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Comorbid psychopathology with autism spectrum disorder in children: An overview

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Abstract

Comorbidity, the co-occurrence of two or more disorders in the same person, has been a topic receiving considerable attention in the child psychopathology literature overall. Despite many publications in the ADHD, depression and other child literatures, autism spectrum disorder has not received such scrutiny. The purpose of this review will be to discuss the available evidence. We address specific variables in diagnosis and classification of comorbid symptoms, and propose potential avenues for research and practice with respect to differential diagnosis. A brief discussion of the implications for treatment is also provided.

Keywords: Comorbidity; Autism spectrum disorder; Psychopathology

Comorbidity, defined here as the occurrence of two or more forms of psychopathology in the same person, has received a considerable amount of attention in the child literature. Perhaps the most prominent of these areas of research focuses on attention-deficit/hyperactivity disorder (ADHD) where comorbidity has been reported to be as high as 50% (Anderson, Williams, McGee, & Silva, 1987; Bird et al., 1988; Caron & Rutter, 1991). Similarly, for those ADHD children referred to a clinic, 87% have a comorbid condition and 67% have two or more additional forms of psychopathology (Kadesjo & Gillberg, 2001).

Other childhood disorders have also been studied, although to a lesser degree. Angold, Costello, and Erkanli (1999) for example, found that comorbidity between depression with

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ADHD, anxiety or conduct/oppositional defiant disorder was common. Similarly, children and adolescents with eating disorders are likely to exhibit a variety of psychopathology with comorbidity rates as high as 90% (Lewinsohn, Striegel-Moore, & Seeley, 2000). Substance abuse, anxiety and mood disorders appear to be the most common comorbid conditions (Grilo, Levy, Becker, Edell, & McGlashan, 1996). Perhaps not surprisingly, multiple disorders present in the same person result in more frequent mental health referrals compared to children who evince only one disorder (Mash & Barkley, 2003).

Comorbidity in the assessment of autism spectrum disorder (ASD) is a topic that has infrequently been addressed, particularly when compared to the childhood disorders noted above. When the topic has been discussed, it has often been in the context of ASD with intellectual disability (ID) since, with the exception of Asperger's syndrome, these two conditions co-occur frequently, and symptoms of autism, particularly language delays, stereotypies, and self-injury, increase as the severity of ID increases (Wing & Gould, 1979). For the purposes of this review, we will forgo that discussion and focus on specific forms of emotional problems and challenging behaviors which constitute DSM-IV diagnoses, such as self-injury, stereotypies, and conduct disorder. However, the reader should be aware that disagreement exists over whether many of these diagnoses warrant separate categories or should be viewed as symptom clusters of ASD (AACAP, 1999). Autism can be distinguished from psychosis while stereotypy and self-injury are not differentially diagnostic between autism and ID (Matese, Matson, & Sevin, 1994; Sevin et al., 1995). Given that they are not diagnostic of ASD, but may co-occur with the disorder, describing these behaviors as comorbid conditions versus core features of an ASD appear to be more consistent with the data.

Some researchers have debated over whether comorbidity, at least with some disorders, has perhaps slowed the development of knowledge in this area. However, the notion that "standard diagnostic instruments should be employed to delineate impairment, including the full range of diagnosable disorders," has been asserted (Kazdin, 1993). Kazdin (1993) made these remarks with respect to treatment outcome research with ASD. However, diagnosis would appear to be equally applicable with respect to this point. An additional confounding variable is the complexity of diagnosing ASD and its various subtypes in children, the majority of whom are also ID (Long, Wood, & Holmes, 2000).

While Asperger's does not involve ID, the more prevalent conditions of PDD and autism do involve high rates of the latter condition. Autism in particular has been studied in relationship to ID and occurs in most cases (Folstein & Rutter, 1987; Ritvo et al., 1989). In the latter study, 66% of their sample of autistic children scored below 70 on an I.Q. test.

Given the overlap in ASD and ID, it is difficult and perhaps not particularly profitable to discuss issues of psychopathology that occur conjointly in one of these conditions taken alone. In fact, many of the same factors that make definition and diagnosis difficult with one, applies to another. And, with the exception of Asperger's syndrome, most cases will involve ASD and ID together. Second, it is asserted that diagnosing comorbid psychopathology in these persons is appropriate, although the symptoms may vary from those seen in the general population. At present it seems reasonable to conclude that issues of comorbidity are poorly understood (Matson & Barrett, 1982; Ghaziuddin, Ghaziuddin, & Greden, 2002). Third, there is considerable heterogeneity in symptoms of ASD. This variability leads to additional complications regarding what constitutes core symptoms and whether the disorder should be conceptualized on a dimensional scale with subtyping of ASD or whether distinct disorders within the continuum of ASD should be specified (e.g. PDD-NOS, autism, Asperger's syndrome) (Sturmey & Sevin, 1994; Szatmari, Volkmar, & Walter, 1995).

1. Types of comorbid psychopathology

Sporadically, papers have appeared regarding comorbidity in ASD, although they are almost exclusively about one subtype, autism. This phenomenon is related to the fact that autism has received most of the research attention in the ASD spectrum literature until very recently. Even now, the majority of published studies in ASD involve autism. Asperger's syndrome, which some describe as older, higher intellectually functioning persons with autism, is beginning to receive more attention. However, by the nature of the literature, and the fact that Asperger's syndrome is often not diagnosed until late childhood or early adolescence, the bulk of the review on ASD will be autism studies (Howlin & Moore, 1997; Scott, Baron-Cohen, Bolton, & Brayne, 2002). We have limited our discussion of comorbid disorders to those discussed in the literature. Thus, while an exhaustive list may not be presented here, those comorbid conditions considered most relevant by ASD researchers at this time have been discussed.

1.1. Mood disorders

Mood disorders can be broken down into major depression and bipolar disorder. Both conditions are potentially very debilitating. Ghaziuddin and colleagues have been the most prolific publishers to date on depression and its potential co-occurrence with autism (Ghaziuddin & Greden, 1998; Ghaziuddin, Alessi, & Greden, 1995; Ghaziuddin & Tsai, 1991; Ghaziuddin, Tsai, & Ghaziuddin, 1991). The reader is referred to these articles for a more detailed review of the topic. One general conclusion that can be arrived at from the work of these authors and others is that depression is a comorbid condition with autism, being diagnosed in 2% of the children studied (Ghaziuddin, Tsai, & Ghaziuddin, 1992). Children with Asperger's syndrome have comorbidity rates as high as 30% (Ghaziuddin, Weidmer-Mikhail, & Ghaziuddin, 1998; Wing, 1981). Ghaziuddin et al. (2002) assert that depression is probably the most frequent form of comorbid psychopathology with ASD. They also state that these rates are probably low estimates, given the general lack of measures for assessing comorbidity in ASD.

The meager findings on depression in ASD are consistent with a larger, but still inadequate ID literature. Depression in this latter group is considered to occur, and at a high incidence and prevalence (Kazdin, Matson, & Senatore, 1983; Matson, Kazdin, & Senatore, 1984). Additionally, depressed persons with mild ID are likely to evince symptomatology consistent with behavior observed in the general population with major depression (Matson, Barrett, & Helsel, 1988). However, those with severe ID are likely to display somewhat different psychopathology symptom profiles, particularly in poverty of verbal behavior. Thus, focusing assessment largely on vegetative symptoms and family history has been suggested (Ghaziuddin et al., 2002; Matson et al., 1999). Severity of ID is likely to complicate efforts at diagnosis of comorbid psychopathology. Additionally, more severe ASD core symptom clusters are likely to mask or reconfigure depression profiles. How this occurs and the implications for differential diagnosis, prognosis, and treatment await much needed investigation.

It should be stressed that identifying comorbidity of depression and ASD is more than an academic exercise. Depression can negatively impact long-term outcome. Second, but related to the first point, depression may put the person with ASD at risk for suicide, greater levels of withdrawal, non-compliance and aggression. The occurrence, recognition, causes and targeting of these behaviors/symptoms has major implications for treatment. Additionally, these problems can negatively impact the family unit, resulting in increased stress and conflict (Gold, 1993). Data then on developments in this research, to date, might best be described as slow and halting.

Researchers have in the past suggested that diagnosis of major depression occurs less frequently in children than in adolescents or adulthood, thus partially explaining the lack of inclusion of outcome measure in this domain for program studies of young children with ASD (Lainhart & Folstein, 1994; Pollard & Prendergast, 2004). However, until recently there has been a general lack of measures for diagnosing children with depression in general, further compounding this problem.

Bipolar disorder is a second mood disorder and a very serious condition which has proven both difficult to differentially diagnose and treat (Matson et al., in press). For 70% of the childhood cases in the general population, the disorder initially presents as major depression (Roberston et al., 1994). Additionally, symptoms may wax and wane (Findling et al., 2001) and comorbidity with other psychopathologies, regardless of the occurrence of ASDs, such as anxiety and ADHD are common (Carlson, 1998; Masi et al., 2001). The literature with the ASD population is almost non-existent at this point. Gillberg (1985) has described a single case of bipolar disorder in Asperger's syndrome and Realmuto and August (1991) describe three autistic individuals where some bipolar features were present. Much of the problem here is that until very recently bipolar research has been conducted almost exclusively with adults, and the conceptualization of bipolar and subtyping (e.g. bipolar I, bipolar II, schizoaffective, etc.) has been in flux. Reliable and valid methods of assessing the condition in children are beginning to be codified. As the area matures, implications for the ASD population are likely to receive more attention.

1.2. Phobias/OCD/anxiety

Fears and phobias among children with ASD have been largely ignored in the literature. However, a few single case treatment studies of ASD children with phobias have been published. Luiselli (1978) treated an autistic child who feared riding a bus. Love, Matson, and West (1990) trained mothers to effectively deal with their autistic children's fears of going outside and of bathroom showers, and Luscre and Center (1996) developed a treatment for ASD children who had dental fears. Most recently, Rapp, Vollmer, and Hovanetz (2005) treated swimming pool avoidance in an autistic adolescent girl.

The first systematic group study of phobias was by Matson and Love (1990). They looked at the intensity of fears and phobias of autistic children by matching them to normal same age peers. Autistic children were more fearful of thunderstorms, dark places, large crowds, dark rooms or closets, going to bed in the dark, and closed places. The fears and phobias most common in the matched normal developing peers showed little overlap with the autistic group. More recently, Evans, Canavera, Kleinpeter, Maccubbin, and Taga (2005) replicated and extended this study with 25 ASD children, 43 children with Down syndrome, 45 children matched on mental age and 37 normal developing peers who were chronologically matched. These authors findings were similar to the Matson and Love (1990) data. The ASD children evinced a different set of fear and phobia priorities than other children studied. Medical, animal and situation phobias were more common than in the others groups studied. The authors note that an ASD diagnosis is predictive of certain fears and phobias, which the clinician should watch for, and which may require clinical attention.

1.3. Anxiety and obsessions

Anxiety appears to overlap particularly with depression and ASD. However, controversy exists not only with respect to whether ASD is separate from anxiety, but also with respect to fears, phobias and depression. The research supporting comorbidity is sparse while data refuting

a comorbidity hypothesis is non-existent. Woodard, Groden, Goodwin, Shanower, and Bianco (2005) treated a 10-year-old autistic boy who they also describe as being diagnosed with generalized anxiety disorder. The authors do not report who gave the diagnosis or the criteria or methods used. However, using an ABAB single case design, he was treated with 0.5 mg BID of dextromethorphan. The authors report marked improvements including less frequent communications about being anxious. He was also reported to be more cooperative, empathetic, and responsive to consequences.

Behaviors related to obsessive compulsive disorder (OCD) are also characterized by anxiety. Perhaps more so than any other disorder, concern about whether OCD can be separate from ASD has been debated. A person with OCD engages in repetitive acts with the goal of reduced anxiety in mind. From a definitional standpoint, ASD symptoms would also meet this criterion. Three factors which would need to be met include engagement in acts typical of OCD, such as frequent hand washing to kill germs, responsiveness to interventions typically effective for OCD (validity), and a core set of OCD symptoms that would be above and beyond the typical obsessive symptoms seen in the model ASD case. Studies that look at these factors have yet to be done. Until then, conjecture on this topic is likely to flourish.

Charlop-Christy and Haymes (1996) operationally defined obsessions as continuous verbal requests across settings in their study. They note that DSM-IV criteria were used, but it is unclear whether the DSM-IV criteria applied were for OCD and/or ASD. Nonetheless, it is instructive to see these targets described in such a manner for ASD children. The authors label theses behaviors as aberrant and the authors appear to support the notion that in this context, the obsessions (e.g. looking at maps, tossing a ball, playing with a helicopter), were a form of stereotypic behaviors. They also noted, however, that some autistic children display obsessive behaviors while others do not. This article, thus, provides an interesting exemplar of obsessive behavior as part of the ASD syndrome versus part of a distinct comorbid condition. At this point, more descriptive data are needed on frequency, intensity, and rate of behaviors/symptoms to further delineate if distinct OCD occurs in ASD, and if so, when and at what rate.

1.4. Psychosis and ASD

Childhood schizophrenia and autism have been seen as overlapping conditions, and in fact the terms were sometimes used interchangeably in the past. More recently, the conditions have been viewed as very distinct and ASD has been referred to as a developmental disorder (American Psychiatric Association, 1994). In a phrase becoming redundant at this point, little information directly testing this hypothesis has occurred. It is the case that many studies of ASD, autism in particular, have shown that these scales can effectively differentiate young children with autism from PDD or Asperger's syndrome (Cox et al., 1999), and receptive language disorders (Mildenberger, Sitter, Noterdaeme, & Amorosa, 2001). However, direct attempts to distinguish between schizophrenia and autism have been almost non-existent.

McEachin, Smith, and Lovaas (1993) used the personality inventory for children and found at post-test that although very young autistic children were in the normal range on a variety of standardized measures of intelligence, adaptive behavior and maladaptive behavior, they tended to score higher on psychosis. These data are interesting when compared to Matese et al. (1994) who assessed the relationship between childhood psychosis and autism. Fifteen children with psychosis and 15 with autism from 4 to 13 years of age and matched on age, sex, and race, were compared on the real life rating scale (RLRS) and the childhood autism rating scale (CARS). The two groups differed in language, social skills, and adaptation to change. The psychotic children

were relatively less impaired. These data support Cantor's (1988) claim that the two groups could be differentiated on language and social skills.

Taken together, these preliminary results suggest that autism and childhood psychosis are distinct disorders. Also, the McEachin et al. (1993) data hint at the possibility that at least some children have comorbid diagnoses of autism and psychosis. However, Matese et al. (1994) lament the lack of sound diagnostic measures for childhood psychosis and point out that at one point or another, 20% of this group had received a PDD-NOS diagnosis. The comorbidity of ASD and psychosis is not confirmed by these data, but the data seem to support the value of additional research on this topic. Additionally, Cox et al. (1999) and Mildenberger et al. (2001) more recently have presented indirect evidence that autism can be differentially diagnosed from other ASDs. As can be seen however, the data are scant.

2. Comorbidity in ASD

The first ASD disorder popularly discussed in the literature was autism (Kanner, 1943). Initial attempts to systematically develop assessments and treatments for the disorder have been more recent (LeCouteur et al., 1989; Lovaas, 1987). Other ASDs have received even less attention with the development and criteria of assessment instruments only recently emerging (Ehlers & Gillberg, 1993). Not surprisingly then, there is currently a debate on the diagnosis and conceptualization of ASDs. Therefore, issues such as whether Asperger's syndrome is a form of autism or a distinct disorder (Klin, Pauls, Schultz, & Volkmar, 2005), and whether comorbidity of psychopathology is in play for ASD are still debated (Caron & Rutter, 1991). This phenomenon is not specific to ASD however. As recently as 1978, for example, researchers and clinicians were in disagreement as to whether children could evince major depression (Lefkowitz & Burton, 1978). Others questioned until recently whether persons with ID were able to develop mental health disorders (Matson & Barrett, 1982). Given this context, it should not be surprising that comorbidity in ASD is still a question in need of data.

The available evidence, as scanty as it is, does suggest the possibility of comorbidity in ASD. However, some conditions can be more easily distinguished from ASD than others. Depression would appear to be on the more distinctive end of the continuum, for example, while obsessive compulsive behavior is on the other due to their similarity to core symptoms of ASD. The point with respect to these two disorders is the degree to which overlap with ASD symptoms is present. Obviously, with OCD, the overlap is considerable and makes for describing this condition in ASD more questionable than most other forms of psychopathology. However, these are empirical questions that can at least to some degree be tested. Five points are proposed to begin this analysis.

2.1. Waxing and waning and change of symptoms

Researchers have remarked on the stability of ASD symptoms once the child reaches an age at which a reliable diagnosis can be made (usually age 3 at present) (Moore & Goodson, 2003; Sigman & Ruskin, 1999). Obviously, this factor is concerning for children who do not receive adequate intensive intervention at a young age, who are non-responders, or who have a residual core symptom subset remaining after prolonged intervention. However, the majority of child psychopathologies evinced by children either have a marked change in the type or context of symptoms over time and variability in intensity of symptoms, often over days or weeks. Such changes would occur with fears and phobias, depression and psychosis. Waxing and waning and

change of symptoms then is a central distinguishing feature between ASDs and most forms of childhood psychopathology. We know that mood disorders result in intense symptom periods followed by times where less pronounced symptom severity is present (Matson, 1989; Matson et al., in press). Similarly, psychosis in general is often marked by acute episodes. Thus, our template is to conduct multiple measures at periodic intervals to assess which symptoms remain stable or do not change as rapidly based on developmental course. In the case of the former approach, this would be possible even in cases of ongoing intensive behavioral intervention since many symptoms of psychopathology are likely to change over days or weeks, whereas therapeutic alterations of core ASD symptoms are more likely to be observed over months or years. This assumption is an inference from programmatic treatment studies of young ASD children which typically are 6 months to 2 years in duration (Matson & Minshawi, 2006). While this data is not particularly strong for measuring course it is the best available at present.

2.2. Defining core symptoms

ASD remains a heterogeneous group of disorders which have been described in various ways. For example, Sturmey and Sevin (1994) note that some children with autism develop sophisticated language while 50% may never develop a workable set of language skills. Additionally, some persons have highly restrictive repertoires, some have extreme self-injury or aggression while others have none. Social deficits and excesses among the ASD group can vary markedly as well.

Rates of autism have doubled in the last three decades. Seventy-five percent of persons with autism show some level of ID (Croen, Grether, & Selvin, 2002). The incidence and prevalence of autism in particular among ASD diagnoses, appear to be continuing to increase and may at least in part be due to the broadening of the diagnosis. Croen, Grether and colleagues (Croen & Grether, 2003; Croen et al., 2002) for example, suggest that increased rates of autism might be due to the reclassification of children from the ID group to the autism category. Furthermore, new categories such as Asperger's syndrome is a high incidence ASD at a four (autism) to a one (Asperger's) rate (Howlin & Asgharian, 1999). Rett's and childhood disintegrative disorder are very low incidence ASDs, but further expand the number and heterogeneity of ASD diagnoses. Thus, and this is a hard one, the research community will need to develop a better consensus of what constitutes ASD syndromes, and what symptoms constitute the characteristics for a given syndrome. In essence, a comorbid condition is a second disorder diagnosis whose core symptoms differ in a number of important ways from the primary disorder. However, expanded criteria make for more heterogeneous criteria. At some point criteria are so broad that core features are barely discernable across disorders. At that point, subtyping needs to be more precise or the definition of the disorder must be restricted. The former method appears to be favored by researchers at present. However, it will be difficult to clearly delineate the nature and scope of other psychopathologies as they covary with ASD until there are better data and greater consensus on core symptoms than what exists at present.

2.3. Identification of comorbidity by multiple investigators

Another argument for the existence of comorbid psychopathology in ASD is the published research that has emerged across multiple disorders and multiple investigations. These studies are frequently case studies, therefore, the data can hardly be considered conclusive. However, if the reader looks at the variety of authors, the variety of settings where studies were conducted and

the types of co-occurring psychopathology identified, a compelling argument could be made to study the issue further. It is argued that co-occurring conditions likely exist. Which forms of psychopathology, at what rates, and how the symptoms are displayed for ASD individuals, awaits investigation.

2.4. Development of scaling methods to assess comorbidity

Interestingly, most assessment instruments designed for ASD involve autism, particularly scales that are geared to children between 18 months to 8 or 9 years of age. Scales specific to Asperger's syndrome and PDD-NOS, in particular, have seen some scale development research. Rett's disorder and childhood disintegrative disorder have not received this attention, but they have a very low incidence rate relative to the other three ASD syndromes. To date, none of these disorders have had instrumentation developed to look at comorbidity in ASD. Efforts in this area are urgently needed. Empirically determining what comorbid conditions are most prevalent, if types and rate of comorbidity vary by type of severity of ASD, employing such measures as a feature of assessing treatment outcome, and many related fundamental aspects of ASD are needed. Given the use of psychotropic medication in recent years with even very young ASD children provides yet another compelling reason for the design and implementation of these assessment methods. The rationale for drug administration is often likely to be challenging behaviors, or comorbid psychopathology versus core symptoms of ASD.

2.5. The need for differential diagnosis studies

Matese et al. (1994) provide one of the very few attempts to compare autistic children to same age peers with schizophrenia. Much greater attention is needed using a similar paradigm with comparisons of other typical childhood psychopathologies to autism and other ASDs. For example, comparing depressed children and those with PDD-NOS on measures of PDD-NOS and depression, or autistic and ADHD children on tests designed for these conditions. Using groups that are specifically and unambiguously identified with particular disorders and comparing them on the same assessment tools should help to better clarify the similarities and differences in forms of childhood psychopathology and developmental disabilities. Again, this is a methodological approach to the study of comorbidity that has largely been ignored in the experimental literature to date.

3. Primary versus secondary diagnosis

By definition, comorbid is the ''other disorder'' which co-occurs with the condition of most interest to the parent or professional. The first issue is whether one disorder is designated as primary versus secondary. From a purely clinical perspective, this issue is of importance in prioritizing intervention goals. Secondly, it may have meaning in terms of long-term prognosis. Researchers do know, for example, that severity of symptoms, type of disorders and comorbidity effect outcome. Third, prognostic factors can be helpful for determining required resources, or the child's ability to cope with intervention on multiple target behaviors. Additionally, these data can help in identifying what behaviors require intervention and in what priority.

Determining the ''primary disorder'' can be looked at on several levels. First, the degree to which each disorder interferes with daily routine and normal adjustment is one possible ranking method. Second, availability of resources may dictate primary versus secondary diagnosis. For

example, a heavily staffed small class for ASD but not depression may be an important prognostic issue for family and professionals. Third, the severe and pervasive nature of the two disorders is likely to be highly significant. For example, ASD versus a simple phobia or tic would be a major differentiating variable. Obviously, in this latter case, ASD is a much more pervasive and overwhelming condition and should be noted as such (primary disorders).

It is also possible that differentiating priorities on multiple forms of psychopathology may not be necessary in some instances. Where pragmatic variables do not dictate prioritizing disorders, primary versus secondary diagnoses are not necessary. A decision of this sort would seem to be pragmatic and situation or individual specific.

4. General conclusions

The available data for a range of childhood psychopathologies suggest that comorbid features exist in children and adolescents with ASD. The overlap of ID may further exacerbate the frequency of these comorbid conditions. Certainly, level of ID is a major factor in symptom presentation with those evincing severe and profound ID, sharing few typical verbal behaviors but many similar vegetative signs. Whether aggression and self-injury are behavioral equivalents for some children displaying some comorbid psychopathologies is frequently mentioned, but that hypothesis awaits empirical verification.

Perhaps the clearest finding is that phobias, depression, and other childhood disorders in studies dating back almost 30 years have been described in ASDs. Despite this, little systematic assessment or treatment research has followed from these ground-breaking studies. Similarly, no ASD measures cover comorbid disorders. In fact, assessment scales in the area might be described best as piecemeal and highly uneven in published psychometrics. Autism has seen the development of excellent school age measures, and some initial attempts to diagnose 18–24 month olds. A scale for PDD-NOS has recently emerged as have measures for Asperger's. Instruments that can screen across the dimension of PDD-NOS, autism, and Asperger's are not available at this writing. Such measures could augment but would not replace existing instruments which provide more in-depth assessment of a specific ASD. The DASH-II for adults and children with severe/profound mental retardation is one model for this approach (Matson et al., 1999). Initial separation of ''comorbid'' ASD symptoms by more clearly establishing specific ASDs need to be augmented by measures of comorbid psychopathologies. More specific scales can then be employed to further refine the diagnostic picture of comorbidity while establishing behavioral/symptom targets for intervention.

References

American Academy of Child and Adolescent Psychiatry. (1999). Practice parameters for the assessment and treatment of children, adolescents, and adults with autism and other pervasive developmental disorders. *Journal of the American Academy of Child and Adolescent Psychiatry, 38*, 325–545.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: American Psychiatric Association.

Anderson, J. L., Williams, S., McGee, R., & Silva, P. A. (1987). DSM-III disorders in preadolescent children: Prevalence in a large sample from the general population. *Archives of General Psychiatry, 44*, 69–76.

Angold, A., Costello, E. J., & Erkanli, A. (1999). Comorbidity. *Journal of Child Psychology and Psychiatry, 40*, 57–87.

Baird, G., Charman, T., Baron-Cohen, S., Cox, A., Swettenham, J., Wheelwright, S., et al. (2000). A screening instrument for autism at 18 months of age: A 6-year follow-up study. *Journal of the American Academy of Child and Adolescent Psychiatry, 39*, 694–702.

Baird, G., Charman, T., Cox, A., Baron-Cohen, S., Swettenham, J., Wheelwright, S., et al. (2001). Current topic: Screening and surveillance for autism and pervasive developmental disorders. *Archives of Disease in Childhood, 84*, 468–475.

Bird, H. R., Canino, G. J., Rubio-Stipec, M., Gould, M. S., Ribera, J., Sesman, M., et al. (1988). Estimates of the prevalence of childhood maladjustment in a community survey of Puerto Rico: The use of combined measures. *Archives of General Psychiatry, 45*, 1120–1126.

Cantor, S. (1988). Schizophrenia. In C. G. Last, & M. Hersen (Eds.), *Handbook of child psychiatric diagnosis*. New York: Wiley.

Carlson, G. A. (1998). Mania and ADHD: Comorbidity or confusion. *Journal of Affective Disorders, 51*, 177–187.

Caron, C., & Rutter, M. (1991). Comorbidity in child psychopathology: Concepts, issues and research strategies. *Journal of Child Psychology and Psychiatry, 37*, 1063–1080.

Charlop-Christy, M. H., & Haymes, L. K. (1996). Using obsessions as reinforcers with and without mild reduction procedures to decrease inappropriate behaviors of children with autism. *Journal of Autism and Developmental Disorders, 26*, 527–546.

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 diagnoses. *Journal of Child Psychology and Psychiatry, 40*, 719–732.

Croen, L. A., & Grether, J. K. (2003). Response: A response to Blaxill, Baskin and Spitzer on Croen et al. (2002). The changing prevalence of autism in California. *Journal of Autism and Developmental Disorders, 33*, 227–229.

Croen, L. A., Grether, J. K., & Selvin, S. (2002). Descriptive epidemiology of autism in a California population: Who is at risk? *Journal of Autism and Developmental Disorders, 32*, 217–224.

Ehlers, S., & Gillberg, C. (1993). The epidemiology of Asperger syndrome: A total population study. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 34*, 1327–1350.

Evans, D. W., Canavera, K., Kleinpeter, F. L., Maccubbin, E., & Taga, K. (2005). The fears, phobias and anxieties of children with autism spectrum disorders and Down syndrome: Comparisons with developmentally and chronologically age matched children. *Child Psychiatry and Human Development, 36*, 3–26.

Findling, R. L., Gracious, B. L., McNamara, N. K., Youngstrom, E. A., Demeter, C. A., Branicky, L. A., et al. (2001). Rapid continuous cycling and psychiatric co-morbidity in pediatric bipolar I disorder. *Bipolar Disorders, 3*, 202–210.

Folstein, S. E., & Rutter, M. L. (1987). Autism: Familial aggregation and genetic implications. In E. Schopler, & G. B. Mesibou (Eds.), *Neurobiological issues in autism* (pp. 83–105). New York: Plenum Press.

Ghaziuddin, M., Alessi, N., & Greden, J. F. (1995). Life events and depression in children with pervasive developmental disorders. *Journal of Autism and Developmental Disorders, 25*, 495–502.

Ghaziuddin, M., Ghaziuddin, N., & Greden, J. (2002). Depression in persons with autism: Implications for research and clinical care. *Journal of Autism and Developmental Disorders, 32*, 299–306.

Ghaziuddin, M., & Greden, J. (1998). Depression in children with autism/pervasive developmental disorders: A case-control family history study. *Journal of Autism and Developmental Disorders, 28*, 111–115.

Ghaziuddin, M., & Tsai, L. (1991). Depression in autistic disorder. *British Journal of Psychiatry, 159*, 721–723.

Ghaziuddin, M., Tsai, L., & Ghaziuddin, N. (1992). Comorbidity of autistic disorder in children and adolescents. *European Child and Adolescent Psychiatry, 1*, 209–213.

Ghaziuddin, M., Tsai, L., & Ghaziuddin, N. (1991). Fluoxetine in autism and depression. *Journal of the American Academy of Child and Adolescent Psychiatry, 30*, 508–509.

Ghaziuddin, M., Weidmer-Mikhail, E., & Ghaziuddin, N. (1998). Comorbidity of Asperger syndrome: A preliminary report. *Journal of Intellectual Disability Research, 4*, 279–283.

Gillberg, C. (1985). Asperger's syndrome and recurrent psychosis—A case study. *Journal of Autism and Developmental Disorders, 15*, 389–397.

Gold, N. (1993). Depression and social adjustment in siblings of boys with autism. *Journal of Autism and Developmental Disorders, 23*, 147–163.

Grilo, C. M., Levy, K. N., Becker, D. F., Edell, W. S., & McGlashan, T. H. (1996). Comorbidity of DSM-III-R axis I and II disorders among female inpatients with eating disorders. *Psychiatric Services, 47*, 426–429.

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*, 3–13.

Howlin, P., & Asgharian, A. (1999). The diagnosis of autism and Asperger syndrome: Findings from a survey of 770 families. *Developmental Medicine and Child Neurology, 41*, 834–839.

Howlin, P., & Moore, A. (1997). Diagnosis in autism: A survey of over 1200 patients in the UK. *Autism: International Journal of Research and Practice, 1*, 135–162.

Kadesjo, B., & Gillberg, C. (2001). The comorbidity of ADHD in the general population of Swedish school-age children. *Journal of Child Psychology and Psychiatry, 42*, 487–492.

Kanner, L. (1943). Autistic disturbances of affective contact. *Nervous Child, 2*, 217–250.

Kasari, C. (2002). Assessing change in early intervention programs for children with autism. *Journal of Autism and Developmental Disorders, 32*, 447–461.

Kazdin, A. E. (1993). Replication and extension of behavioral treatment of autistic disorder. *American Journal of Mental Retardation, 97*, 377–378.

Kazdin, A. E., Matson, J. L., & Senatore, V. (1983). Assessment of depression in mentally retarded adults. *American Journal of Psychiatry, 140*, 1040–1043.

Klin, A., Pauls, D., Schultz, R., & Volkmar, F. (2005). Three diagnostic approaches to Asperger syndrome: Implications for research. *Journal of Autism and Developmental Disabilities, 35*, 221–234.

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*, 587–601.

LeCouteur, A., Rutter, M., Lord, C., Rios, P., Robertson, S., Holdgrafer, M., et al. (1989). Autistic diagnostic interview: A semi-structured interview for parents and caregivers of autistic persons. *Journal of Autism and Developmental Disorders, 19*, 363–387.

Lefkowitz, M. M., & Burton, N. (1978). Childhood depression. *Psychological Bulletin, 85*, 716–726.

Lewinsohn, P. M., Striegel-Moore, R. H., & Seeley, J. R. (2000). Epidemiology and natural course of eating disorders: Young women from adolescence to young adulthood. *Journal of the American Academy of Child and Adolescent Psychiatry, 39*, 1284–1292.

Long, K., Wood, H., & Holmes, N. (2000). Presentation, assessment and treatment of depression in a young woman with learning disability and autism. *British Journal of Learning Disabilities, 28*, 102–108.

Lovaas, O. I. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology, 55*, 3–9.

Love, S. R., Matson, J. L., & West, D. (1990). Mothers as effective therapists for autistic children's phobias. *Journal of Applied Behavior Analysis, 23*, 379–385.

Luiselli, J. K. (1978). Treatment of an autistic child's fear of riding a school bus through exposure and reinforcement. *Journal of Behavior Therapy and Experimental Psychiatry, 9*, 1969–1972.

Luscre, D. M., & Center, D. B. (1996). Procedures for reducing dental fear in children with autism. *Journal of Autism and Developmental Disorders, 26*, 547–556.

Mash, E. J., & Barkley, R. A. (2003). *Child psychopathology* (2nd ed.). New York: Guilford Press. p. 37.

Masi, G., Toni, C., Perugi, G., Mucci, M., Millepiedi, S., & Akiskal, H. (2001). Anxiety disorders in children and adolescents with bipolar disorders: A neglected comorbidity. *Canadian Journal of Psychiatry, 46*, 797–802.

Matese, M., Matson, J. L., & Sevin, J. (1994). Comparison of psychotic and autistic children using behavioral observations. *Journal of Autism and Developmental Disorders, 24*, 83–94.

Matson, J. L. (1989). *Treating depression in children and adolescents*. New York: Pergamon Press.

Matson, J. L. (1986). Treatment outcome research for depression in mentally retarded children and youth: Methodological issues. *Psychopharmacology Bulletin, 22*, 1081–1085.

Matson, J. L., & Barrett, R. P. (1982). *Psychopathology in the mentally retarded*. New York: Grane and Stratton. p. 1.

Matson, J. L., Barrett, R. P., & Helsel, W. J. (1988). Depression in mentally retarded children. *Research in Developmental Disabilities, 9*, 39–46.

Matson, J. L., Gonzalez, M. L., Smith, K. R., Terlonge, C., Thorson, R. T. & Dixon, D. R. (in press). Assessing side effects of pharmacotherapy treatment of bipolar disorder: A 20-year review of the literature. *Research in Developmental Disabilities*.

Matson, J. L., Kazdin, A. E., & Senatore, V. (1984). Psychometric properties of the psychopathology instrument for mentally retarded adults. *Applied Research in Mental Retardation, 5*, 81–89.

Matson, J. L., & Love, S. R. (1990). A comparison of parent-reported fear for autistic and non-handicapped age-matched children and youth. *Australian and New Zealand Journal of Developmental Disabilities, 16*, 349–357.

Matson, J. L., & Minshawi, N. F. (2006). *Early intervention for autism spectrum disorders: A critical analysis*. Oxford, England: Elsevier Science Inc.

Matson, J. L., Rush, K. S., Smiroldo, B. B., Hamilton, M., Anderson, S. J., Baglio, C. S., et al. (1999). Characteristics of depression as assessed by the diagnostic assessment for the severely handicapped II (DASH-II). *Research in Developmental Disabilities, 20*, 305–313.

McEachin, J. J., Smith, T., & Lovaas, O. I. (1993). Long-term outcome for children with autism who received early intensive behavioral treatment. *American Journal on Mental Retardation, 97*, 359–391.

Mildenberger, K., Sitter, S., Noterdaeme, M., & Amorosa, H. (2001). The use of the ADI-R as a diagnostic tool in the differential diagnosis of children with infantile autism and children with a receptive language disorder. *European Child and Adolescent Psychiatry, 10*, 248–255.

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, 7*, 47–63.

Pollard, A. J., & Prendergast, M. (2004). Depressive pseudodementia in a child with autism. *Developmental Medicine and Child Neurology, 46*, 485–489.

Rapp, J. T., Vollmer, T. R., & Hovanetz, A. N. (2005). Evaluation and treatment of swimming pool avoidance exhibited by an adolescent girl with autism. *Behavior Therapy, 36*, 101–105.

Realmuto, G. M., & August, G. J. (1991). Catatonia in autistic disorder: A sign of comorbidity or variable expression. *Journal of Autism and Developmental Disorders, 21*, 517–528.

Ritvo, E. R., Freeman, B. J., Pingree, C., Mason-Brother, A., Jorde, L., Jenson, W. R., et al. (1989). The UCLA-University of Utah epidemiologic survey of autism: Recurrence estimates and genetic counseling. *American Journal of Psychiatry, 146*, 1032–1036.

Roberston, H. A., Kutcher, S. P., Antonio, E., Bird, D., Newton, S., Shott, P., et al. (1994). Adolescent bipolar I outcome study. *Paper presented at the American academy of child and adolescent psychiatry, 41st annual meeting*.

Scott, F. J., Baron-Cohen, S., Bolton, P., & Brayne, C. (2002). The CAST (childhood Asperger syndrome test): Preliminary development of a UK screen for mainstream primary-school age children. *Autism: International Journal of Research and Practice, 6*, 9–31.

Sevin, J. A., Matson, J. L., Coe, D., Love, S. R., Mateses, M., & Benavidez, D. A. (1995). Empirically derived subtypes of pervasive developmental disorder. *Journal of Autism and Developmental Disorders, 25*, 561–578.

Sigman, M., & Ruskin, E. (1999). Continuity and change in the social competence of children with autism, Down syndrome, and developmental delays. *Monographs of the Society for Research in Child Development, 64*, 1–114.

Sturmey, P., & Sevin, J. A. (1994). Defining and assessing autism. In J. L. Matson (Ed.), *Autism in Children and Adults*. Pacific Grove, CA: Brooks/Cole Publishing Company.

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*, 216–222.

Wing, L. (1981). Asperger's syndrome: A clinical account. *Psychological Medicine, 11*, 115–119.

Wing, L., & Gould, J. (1979). Severe impairments of social interaction and associated abnormalities. *Journal of Autism and Developmental Disorders, 9*, 11–29.

Woodard, C., Groden, J., Goodwin, M., Shanower, C., & Bianco, J. (2005). The treatment of behavioral sequelae of autism with dextromethorphan: A case report. *Journal of Autism and Developmental Disorders, 35*, 515–518.