles (Fein et al., 1985), language problems (Rapin, 1991; Rapin & Allen, 1983), presence of signs of overt central nervous system dysfunction (Tsai, Tsai, & August, 1985), and so forth. A decade ago, it appeared that possible associations of autism with various medical conditions would have major implications for understanding subtypes and etiology. At present, however, it appears that distinctions based on the presence of a strictly defined etiology or

associated medical condition do not simply correspond to obvious behavioral subtypes (Rutter, 1996). As Rutter has noted (2000), conditions such as autism are defined on the basis of their clinical features, and it is likely that complex, multifactorial models will be needed to understand underlying pathophysiology. That is, systems such as *DSM* and *ICD* are strongly influenced by pathophysiology when this is known but should not simply be thought of as classifying by cause.

As with the more statistically based approaches, clinically inspired approaches also must deal with the major confounding problem of intellectual level. For example, the three-group subtyping (aloof, passive, active-but-odd) proposed by Wing and Gould (1979) appears to sort children into relatively reliable groups; the typology has some measure of validity as well as potential benefits for planning interventions (Borden & Ollendick, 1994; Castelloe & Dawson, 1993; Volkmar & Cohen, 1989). However, differences among the subgroups appear to be largely a function of associated IQ. When IQ is controlled for, differences among the groups largely vanish (Volkmar & Cohen, 1989).

Individuals with profound mental retardation exhibit a number of autistic-like features (Wing & Gould, 1979) without, however, meeting full criteria for autism. Such cases have many of the same service needs as those with more strictly defined autism. Various investigators have, accordingly, proposed a distinction among primary, higher, and lower functioning autism given the very different patterns of educational need, associated medical problems, outcome, family history, and so forth associated with lower and higher IQ (Cohen, Paul, & Volkmar, 1986; Rutter, 1996; Tsai, 1992; Waterhouse et al., 1996). This important issue remains unresolved. Similarly, it is clear that, over time, children with severe developmental language disorders go on to exhibit marked social difficulties (Howlin, Mawhood, & Rutter, 2000) so that the issue of the connection between language disorders and autism remains an important area of study.

Developmental Regression

Various studies have suggested that perhaps 20% to 25% of children with autism have some

degree of developmental regression (see Chapter 3, this *Handbook*, this volume). Unfortunately, this phenomenon remains poorly understood and, in part as a result, controversial. Most studies have utilized parent report with all the attendant problems of definition, reliability, and validity. In some cases, parents report a pattern less of regression and more one of developmental stagnation; in other cases, the report is of a regression but the history may also be remarkable for prior developmental delays. Finally, in some cases, a dramatic regression is observed (Siperstein & Volkmar, 2004). The most common pattern is one in which a few words are apparently acquired and then lost. The more dramatic cases (e.g., where hundreds of words are acquired and then lost) are often more consistent with a diagnosis of childhood disintegrative disorder; however, the latter condition, by definition, has its onset after age 2. It is possible that some of the earlier and more dramatic cases of regression are expressions of the earliest forms of childhood disintegrative disorder. In any event, the study of this phenomenon (ideally at the time it happens) using various methodologies (genetics, neuroimaging, EEG, etc.) is critically needed.

Developmental Change

Important issues of developmental change in syndrome expression (over both age and IQ level) have been recognized for many years (Rutter, 1970). Diagnostic systems such as *DSM-IV* and *ICD-10* have generally adopted the stance of providing criteria that are specifically meant to cover this range of syndrome expression. An alternative, if rather unwieldy, approach is to provide different diagnostic criteria either for different age groups or for different levels of impairment (e.g., depending on level of communicative ability).

Examination of the data from the *DSM-IV* field trial illustrates some of these issues. For example, if we utilize the phi statistic to evaluate the ability of criteria to predict autism, the criteria included in *DSM-IV* and *ICD-10* are generally comparably powerful predictors across age and developmental level with some expectable but not overly dramatic exceptions; for example, stereotyped language use and problems in conversation would be expected to become more common as children become

older (and make communicative gains). Stereotyped mannerisms also become somewhat more common when children become older while other features (e.g., persistent preoccupation with parts of objects) are consistently observed.

Examination of some of the items *not* included in *DSM-IV/ICD-10* also illustrates this issue. Abnormal pitch/tone is largely a phenomenon observed in older individuals while attachments to unusual objects are less commonly observed in older individuals. Similarly, the phenomenon of hyper- or hyposensitivity to the inanimate environment has a complicated developmental course with features exhibited at some ages and not others (see Chapter 32, this *Handbook*, Volume 2).

Autism in Infants and Young Children

Increased awareness (on the part of both the general public and health care providers) and advances in early diagnosis have led to a change in the age at which autism is first diagnosed. A decade ago, diagnosis at age 4 was relatively typical (Siegel, Pliner, Eschler, & Elliott, 1988)—even when parents had been concerned much earlier. It is now more common for specialized diagnostic centers to see children at age 2 years (Lord, 1995; Moore & Goodson, 2003) or even younger (Klin, Cahawarska, Paul, Rubin, Morgan, et al., 2004). The increased interest in early diagnosis and the increasing numbers of younger children presenting for assessment present special problems for diagnosis. In contrast to older individuals, the diagnosis of infants and very young children is more complex (Charman & Baird, 2002; Cox et al., 1999; Stone et al., 1999) with diagnostic stability increasing after about age 2 years (Courchesne, 2002; Dawson et al., 2002). However, developmental changes in this age group can be marked (Szatmari, Merette, Bryson, Thivierge, Roy, et al., 2002). For example, the repetitive behaviors typical of older children are much less common in very young children (Charman & Baird, 2002; Cox et al., 1999; Lord, 1995; Moore & Goodson, 2003; Stone et al., 1999). Social abnormalities may become more striking as the child matures (Lord, Storoschuk, Rutter, & Pickles, 1993).

A few studies have addressed the applicability of *DSM-IV* and *ICD-10* criteria in

infants and young children. It appears that some young children will meet criteria for autism, but some may not necessarily fulfill the required repetitive behavior criteria until around their third birthday (Lord, 1996). Less commonly, a child appears to meet criteria for autism but then, over time, makes substantial gain. Some alternatives to *DSM-IV* and *ICD-10* have been proposed (e.g., National Center for Clinical Infant Programs [NCCIP], 1994) but have not met with wide acceptance due to both practical and theoretical concerns.

Considerable efforts have gone into the development of methods to facilitate screening and early diagnosis (see Chapter 27, this *Handbook*, Volume 2). Given the apparent association of early identification and intervention with improved outcome (NRC, 2001) the issues of early diagnosis have assumed increasing importance. In addition to the various approaches for screening based on history and direct observation, new approaches are needed in which screening becomes more behavioral and less subjective (and thus more readily available in nonspecialist settings; see Chawarska, Klin, & Volkmar, 2003).

Cultural Issues and Diagnosis

The issue of cultural factors in the diagnosis of autism has been the subject of remarkably little discussion. As Brown and Rogers (2003) point out, this is somewhat paradoxical given the various governmental and other mandates for the study of cultural factors. While by no means excusing the dearth of studies, several factors likely have operated to reduce interest in this area. First, the general impression of clinicians seeing children from a range of cultures and subcultures around the world is one of how much more alike than different children are. While variations in treatment and, to some extent, theoretical conceptualizations differ (see Chapter 48, this *Handbook*, Volume 2), it is a testament to the robustness of autism as a diagnostic concept that cultural influences are not more striking. One potential exception (although one tending to prove the rule) relates to the high levels of autistic-like behavior in individuals who suffer severe early institutional deprivation (Rutter, 1999). More rigorous and well-controlled studies on the issue of social-cultural factors in autism are clearly

critically needed. Given the very limited literature on the topic of cultural factors, this area is one ripe for future research. Chapter 48 (this *Handbook*, Volume 2) provides an international perspective on this problem.

Defining the Broader Phenotype

Somewhat paradoxically as the definition of autism has become more elaborated, interest has also increased in the broader spectrum of difficulties apparently inherited in families (see Chapter 16, this *Handbook*, this volume). Most investigators would now agree what is transmitted genetically includes not only classical autism (Kanner, 1943) but a broader range of difficulties variously impacting on social development, communication, and/or behavior. Attempts are now being made to stratify families based on various measures initially designed for use in more stringently diagnostic autistic samples (Bishop, 1998; Constantino & Todd, 2003; Lord, 1990; Lord et al., 2000; Shao et al., 2002; Tadevosyan-Leyfer et al., 2003; Tanguay, Robertson, & Derrick, 1998). Such approaches hold promise for identifying broader dimensions of function/dysfunction in families. The development of new methods for assessing the broader phenotype (e.g., Bishop, 1998; Constantino & Todd, 2003) is of great interest in this regard.

In addition to both the more strictly defined cases of autism, the broader range of autism spectrum disorders includes difficulties that do not fit neatly into our current classification scheme. Such cases of atypical autism test the boundaries of our classification system but also serve to underscore the important point that individuals with these conditions have not always read the textbooks and may exhibit unusual patterns of difficulty suggestive of autism in some ways but also with important differences. Children reared in profoundly impoverished environments may exhibit marked social difficulties and other problems suggestive of autism (Rutter, 1999). Similar issues arise with respect to children who are congenitally blind (Hobson & Bishop, 2003). Yet another set of issues arises with regard to children who, at least initially, seem to exhibit problems more suggestive of a language disorder but, over time, exhibit a course and outcome in some ways more suggestive of

autism (Mawhood, Howlin, & Rutter, 2000). Issues with regard to differentiation of autism and Asperger's and language disorders have been noted (Bishop, 2000; Bishop & Norbury, 2002). Cases with unusual features or presentations are of great interest in that they may help to clarify syndrome boundaries, underscore areas where knowledge is lacking, and may clarify alternative mechanisms or developmental pathways. For example, while there is little disagreement that higher functioning autism and Asperger's disorder both are characterized by significant problems in social interaction in the face of average overall cognitive ability, the social difficulties appear to arise in the context of rather different developmental pathways and trajectories, for example, with preservation of language skills early on, and possibly later, in Asperger's but not in higher functioning autism (see Chapter 5, this *Handbook*, this volume).

CONCLUSION

Leo Kanner's description (1943) of the syndrome of early infantile autism has proven to be robust and enduring. To a remarkable degree, his observations and intuitions remain fresh and inspiring. False leads in the original work have been clarified by research. We are also aware of how much work remains 60 years later.

Studies have clarified that the disintegrative PDDs (Rett's disorder and childhood disintegrative disorder) differ from strictly defined autism in various ways (Tsai, 1992; Volkmar & Rutter, 1995); the study of these unusual conditions may be helpful in clarifying mechanisms of pathogenesis relevant to autism (see Chapters 3 & 5, this *Handbook*, this volume). The validity of the newest PDD—Asperger's disorder—apart from higher functioning autism is less clearly established and results contradictory (although often based on markedly differing definitions of the disorder; Gilchrist et al., 2001; Klin et al., 1995; Manjiviona & Prior, 1999; Miller & Ozonoff, 2000; Ozonoff, Pennington, & Rogers, 1991). The boundaries of Asperger's disorder with autism and other disorders, such as schizoid disorder of childhood (Wolff, 1998, 2000) and semantic-pragmatic

disorder (Bishop, 1989, 2002), also remain to be clearly established.

While *DSM-IV* and *ICD-10* are the most recent and most extensively evaluated diagnostic approaches for autism, they are undoubtedly not the last word on diagnosis. The present *DSM-IV* and *ICD-10* systems have the considerable advantage of being based on a relatively extensive set of data; they have clearly facilitated research and service. The dual-use constraints on *DSM*, that is, the use of the same criteria for both research and service, meant that brevity and ease of use were important considerations. The *ICD-10* system does not, at least for the research definitions, have this constraint. It remains to be seen whether the more detailed *ICD-10* research definition will, in the end, predominate. From the point of view of research, the attempt to link diagnostic instruments specially to diagnostic criteria is a considerable advantage and may mean that for research purposes, in effect, the more detailed research definition will come to dominate.

Probably the greatest nosological need at present is the classification of conditions that appear to fall within the broad class of the PDDs but do not meet criteria for presently recognized disorders. This group of conditions, referred to either as "atypical autism" or "pervasive developmental disorder not otherwise specified," includes a larger number of children than those who are stringently defined as autistic. Their nosological status is much less well defined (see Chapter 6, this *Handbook*, this volume). Concepts such as multiplex developmental disorder have been proposed for some of these individuals. A large subgroup of such cases is associated with severe mental handicap. These conditions require special services similar to those required for autism (Wing & Gould, 1979); their relationship to strictly defined autism remains an area of considerable interest and may have particular importance for family-genetic studies (Rutter, 1996). Biological and behavioral research depends on well-defined groups of patients and rigorous application of diagnostic methodologies. For example, genetic studies require clear definition of affected individuals and exclusion of false-positive cases. In turn, we can hope that future nosologies will be enriched by the inclusion of other types of data,

including genetic, neuroimaging, neurochemical, and other behavioral and biological markers. Thus, there is a critical dialectic between research in nosology and research of other types. Advances in both fields are mutually dependent and have the same goal: enhancing the understanding and care of individuals and advancing our understanding of autism and related conditions (Rutter, 1999).

Cross-References

Other syndromes presently included as PDDs are discussed in Chapters 3 through 6; Chapter 21 provides an alternative view of issues of diagnosis and classification; changes in syndrome expression are discussed in Chapters 8 through 10.

REFERENCES

- American Psychiatric Association. (1952). *Diagnostic and statistical manual of mental disorders*. Washington, DC: Author.
- American Psychiatric Association. (1968). *Diagnostic and statistical manual of mental disorders* (2nd ed.). Washington, DC: Author.
- American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington, DC: Author.
- American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed., rev.). Washington, DC: Author.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- Amir, R. E., Van den Veyver, I. B., Wan, M., Tran, C. Q., Francke, U., & Zoghbi, H. Y. (1999). Rett syndrome is caused by mutations in X-linked MECP2, encoding methyl-CpG-binding protein 2 [See comment]. *Nature Genetics*, 23(2), 185–188.
- Asperger, H. (1944). Die “autistischen Psychopathen” im Kindersalter. *Archiv für psychiatrie und Nervenkrankheiten*, 117, 76–136.
- Bailey, A., Palferman, S., Heavey, L., & Le Couteur, A. (1998). Autism: The phenotype in relatives. *Journal of Autism and Developmental Disorders*, 28(5), 369–392.
- Barkely, R. A. (1990). *Attention deficit hyperactivity disorder: A handbook for diagnosis and treatment*. New York: Guilford Press.
- Baron-Cohen, S. (1989). Do autistic children have obsessions and compulsions? *British Journal of Clinical Psychology*, 28(3), 193–200.
- Bartak, L., Rutter, M., & Cox, A. (1977). A comparative study of infantile autism and specific developmental receptive language disorders—III. Discriminant function analysis. *Journal of Autism and Childhood Schizophrenia*, 7, 383–396.
- Bender, L. (1946). Childhood schizophrenia. *American Journal of Orthopsychiatry*, 17, 40–56.
- Bishop, D. V. (1989). Autism, Asperger’s syndrome and semantic-pragmatic disorder: Where are the boundaries? [Special issue: Autism]. *British Journal of Disorders of Communication*, 24(2), 107–121.
- Bishop, D. V. (1998). Development of the Children’s Communication Checklist (CCC): A method for assessing qualitative aspects of communicative impairment in children. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 39(6), 879–891.
- Bishop, D. V. (2000). What’s so special about Asperger syndrome? The need for further exploration of the borderlands of autism. In A. Klin & F. R. Volkmar (Eds.), *Asperger syndrome* (pp. 254–277). New York: Guilford Press.
- Bishop, D. V., & Norbury, C. F. (2002). Exploring the borderlands of autistic disorder and specific language impairment: A study using standardised diagnostic instruments. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 43(7), 917–929.
- Bleuler, E. (1951). *Dementia Praecox, or the Group of Schizophrenia*. Translated by J. Zinkin. New York: International Universities Press. (Original work published 1911)
- Borden, M. C., & Ollendick, T. H. (1994). An examination of the validity of social subtypes in autism. *Journal of Autism and Developmental Disorders*, 24(1), 23–37.
- Brasic, J. R., Barnett, J. Y., Kaplan, D., Sheitman, B. B., Aisemberg, P., Lafargue, R. T., et al. (1994). Clomipramine ameliorates adventitious movements and compulsions in prepubertal boys with autistic disorder and severe mental retardation. *Neurology*, 44(7), 1309–1312.
- Brown, J. R., & Rogers, S. J. (2003). Cultural issues in autism. In R. L. Hendren, S. Ozonoff, & S. Rogers (Eds.), *Autism spectrum disorders* (pp. 209–226). Washington, DC: American Psychiatric Press.
- Buitelaar, J. K., Van der Gaag, R., Klin, A., & Volkmar, F. (1999). Exploring the boundaries of Pervasive Developmental Disorder Not Otherwise Specified: Analyses of data from the DSM-IV autistic field trial. *Journal of Autism and Developmental Disorders*, 29(1), 33–43.
- Burd, L., Fisher, W. W., Kerbeshian, J., & Arnold, M. E. (1987). Is development of Tourette dis-

- order a marker for improvement in patients with autism and other pervasive developmental disorders? *Journal of the American Academy of Child and Adolescent Psychiatry*, 26(2), 162–165.
- Candland, D. K. (1993). Feral children and clever animals: Reflections on human nature. *Oxford University Press*, 411.
- Cantwell, D. P. (1996). Classification of Child and Adolescent Psychopathology. *Journal of Child Psychiatry and Psychology*, 37, 3–12.
- Cantwell, D. P., Baker, L., & Rutter, M. (1979). Families of autistic children and dysphasic children: Family life and interaction patterns. *Archives of General Psychiatry*, 36, 682–687.
- Castelloe, P., & Dawson, G. (1993). Subclassification of children with autism and pervasive developmental disorder: A questionnaire based on Wing's subgrouping scheme. *Journal of Autism and Developmental Disorders*, 23(2), 229–241.
- Charman, T. (1998). Specifying the nature and course of the joint attention impairment in autism in the preschool years: Implications for diagnosis and intervention. *Autism: International Journal of Research and Practice*, 2(1), 61–79.
- Charman, T., & Baird, G. (2002). Practitioner review: Diagnosis of autism spectrum disorder in 2- and 3-year-old children. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 43(3), 289–305.
- Chawarska, K., Klin, A., & Volkmar, F. (2003). Automatic attention cueing through eye movement in 2-year-old children with autism. *Child Development*, 74(4), 1108–1122.
- Chess, S., Fernandez, P., & Korn, S. (1978). Behavioral consequences of congenital rubella. *Journal of Pediatrics*, 93(4), 699–703.
- Cicchetti, D. V., Volkmar, F. R., Klin, A., & Showalter, D. (1995). Diagnosing autism using *ICD-10* criteria: A comparison of neural networks and standard multi variate procedures. *Journal of Child Neuropsychology*, 1(1), 26–37.
- Cohen, D. J. (1976). The diagnostic process in child psychiatry. *Psychiatric Annals*, 6(9), 29–56.
- Cohen, D. J. (1980). The pathology of the self in primary childhood autism and Gilles de la Tourette syndrome. In B. Blinder (Ed.), *Psychiatric clinics of North America* (pp. 383–402). Philadelphia: Saunders.
- Cohen, D. J., Paul, R., & Volkmar, F. R. (1986). Issues in the classification of pervasive and other developmental disorders: Toward *DSM-IV*. *Journal of the American Academy of Child Psychiatry*, 25(2), 213–220.
- Cohen, I. L., Sudhalter, V., Landon-Jimenez, D., & Keogh, M. (1993). A neural network approach to the classification of autism. *Journal of Autism and Developmental Disorders*, 23(3), 443–466.
- Constantino, J. N., & Todd, R. D. (2003). Autistic traits in the general population: A twin study. *Archives of General Psychiatry*, 60(5), 524–530.
- Courchesne, E. (2002). Abnormal early brain development in autism. *Molecular Psychiatry*, 7(Suppl. 2), S21–S23.
- Cox, A., Klein, K., Charman, T., Baird, G., Baron-Cohen, S., Swettenham, J., et al. (1999). Autism spectrum disorders at 20 and 42 months of age: Stability of clinical and ADI-R diagnosis. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 40(5), 719–732.
- Dahl, E. K., Cohen, D. J., & Provence, S. (1986). Clinical and multivariate approaches to the nosology of pervasive developmental disorders. *Journal of the American Academy of Child Psychiatry*, 25(2), 170–180.
- Dawson, G., Munson, J., Estes, A., Osterling, J., McPartland, J., Toth, K., et al. (2002). Neurocognitive function and joint attention ability in young children with autism spectrum disorder versus developmental delay. *Child Development*, 73(2), 345–358.
- DeMyer, M. K., Hingtgen, J. N., & Jackson, R. K. (1981). Infantile autism reviewed: A decade of research. *Schizophrenia Bulletin*, 7(3), 388–451.
- Dykens, E. M. (2000). Psychopathology in children with intellectual disability. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 41(4), 407–417.
- Eaves, L. C., Eaves, D. M., & Ho, H. H. (1994). Subtypes of autism by cluster analysis. *Journal of Autism and Developmental Disorders*, 24(1), 3–22.
- Eisenmajer, R., Prior, M., Leekam, S., Wing, L., Ong, B., Gould, J., et al. (1996). Comparison of clinical symptoms in autism and Asperger's disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, 35(11), 1523–1531.
- Factor, D. C., Freeman, N. L., & Kardash, A. (1989, December). A comparison of *DSM-III* and *DSM-III-R* criteria for autism. *Journal of Autism and Developmental Disorders*, 19(4), 637–640.
- Fein, D., Waterhouse, L., Lucci, D., & Snyder, D. (1985). Cognitive subtypes in developmentally disabled children: A pilot study. *Journal of Autism and Developmental Disorders*, 15(1), 77–95.

- Fombonne, E. (1992). Diagnostic assessment in a sample of autistic and developmentally impaired adolescents [Special issue: Classification and diagnosis]. *Journal of Autism and Developmental Disorders*, 22(4), 563–581.
- Frances, A. J., Widiger, T. A., & Pincus, H. A. (1989). The development of *DSM-IV*. *Archives of General Psychiatry*, 46, 373–375.
- Ghaziuddin, M., Alessi, N., & Greden, J. F. (1995). Life events and depression in children with pervasive disorders. *Journal of Autism and Developmental Disorders*, 25(5), 495–502.
- Ghaziuddin, M., & Butler, E. (1998). Clumsiness in autism and Asperger syndrome: A further report. *Journal of Intellectual Disability Research*, 42(Pt. 1), 43–48.
- Ghaziuddin, M., & Gerstein, L. (1996). Pedantic speaking style differentiates Asperger syndrome from high-functioning autism. *Journal of Autism and Developmental Disorders*, 26(6), 585–595.
- Ghaziuddin, M., Tsai, L., & Ghaziuddin, N. (1992). Comorbidity of autistic disorder in children and adolescents. *European Child and Adolescent Psychiatry*, 1(4), 209–213.
- Gilchrist, A., Green, J., Cox, A., Burton, D., Rutter, M., & Le Couteur, A. (2001). Development and current functioning in adolescents with Asperger syndrome: A comparative study. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 42(2), 227–240.
- Gillberg, C. (1985). Asperger's syndrome and recurrent psychosis: A case study. *Journal of Autism and Developmental Disorders*, 15(4), 389–397.
- Gillberg, C. (1990). Medical work-up in children with autism and Asperger syndrome. *Brain Dysfunction*, 3(5/6), 249–260.
- Gillberg, C. (1991). Debate and argument: Is autism a pervasive developmental disorder? *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 32(7), 1169–1170.
- Gillberg, C. (1994). Debate and argument: Having Rett syndrome in the *ICD-10* PDD category does not make sense. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 35(2), 377–378.
- Gillberg, C., & M. Coleman. (2000). *The biology of the autistic syndromes* (3rd ed.). London: Mac Keith Press.
- Gordon, C. T., Rapoport, J. L., Hamburger, S. D., State, R. C., & Mannheim, G. B. (1992). Differential response of seven subjects with autistic disorder to clomipramine and desipramine. *American Journal of Psychiatry*, 149(3), 363–366.
- Gordon, C. T., State, R. C., Nelson, J. E., Hamburger, S. D., & Rapoport, J. L. (1993). A double-blind comparison of clomipramine, desipramine, and placebo in the treatment of autistic disorder. *Archives of General Psychiatry*, 50(6), 441–447.
- Harper, J., & Williams, S. (1975). Age and type of onset as critical variables in early infantile autism. *Journal of Autism and Childhood Schizophrenia*, 5, 25–35.
- Heller, T. (1908). Dementia Infantilis. Zeitschrift für die Erforschung und Behandlung des Jugendlichen. *Schwachsinn*, 2, 141–165.
- Hellgren, L., Gillberg, C., & Gillberg, I. C. (1994). Children with deficits in attention, motor control and perception (DAMP) almost grown up: The contribution of various background to outcome at age 16 years. *European Child and Adolescent Psychiatry*, 3(1), 1–15.
- Hendry, C. N. (2000). Childhood disintegrative disorder: Should it be considered a distinct diagnosis. *Clinical Psychology Review*, 20, 77–90.
- Hertzog, M. E., Snow, M. E., New, E., & Shapiro, T. (1990). *DSM-III* and *DSM-III-R* diagnosis of autism and pervasive. *Journal of the American Academy of Child and Adolescent Psychiatry*, 29(1), 123–126.
- Hippler, K., & Klicpera, C. (2003). A retrospective analysis of the clinical case records of “autistic psychopaths” diagnosed by Hans Asperger and his team at the University Children's Hospital, Vienna. In U. Frith & E. Hill (Eds.), *Autism: Mind and Brain* (pp. 21–42). Oxford, England: Oxford University Press.
- Hobbs, N. (1975). *Issues in the classification of children*. San Francisco: Jossey-Bass.
- Hobson, R. P., & Bishop, M. (2003). The pathogenesis of autism: Insights from congenital blindness. *Philosophical Transactions of the Royal Society of London—Series B: Biological Sciences*, 358(1430), 335–344.
- Howlin, P. (2003). Outcome in high-functioning adults with autism with and without early language delays: Implications for the differentiation between autism and Asperger syndrome. *Journal of Autism and Developmental Disorders*, 33(1), 3–13.
- Howlin, P., Mawhood, L., & Rutter, M. (2000). Autism and developmental receptive language disorders—a follow-up comparison in early adult life: II. Social, behavioural, and psychiatric outcomes. *Journal of Child Psychology and Psychiatry*, 41, 561–578.
- Iacoboni, M. (2000). Attention and sensorimotor integration: Mapping the embodied mind. In A. W. Toga & J. C. Mazziotta (Eds.), *Brain mapping: The systems* (pp. 463–490). San Diego, CA: Academic Press.
- Jaselskis, C. A., Cook, E. H., & Fletcher, K. E. (1992). Clonidine treatment of hyperactive

- and impulsive children with autistic disorder. *Journal of Clinical Psychopharmacology*, 12(5), 322–327.
- Kanner, L. (1943). Autistic disturbances of affective contact. *Nervous Child*, 2, 217–250.
- Kereshian, J., Burd, L., & Fisher, W. (1987). Lithium carbonate in the treatment of two patients with infantile autism and atypical bipolar symptomatology. *Journal of Clinical Psychopharmacology*, 7(6), 401–405.
- Klin, A., Chawarska, K., Paul, R., Rubin, E., Morgan, T., Wiesner, L., & Volkmar, F. R. (2004). Autism in a 15 month old child. *American Journal of Psychiatry*, 161, 1981–1988.
- Klin, A., Jones, W., Schultz, R., & Volkmar, F. (2003). The enactive mind, or from actions to cognition: Lessons from autism. *Philosophical Transactions of the Royal Society of London—Series B: Biological Sciences*, 358(1430), 345–360.
- Klin, A., Lang, J., Cicchetti, D. V., & Volkmar, F. R. (2000). Brief report: Interrater reliability of clinical diagnosis and *DSM-IV* criteria for autistic disorder: Results of the *DSM-IV* autism field trial. *Journal of Autism and Developmental Disorders*, 30(2), 163–167.
- Klin, A., Schultz, R., Pauls, D., & Volkmar, F. R. (in press). Three diagnostic approaches to Asperger's Disorder. *Journal of Autism and Developmental Disorders*.
- Klin, A., Sparrow, S., & Volkmar, F. R. (1997). *Asperger's syndrome*. New York: Guilford Press.
- Klin, A., & Volkmar, F. R. (1997). Asperger's Syndrome. In D. J. Cohen & F. R. Volkmar (Eds.), *Handbook of Autism and Pervasive Developmental Disorders* (2nd ed., pp. 94–122). New York: Wiley.
- Klin, A., Volkmar, F. R., & Sparrow, S. S. (Eds.). (2000). *Asperger syndrome*. New York: Guilford Press.
- Klin, A., Volkmar, F. R., Sparrow, S. S., Cicchetti, D. V., & Rourke, B. P. (1995). Validity and neuropsychological characterization of Asperger syndrome: Convergence with nonverbal learning disabilities syndrome. *Journal of Child Psychology and Psychiatry*, 36(7), 1127–1140.
- Kolvin, I. (1971). Studies in childhood psychoses: Diagnostic criteria and classification. *British Journal of Psychiatry*, 118, 381–384.
- Komoto, J., Usui, S., & Hirata, J. (1984). Infantile autism and affective disorder. *Journal of Autism and Developmental Disorders*, 14(1), 81–84.
- Kramer, M. (1968). The history of the efforts to agree on an international classification of mental disorders. In *Diagnostic and statistical manual of mental disorders* (2nd ed., pp. xi–xx). Washington, DC: American Psychiatric Association.
- Lainhart, J. E., & Folstein, S. E. (1994). Affective disorders in people with autism: A review of published cases. *Journal of Autism and Developmental Disorders*, 24(5), 587–601.
- Leckman, J. F., Peterson, B. S., Pauls, D. L., & Cohen, D. J. (1997). Tic disorders. *Psychiatric Clinics of North America*, 20(4), 839–861.
- Leekam, S., Libby, S., Wing, L., Gould, J., & Gillberg, C. (2000). Comparison of *ICD-10* and Gillberg's criteria for Asperger syndrome [Special issue: Asperger syndrome]. *Autism: Journal of Research and Practice*, 4(1), 11–28.
- Lincoln, A. E., Courchesne, E., Kilman, B. A., Elmasian, R., & Allen, M. (1998). Neurobiology of Asperger syndrome: Seven case studies and quantitative magnetic resonance imaging findings. In E. Schopler, G. B. Mesibov, & L. J. Kunc (Eds.), *Asperger syndrome or high functioning autism?* (pp. 145–166). New York: Plenum Press.
- Lockyer, L., & Rutter, M. (1969). A five to fifteen year follow-up study of infantile psychosis: III. Psychological Aspects. *British Journal of Psychiatry*, 115, 865–882.
- Lockyer, L., & Rutter, M. (1970). A five to fifteen year follow-up study of infantile psychosis. *British Journal of Social and Clinical Psychology*, 9, 152–163.
- Lord, C. (1995). Follow-up of two year olds referred for possible autism. *Journal of Child Psychology and Psychiatry*, 36, 1365–1382.
- Lord, C., Storoschuk, S., Rutter, M., & Pickles, A. (1993). Using the ADI-R to diagnose autism in preschool children. *Infant Mental Health Journal*, 14(3), 234–252.
- Magnusson, P., & Saemundsen, E. (2001). Prevalence of autism in Iceland. *Journal of Autism and Developmental Disorders*, 31(2), 153–163.
- Mahler, M. (1952). On child psychoses and schizophrenia: Autistic and symbiotic infantile psychoses. *Psychoanalytic Study of the Child*, 7, 286–305.
- Manjiviona, J., & Prior, M. (1999). Neuropsychological profiles of children with Asperger syndrome and autism. *Autism: International Journal of Research and Practice*, 3(4), 327–356.
- Mawhood, L., Howlin, P., & Rutter, M. (2000). Autism and developmental receptive language disorder—a comparative follow-up in early adult life. I: Cognitive and language outcomes. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 41(5), 547–559.
- McDougle, C. J., Kresch, L. E., Goodman, W. K., Naylor, S. T., Volkmar, F. R., Cohen, D. J., et al. (1995). A case-controlled study of repetitive

- thoughts and behavior in adults with autistic disorder and obsessive-compulsive disorder. *American Journal of Psychiatry*, 152(5), 772–777.
- McDougle, C. J., Price, L. H., Volkmar, F. R., & Goodman, W. K. E. (1992). Clomipramine in autism: Preliminary evidence of efficacy. *Journal of the American Academy of Child and Adolescent Psychiatry*, 31(4), 746–750.
- Miller, J. N., & Ozonoff, S. (1997). Did Asperger's cases have Asperger disorder? A research note. *Journal of Child Psychology and Psychiatry*, 38(2), 247–251.
- Miller, J. N., & Ozonoff, S. (2000). The external validity of Asperger disorder: Lack of evidence from the domain of neuropsychology. *Journal of Abnormal Psychology*, 109(2), 227–238.
- Moore, V., & Goodson, S. (2003). How well does early diagnosis of autism stand the test of time? Follow-up study of children assessed for autism at age 2 and development of an early diagnostic service. *Autism: International Journal of Research and Practice*, 7(1), 47–63.
- Mundy, P., Sigman, M. D., Ungerer, J., & Sherman, T. (1986). Defining the social deficits of autism: The contribution of non-verbal. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 27(5), 657–669.
- National Center for Clinical Infant Programs. (1994). Diagnostic classification: 0–3. *National Center for Clinical Infant Programs*. Washington, DC: Author.
- National Research Council. (2001). *Educating young children with Autism*. Washington, DC: National Academy Press.
- Nelson, E. C., & Pribor, E. F. (1993). A calendar savant with autism and Tourette syndrome: Response to treatment and thoughts on the interrelationships of these conditions. *Annals of Clinical Psychiatry*, 5(2), 135–140.
- Ozonoff, S., Pennington, B. F., & Rogers, S. J. (1991). Executive function deficits in high-functioning autistic individuals: Relationship to theory of mind. *Journal of Child Psychology and Psychiatry*, 32(7), 1081–1105.
- Petty, L. K., Ornitz, E. M., Michelman, J. D., & Zimmerman, E. G. (1985). Autistic children who become schizophrenic. *Annual Progress in Child Psychiatry and Child Development*.
- Pickles, A., Starr, E., Kazak, S., Bolton, P., Papanikolaou, K., Bailey, A., et al. (2000). Variable expression of the autism broader phenotype: Findings from extended pedigrees. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 41(4), 491–502.
- Piven, J., Palmer, P., Jacobi, D., Childress, D., & Arndt, S. (1997). Broader autism phenotype: Evidence from a family history study of multiple-incidence autism families. *American Journal of Psychiatry*, 154(2), 185–190.
- Poustka, F., & Lisch, S. (1993). Autistic behaviour domains and their relation to self-injurious behaviour. *Acta Paedopsychiatrica: International Journal of Child and Adolescent Psychiatry*, 56(2), 69–73.
- Prior, M., Boulton, D., Gajago, C., & Perry, D. (1975). The classification of childhood psychoses by numerical taxonomy. *Journal of Child Psychology and Psychiatry*, 16(4), 321–330.
- Provence, S., & Dahl, K. (1987). Disorders of atypical development: Diagnostic issues raised by a spectrum disorder. In D. Cohen & A. Donnellan (Eds.), *Handbook of autism and pervasive developmental disorders* (pp. 677–689). New York: Wiley.
- Quintana, H., Birmaher, B., Stedje, D., Lennon, S., Freed, J., Bridge, J., et al. (1995). Use of methylphenidate in the treatment of children with autistic disorder. *Journal of Autism and Developmental Disorders*, 25(3), 283–294.
- Rank, B. (1949). Adaptation of the psychoanalytic technique for the treatment of young children with atypical development. *American Journal of Orthopsychiatry*, 19, 130–139.
- Rapin, I. (1991). Autistic children: Diagnosis and clinical features. *Pediatrics*, 87(5, Pt. 2), 751–760.
- Rapin, I., & Allen, D. A. (1983). Developmental language disorders: Nosologic considerations. In U. Kirk (Ed.), *Neuropsychology of language, reading and spelling* (pp. 155–184). New York: Academic Press.
- Realmuto, G. M., & Main, B. (1982). Coincidence of Tourette's disorder and infantile autism. *Journal of Autism and Developmental Disorders*, 12(4), 367–372.
- Rett, A. (1966). Über ein eigenartiges hirntrophisches Syndrom bei hyperammonie im Kindersalter. *Wein Medizinische Wochenschrift*, 118, 723–726.
- Ritvo, E. R., & Freeman, B. J. (1977). National Society for Autistic Children definition of the syndrome of. *Journal of Pediatric Psychology*, 2(4), 142–145.
- Rogers, S. (2001). Diagnosis of autism before the age of 3. *International review of research in mental retardation: Autism* (23), 1–31.
- Rogers, S., & Ozonoff, S. (in press). What do we know about sensory dysfunction in autism? A critical review of the empirical evidence. *Journal of Child Psychology and Psychiatry*.
- Rumsey, J. M., Rapoport, J. L., & Sceery, W. R. (1985). Autistic children as adults: Psychiatric,

- social, and behavioral. *Journal of the American Academy of Child Psychiatry*, 24(4), 465–473.
- Rutter, M. (1970). Autistic children: Infancy to adulthood. *Seminars in Psychiatry*, 2, 435–450.
- Rutter, M. (1978). Diagnostic validity in child psychiatry. *Advances in Biological Psychiatry*, 2, 2–22.
- Rutter, M. (1994). Debate and argument: There are connections between brain and mind and it is important that Rett syndrome be classified somewhere. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 35(2), 379–381.
- Rutter, M. (1996). Autism research: Prospects and priorities. *Journal of Autism and Developmental Disorders*, 26, 257–276.
- Rutter, M. (1999). The Emmanual Miller Memorial Lectur 1998: Autism: Two-way interplay between research and clinical world. *Journal of Child Psychology and Psychiatry*, 40, 169–188.
- Rutter, M. (2000). Genetic studies of autism: From the 1970s into the millennium. *Journal of Abnormal Child Psychology*, 28(1), 3–14.
- Rutter, M. (2002). Classification: Conceptual issues and substantive findings. In E. Taylor & M. Rutter (Eds.), *Child and adolescent psychiatry* (4th ed., pp. 3–17). Oxford, England: Blackwell.
- Rutter, M., Bailey, A., Bolton, P., & Le Couter, A. (1994). Autism and known medical conditions: Myth and substance. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 35(2), 311–322.
- Rutter, M., & Garmezy, N. (1983). Developmental psychopathology. In E. M. Hetherington (Ed.), *Mussen's handbook of child psychology: Vol. 4. Socialization, personality and child development* (pp. 755–911). New York: Wiley.
- Rutter M., & Gould, M. (1985). Classification. In M. Rutter & L. Hersov (Eds.), *Child and Adolescent Psychiatry: Modern Approaches* (2nd ed., pp. 304–321). Cambridge, MA: Blackwell.
- Rutter, M., Le Couteur, A., & Lord, C. (2003). *Autism diagnostic interview-Revised*. Los Angeles: Western Psychological Services.
- Rutter, M., & Schopler, E. (1992). Classification of pervasive developmental disorders: Some concepts and practical considerations [Special issue: Classification and diagnosis]. *Journal of Autism and Developmental Disorders*, 22(4), 459–482.
- Rutter, M., Shaffer, D., & Shepherd, M. (1975). *A multiaxial classification of child psychiatric disorders*. Geneva, Switzerland: World Health Organization.
- Sartorius, N. (1988). International perspectives of psychiatric classification. *British Journal of Psychiatry*, 152(Suppl.), 9–14.
- Shao, Y., Raiford, K. L., Wolpert, C. M., Cope, H. A., Ravan, S. A., Ashley-Koch, A. A., et al. (2002). Phenotypic homogeneity provides increased support for linkage on chromosome 2 in autistic disorder. *American Journal of Human Genetics*, 70(4), 1058–1061.
- Short, A., & Schopler, E. (1988). Factors relating to age of onset in autism. *Journal of Autism and Developmental Disorders*, 18, 207–216.
- Siegel, B., Anders, T. F., Ciaranello, R. D., Bienenstock, B., & Kraemer, H. C. (1986). Empirically derived subclassification of the autistic syndrome. *Journal of Autism and Developmental Disorders*, 16(3), 275–293.
- Siegel, B., Pliner, C., Eschler, J., & Elliott, G. R. (1988). How children with autism are diagnosed: Difficulties in identification of children with multiple developmental delays. *Journal of Developmental Behavioral Pediatrics*, 9(4), 199–204.
- Siegel, B., Vukicevic, J., Elliott, G. R., & Kraemer, H. C. (1989). The use of signal detection theory to assess *DSM-III-R* criteria for autistic disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, 28(4), 542–548.
- Simon, N. (1978). Kaspar Hauser's recovery and autopsy: A perspective on neurological and sociological requirements for language development. *Journal of Autism and Childhood Schizophrenia*, 8(2), 209–217.
- Siperstein, R., & Volkmar, F. R. (2004). Parental reporting of regression in children with pervasive developmental disorders. *Journal of Autism and Developmental Disorders*.
- Soper, H. V., Satz, P., Orsini, D. L., Henry, R. R., Zvi, J. C., & Schulman, M. (1986). Handedness patterns in autism suggest subtypes. *Journal of Autism and Developmental Disorders*, 16(2), 155–167.
- Spitzer, R. L., Endicott, J. E., & Robins, E. (1978). Research diagnostic criteria. *Archives of General Psychiatry*, 35, 773–782.
- Spitzer, R. L., & Siegel, B. (1990). The *DSM-III-R* field trial of pervasive developmental disorders. *Journal of the American Academy of Child and Adolescent Psychiatry*, 29(6), 855–862.
- Spitzer, R. L., & Williams, J. B. W. (1980). Classification in psychiatry. In H. Kaplan, A. Freedman, & B. Sadock (Eds.), *The comprehensive textbook of psychiatry* (3rd ed.). Baltimore: Williams & Wilkins.

- Sponheim, E. (1996). Changing criteria of autistic disorders: A comparison of the *ICD-10* research criteria and *DSM-IV* with *DSM-III-R*, CARS, and ABC. *Journal of Autism and Developmental Disorders*, 26(5), 513–525.
- Sponheim, E., & Skjeldal, O. (1998). Autism and related disorders: Epidemiological findings in a Norwegian study using *ICD-10* diagnostic criteria. *Journal of Autism and Developmental Disorders*, 28(3), 217–227.
- Steingard, R., & Biederman, J. (1987). Lithium responsive manic-like symptoms in two individuals with autism. *Journal of the American Academy of Child and Adolescent Psychiatry*, 26(6), 932–935.
- Stone, W. L., Lee, E. B., Ashford, L., Brissie, J., Hepburn, S. L., Coonrod, E. E., et al. (1999). Can autism be diagnosed accurately in children under 3 years? *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 40(2), 219–226.
- Szatmari, P. (1992a). A review of the *DSM-III-R* criteria for autistic disorder [Special issue: Classification and diagnosis]. *Journal of Autism and Developmental Disorders*, 22(4), 507–523.
- Szatmari, P. (1992b). The validity of autistic spectrum disorders: A literature review [Special issue: Classification and diagnosis]. *Journal of Autism and Developmental Disorders*, 22(4), 583–600.
- Szatmari, P. (2000). Perspectives on the classification of Asperger syndrome. In A. Klin & F. R. Volkmar (Eds.), *Asperger syndrome* (pp. 403–417). New York: Guilford Press.
- Szatmari, P., Bryson, S. E., Boyle, M. H., Streiner, D. L., & Duku, E. (2003). Predictors of outcome among high functioning children with autism and Asperger syndrome. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 44(4), 520–528.
- Szatmari, P., Merette, C., Bryson, S. E., Thivierge, J., Roy, M. A., Cayer, M., et al. (2002). Quantifying dimensions in autism: a factor-analytic study [Comment]. *Journal of the American Academy of Child and Adolescent Psychiatry*, 41(4), 467–474.
- Szatmari, P., Volkmar, F., & Walter, S. (1995). Evaluation of diagnostic criteria for autism using latent class models. *Journal of the American Academy of Child and Adolescent Psychiatry*, 34(2), 216–222.
- Tadevosyan-Leyfer, O., Dowd, M., Mankoski, R., Winklosky, B., Putnam, S., McGrath, L., et al. (2003). A principal components analysis of the Autism Diagnostic Interview-Revised. *Journal of the American Academy of Child and Adolescent Psychiatry*, 42(7), 864–872.
- Tanguay, P. E., Robertson, J., & Derrick, A. (1998). A dimensional classification of autism spectrum disorder by social communication domains. *Journal of the American Academy of Child and Adolescent Psychiatry*, 37(3), 271–277.
- Towbin, K. E. (2003). Strategies for pharmacologic treatment of high functioning autism and Asperger syndrome. *Child and Adolescent Psychiatric Clinics of North America*, 12(1), 23–45.
- Tsai, L. (1992). Is Rett syndrome a subtype of pervasive developmental disorder? *Journal of Autism and Developmental Disorders*, 22, 551–561.
- Tsai, L. (1996). Brief report: Comorbid psychiatric disorders of autistic disorders. *Journal of Autism and Developmental Disorders*, 26, 159–164.
- Tsai, L. Y. (1999). Psychopharmacology in autism. *Psychosomatic Medicine*, 61(5), 651–665.
- Tsai, L. Y., Tsai, M. C., & August, G. J. (1985). Brief report: Implication of EEG diagnoses in the subclassification of infantile autism. *Journal of Autism and Developmental Disorders*, 15(3), 339–344.
- Van der Gaag, R. J., Buitelaar, J., Van den Ban, E., Bezemer, M., Nijjo, L., & Van Engeland, H. (1995). A controlled multivariate chart review of multiple complex developmental disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, 34(8), 1096–1106.
- Volkmar, F. R. (1992). Childhood disintegrative disorder: Issues for *DSM-IV*. *Journal of Autism and Developmental Disorders*, 22(4), 625–642.
- Volkmar, F. R., Cicchetti, D. V., Bregman, J., & Cohen, D. J. (1992). Three diagnostic systems for autism: *DSM-III*, *DSM-III-R*, and *ICD-10* [Special issue: Classification and diagnosis]. *Journal of Autism and Developmental Disorders*, 22(4), 483–492.
- Volkmar, F. R., Cicchetti, D. V., Cohen, D. J., & Bregman, J. (1992). Brief report: Developmental aspects of *DSM-III-R* criteria for autism [Special issue: Classification and diagnosis]. *Journal of Autism and Developmental Disorders*, 22(4), 657–662.
- Volkmar, F. R., & Cohen, D. J. (1989). Disintegrative disorder or “late onset” autism. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 30(5), 717–724.
- Volkmar, F. R., & Cohen, D. J. (1991a). Comorbid association of autism and schizophrenia. *American Journal of Psychiatry*, 148(12), 1705–1707.

- Volkmar, F. R., & Cohen, D. J. (1991b). Debate and argument: The utility of the term pervasive developmental disorder. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 32(7), 1171–1172.
- Volkmar, F., Cohen, D., Hoshino, K., Rende, R., & Paul, R. (1988). Phenomenology and classification of the childhood psychoses. *Psychological Medicine*, 18(1), 191–201.
- Volkmar, F. R., & Klin, A. (1998). Asperger syndrome and nonverbal learning disabilities. In E. Schopler & G. B. Mesibov (Eds.), *Asperger syndrome or high-functioning autism? Current issues in autism* (pp. 107–121). New York: Plenum Press.
- Volkmar, F. R., Klin, A., & Pauls, D. (1998). Nosological and genetic aspects of Asperger Syndrome. *Journal of Autism and Developmental Disorders*, 28(5), 457–463.
- Volkmar, F. R., Klin, A., Siegel, B., Szatmari, P., Lord, C., Campbell, M., et al. (1994). Field trial for autistic disorder in *DSM-IV*. *American Journal of Psychiatry*, 151(9), 1361–1367.
- Volkmar, F. R., Lord, C., Bailey, A., Schultz, R. T., & Klin, A. J. (2004). Autism and Pervasive Developmental Disorders. *Journal of Child Psychology and Psychiatry*, 45(1), 135–170.
- Volkmar, F. R., & Nelson, D. S. (1990). Seizure disorders in autism. *Journal of the American Academy of Child and Adolescent Psychiatry*, 29(1), 127–129.
- Volkmar, F. R., & Rutter, M. (1995). Childhood disintegrative disorder: Results of the *DSM-IV* Autism Field Trial. *Journal of the American Academy of Child and Adolescent Psychiatry*, 34(8), 1092–1095.
- Volkmar, F. R., & Schwab-Stone, M. (1996). Annotation: Childhood disorders in *DSM-IV*. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 37(7), 779–784.
- Volkmar F. R., Schwab-Stone, M., & First, M. (2002). Classification in child and adolescent Psychiatry: Principles and issues. In M. Lewis (Ed.), *Child and adolescent psychiatry: A comprehensive textbook* (3rd ed., pp. 499–505). Baltimore: Williams & Wilkins.
- Volkmar, F. R., Stier, D. M., & Cohen, D. J. (1985). Age of recognition of pervasive developmental disorder. *American Journal of Psychiatry*, 142(12), 1450–1452.
- Waterhouse, L., Morris, R., Allen, D., Dunn, M., Fein, D., Feinstein, C., et al. (1996). Diagnosis and classification in autism. *Journal of Autism and Developmental Disorders*, 26(1), 59–86.
- Waterhouse, L., Wing, L., Spitzer, R., & Siegel, B. (1993). Pervasive developmental disorders: From *DSM-III* to *DSM-III-R* [Special issue: Classification and diagnosis]. *Journal of Autism and Developmental Disorders*, 22(4), 525–549.
- Weir, K., & Salisbury, D. M. (1980). Acute onset of autistic features following brain damage in a ten-year-old. *Journal of Autism and Developmental Disorders*, 10, 185–191.
- Wing, L. (1980). Childhood autism and social class: A question of selection? *British Journal of Psychiatry*, 137, 410–417.
- Wing, L. (1981). Asperger's syndrome: A clinical account. *Psychological Medicine*, 11(1), 115–129.
- Wing, L., & Gould, J. (1979). Severe impairments of social interaction and associated abnormalities in children: Epidemiology and classification. *Journal of Autism and Developmental Disorders*, 9(1), 11–29.
- Wolff, S. (1998). Schizoid personality in childhood: The links with Asperger syndrome, schizophrenia spectrum disorders, and elective mutism. In E. Schopler & G. B. Mesibov (Eds.), *Asperger syndrome or high-functioning autism? Current issues in autism* (pp. 123–142). New York: Plenum Press.
- World Health Organization. (1992). *International classification of diseases: Diagnostic criteria for research* (10th ed.). Geneva, Switzerland: Author.