

FROM CHILDHOOD TO ADOLESCENCE: DIAGNOSIS AND COMORBIDITY ISSUES*

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ABSTRACT

Attention-deficit/hyperactivity disorder (ADHD) tends to manifest differently in adolescents than in children, with symptoms related primarily to challenges that are typical to this age group, such as executive functions. The manifestations of ADHD can be more internal and subjective, less subjective and overt, or less globally motorically hyperactive. Consequently, overall success in school suffers, as does self-esteem, potentially resulting in a continuing spiral of negative behavior. Comorbidities also occur frequently within this population.

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The shift in nosology from the *Diagnostic and Statistical Manual of Mental Disorders, second edition* (DSM II) hyperkinetic reaction disorder to the *Diagnostic and Statistical Manual of Mental Disorders, third edition* (DSM III) attention-deficit disorder (ADD) occurred as a result of a series of studies demonstrating prominent cognitive deficits.¹ Since these landmark studies, our understanding of the characteristics of attention deficit/hyperactivity disorder (ADHD) has changed profoundly. We now know that 30% of children with ADHD have relatively little hyperactivity

and impulsivity, and that inattention, organization, and other cognitive-behavioral abnormalities are predominant. Since adolescents selectively lose motoric symptoms, we now recognize that ADHD rarely dissipates with age, but rather transforms over time. We must view ADHD as a complex, multifaceted disorder with symptoms that change as the patient ages, as do societal demands and supports.

In early childhood, children are provided with a great deal of structure and generally are not responsible for initiating and organizing tasks. Over time, however, children are expected to do more, with less assistance. By fourth grade, homework is assigned that requires the ability to initiate and complete work. In sixth or seventh grade, children typically have multiple teachers, move from class to class, and must begin to organize their work. By adolescence, one needs to organize and plan independently to perform such tasks as defining and researching projects and managing diverse assignments. Such demands require the ability to perform tasks in a rational sequence and handle multiple projects simultaneously—demands that involve the executive functions of the brain.

Adolescents who are predominantly impaired in executive function do not typically exhibit the impulsive, disruptive behavior that is sometimes associated with children with ADHD. They may exhibit some characteristics typical of adolescence, but at an exaggerated level. In adolescence, the manifestations of ADHD are more internal and subjective, less subjective and overt, and less globally motorically hyperactive. Completing tasks, therefore, is difficult for adolescents with this disorder, which can negatively affect success in school and, thus, self-esteem. The result often is a continuing spiral of negative behavior, as they may begin to engage in risky behaviors to com-

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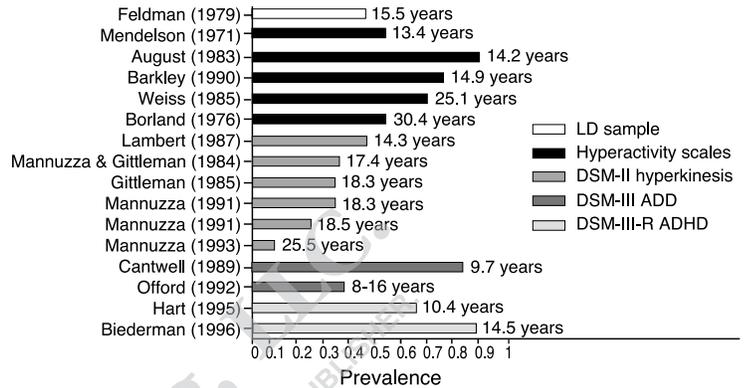
pensate for their lack of success. They are therefore at risk for a vast array of occupational/vocational problems, motor vehicle accidents, injuries, smoking and substance use disorder (SUD), legal difficulties, relationship problems, and academic failure, which are discussed in more detail below.

Although the persistence of ADHD into adolescence and adulthood has been documented,^{2,4} findings have been inconsistent. Differences in rates of remission may be largely related to changing definitions of ADHD itself. Early studies regarding the persistence of ADHD applied definitions consistent with DSM-II criteria, using hyperkinesis as an indicator of ADHD. We now know that hyperactivity tends to decrease in adolescence, which is why such studies show a remission rate for ADHD in children in this age group. However, when applying modern definitions of ADHD, signs of inattention persist into adolescence at a rate of nearly 50% (Figure 1).⁵

Another possible explanation for differences in reported remission rates may in fact be due to the variable definitions of remission that are traditionally used, rather than the natural history of the disorder. Keck et al⁶ proposed that distinctions be made between different types of remission to help standardize the scientific vocabulary and create a uniform frame of reference. Thus, syndromatic remission refers to the loss of full diagnostic status, which, when applied to ADHD, would mean that <6 of the 9 ADHD symptoms from either subtypes are present. Symptomatic remission refers to the loss of sub-threshold diagnostic status or the presence of <4 symptoms from either of the ADHD subtypes; functional remission refers to the loss of subthreshold diagnostic status plus functional recovery, suggesting absence of all symptoms of ADHD and full recovery from the disorder.

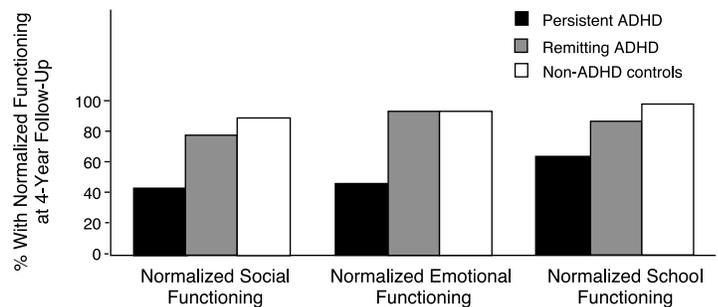
Biederman et al⁷ applied these definitions in an analysis of age-specific remission of ADHD in 128 boys measured 5 times over 4 years, and found that age was significantly associated with decline in total ADHD symptoms and symptoms of hyperactivity, impulsivity, and inattention. However, symptoms of inattention remitted for fewer subjects than did symptoms of hyperactivity or impulsivity. Syndromatic remission, in particular, occurred in approximately 50% of subjects by age 20 years. Using symptomatic remission as a defin-

Figure 1. Chronicity of ADHD: Follow-Up Studies



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Figure 2. ADHD: Course of the Disorder



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ition, approximately 20% of subjects remitted at age 20 years and 80% still manifested a subthreshold condition. Only 10% of subjects showed functional remission by age 20 years.

Such findings raise several important questions: Is the persistence of ADHD associated with dysfunction? And is remission of ADHD associated with normalization of function? To examine normalization of functioning in youths with persistent ADHD symptoms, investigators at the Massachusetts General Hospital followed 85 boys with ADHD and 68 boys without ADHD prospectively into midadolescence.⁸ Subjects were assessed at baseline and follow-up visits by using measures from 3 domains of functioning: school, social, and emotional. The study showed that 20% of boys with ADHD were functioning poorly in all 3 domains, 20% were functioning well in all 3 domains, and 60% had intermediate outcomes (Figure 2).⁸ These results demonstrate that persistent ADHD may manifest in a wide range of functional outcomes. Moreover, some predictors of negative outcomes were observed. Children with persistent ADHD with comorbidities such as mood, anxiety, or disruptive behaviors at baseline demonstrated worse function than those without comorbidities. Normalization of functioning was also inhibited by psychosocial adversity, (eg large family size and maternal psychopathology) as well as persistent impulsivity into the adolescent years.

Evaluations of cognitive function of children and adolescents over time have shown that both younger and older boys with ADHD show signs of neuropsychological impairment.⁹ Performance in ADHD and control children improved with age, but boys with ADHD continued to show significant impairments, suggesting continuity of neuropsychological deficits over time. Initially, there was hope that such impairments represented a developmental lag in brain maturation in childhood that would be overcome in adolescence; however, this study did not substantiate such theories.

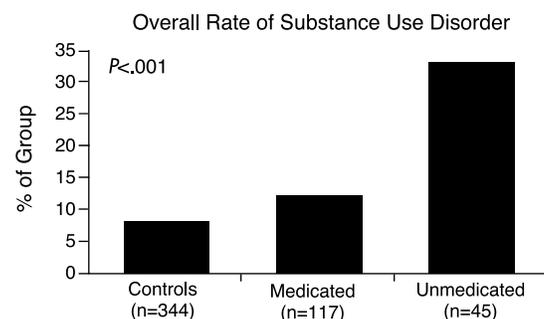
IMPACT OF ADHD ON SOCIALIZATION AND SUBSTANCE USE

Although the impact of ADHD on academic performance has been widely studied, investigators have more recently conducted a more comprehensive analysis of social issues. They have found that approximately 50% of children with ADHD experience social problems, and are frequently severely affected.^{10,11} The

types of social problems that are associated with ADHD vary according to the presentation of ADHD in the child. Obviously, if a child is impatient, has temper tantrums, and is disruptive, there will be social ramifications. However, in some instances, the social ramifications are subtler: the child is not very reciprocal, does not listen well, and, therefore, does not follow social cues. Such children may be less likely to make friends and engage in the social activities that reinforce their sense of happiness and self-worth.

When such social shortcomings persist into adolescence, the consequences shift from simple demoralization to potentially dangerous situations. The ADHD teen and preteen tends not to participate in group activities and to make few friends. As they begin to establish independence from their parents and other adults, they become increasingly vulnerable to antisocial groups and substance abuse. Smoking is initiated at greater levels and earlier in children with ADHD than non-ADHD children (19% vs 10%) and they have a more difficult time quitting.¹² Untreated ADHD children, who have been stigmatized by an accumulation of skill deficits and impairments since early childhood, are twice as likely to develop SUDs by age 18 to 20 years.¹³ Contrary to popular opinion, children with ADHD who are treated with stimulant therapy are less likely to experience SUDs over time (Figure 3).¹⁴

Figure 3. Substance Use Disorder in ADHD Youths Growing Up



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COMORBIDITIES IN ADHD

Studies of children with ADHD consistently document high rates of comorbid psychiatric conditions, including conduct, mood, anxiety, and tic disorders (Table 1).^{15,16} When diagnosing children with ADHD, one must be careful not to dismiss other symptomatology as secondary. Even in nonreferred, epidemiologic samples, there are higher rates of comorbid disorders coexisting with ADHD. These disorders meet full DSM criteria and contribute to further disorder-specific impairments and outcomes.

Oppositional defiant disorder (ODD) is the most prevalent comorbidity in ADHD, affecting approximately 45% to 64% of ADHD children. Although ODD is frequently confused with conduct disorder, they are distinctly different entities with differing outcomes. The child with ODD has difficulty making transitions, loses his or her temper, frequently blames others for his or her failures, and is argumentative. The child with conduct disorder manifests childhood sociopathy, exhibiting aggressive behaviors at times and possibly having problems with lying, theft, and truancy. However, evidence suggests that childhood conduct disorder manifests in a small subset of children with ADHD, and typically does so by the age of 10 years.¹⁷

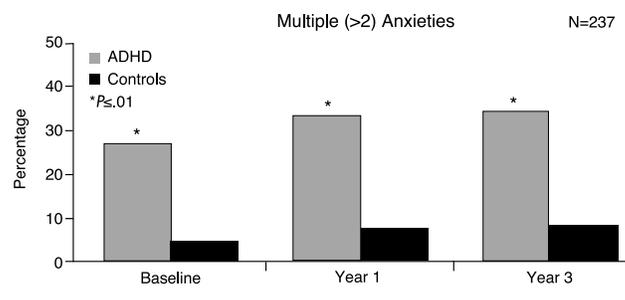
Children with ADHD are at increased risk of anxiety disorders as they pass into adolescence. Whereas it was once thought that hyperactive children with ADHD would be less likely to experience an internalized disorder such as anxiety, we now know the opposite to be true. There are high rates of correlation between the 2 domains. Longitudinal data assessed by Biederman et al revealed that at 1- and 4-year follow-ups, children with ADHD were approximately 3 times more likely to experience multiple anxieties than children in the control group (Figure 4).¹⁸ Moreover, investigators found significant differences between children with ADHD and controls in rates of mood disorders, with mood disorders increasing markedly from baseline to follow-up assessments. In particular, children with ADHD were approximately 4 times more likely to suffer from major depression than control subjects (Figure 5).¹⁸ Baseline depression was a predictor of recurrent depression and other disorders (bipolar, anxiety, and oppositional disorders), as well as increased social dysfunction and family conflict. Therefore, a history of a comorbid disorder within a child with ADHD may become an important predic-

Table 1. Comorbid Conditions in Children With ADHD

Comorbidities	% Range
Anxiety disorder	8–30
Conduct disorder	8–25
Oppositional-defiant disorder	45–64
Depressive disorders	15–75
Tic disorder	8–34
Mania/hypomania	0–22
Learning/academic problems	10–92

Adapted from references 15,16.

Figure 4. 4-Year Follow-Up Study of ADHD



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tor of future outcome and a significant factor in treatment decisions.

A number of studies suggest that depression in children often converts to bipolarity over time.¹⁹ Within the ADHD population, the risk of bipolarity increases in adolescence and is characterized by “affective storms,” or “prolonged and aggressive temper outbursts.”¹³ In an analysis of the efficacy of medications given to children with both bipolarity and ADHD,²⁰ mood stabilizers were frequently used in children with manic-like symptoms and were associated with significant symptom improvement; use of antidepressant, antipsychotic, and stimulant medications was not. These findings are particularly significant, as an analysis of adults with bipolarity has found that as many as 13% also have ADD. Moreover, the ADD subset suffered more severe bipolar disease than those who did not have ADD.²¹

CONCLUSION

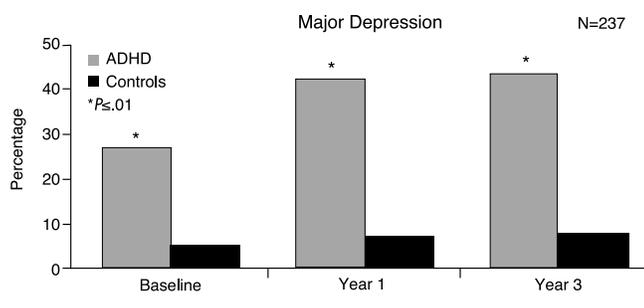
In summary, ADHD significantly interferes with the normal developmental tasks of adolescence. At a time in life when individuation and independence are central to normal development, the impaired executive functions characteristic of ADHD become particularly problematic. The ability to help and support a child with ADHD is hampered by the adolescent's natural inclina-

tion to be self-sufficient and embarrassed by interventions. While ADHD is a serious and significant disorder in itself, it is also a risk factor for additional psychiatric conditions that may lead to risky and dangerous behaviors throughout adolescence and into adulthood.

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Figure 5. 4-Year Follow-Up Study of ADHD



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