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Diagnosis of Attention-Deficit/Hyperactivity Disorder (AD/HD) in Childhood: A Review of the Literature

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This article examines recent literature related to the diagnosis of Attention-deficit/Hyperactivity Disorder (AD/HD) in childhood. First, the article discusses diagnostic criteria presented in the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 2000). Next, it explores the diagnostic procedures for AD/HD recommended in current publications. Results of this comprehensive literature review indicate that rating scales, interviews, laboratory/psychological testing, and observations are the most frequently recommended AD/HD diagnostic techniques. The implications of these findings for school psychologists are discussed.

KEYWORDS: ADHD, Attention Deficit, Diagnosis

Although medical science recognized inattention, impulsivity, and hyperactivity as problematic among children as long as 200 years ago (Anastopoulos & Shelton, 2001), no single method for reliably diagnosing Attention-deficit/Hyperactivity Disorder (AD/HD) has yet to be identified. This lack of a specific diagnostic procedure makes AD/HD identification complicated (Brock, 1999; Detweiler, Hicks, & Hicks, 1999). Furthermore, differential diagnosis can be confounded by a variety of other disorders that can co-exist with AD/HD or cause symptoms similar to those observed in AD/HD (Levy, Hay, Bennett, & McStephen, 2004; Power, Costigan, Eiraldi, & Leff, 2004). To address these issues, an accurate diagnosis requires multiple diagnostic procedures, such as obtaining information from different sources (Barkley, 1998; Hoff, Doepke, & Landau, 2002), behavioral observations (Miranda, Presentacion, & Soriano, 2002), and psychological assessment (Detwiler et al., 1999).

Before proceeding further, it is important to acknowledge that the role of the school psychologist in the diagnosis of AD/HD is somewhat controversial as this disorder is not a special education eligibility category in either state or federal regulations. Consequently, from the first author's experiences, it has been observed that some districts do not allow their school psychologists to make AD/HD diagnoses. Such limitations are problematic given that (a) both state and federal regulations clearly specify that students with AD/HD may be eligible for special education services or Section 504 protections (CEC §56339; Davila, Williams, & MacDonald, 1991), and (b) school districts are required to identify special needs and must conduct assessments in all areas of suspected disability (34 C.F.R. §§ 104.32, 104.35, 300.304). Thus, there appear to be important legal reasons for school psychologists at least being well informed about the important elements of the AD/HD diagnosis. Further emphasizing the need for such knowledge is the California Education Code section specifying that all school personnel be trained to develop greater awareness of AD/HD [CEC §56339(d)].

Consistent with the need for school psychologists to be better informed regarding AD/HD, the purpose of this article is to review relevant diagnostic issues and information, beginning with a discussion of the American Psychiatric Association's (APA) diagnostic criteria and, subsequently, presenting the results of a comprehensive literature review that identified the frequently recommended techniques

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for diagnosing AD/HD. This latter part of the paper is intended to provide school psychologists with a resource that documents the agreed upon elements of a comprehensive AD/HD diagnostic assessment. While it is clear there is no specific method or set of methods for diagnosing AD/HD, this literature review reveals significant agreement regarding recommended diagnostic practices. In addition to guiding the school psychologist's practice, from the first author's applied experiences, this knowledge will be helpful in those instances wherein a school assessment team is presented with an "AD/HD" diagnosis that is judged to be questionable because it fails to meet standard diagnostic practices.

AD/HD DIAGNOSTIC CRITERIA

AD/HD is included in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision* (DSM-IV-TR; APA, 2000). The diagnosis of AD/HD is found within the section titled, "Disorders Usually First Diagnosed in Infancy, Childhood, or Adolescence" (pp. 39-134). Common among all disorders in this section is the presence of symptoms prior to an individual's 18th birthday. AD/HD is further subsumed within the category of "Attention-Deficit and Disruptive Behavior Disorders" (pp. 85-103). Conduct Disorder, Oppositional Defiant Disorder, and Disruptive Behavior Disorders, Not Otherwise Specified are also included within this broader category.

The primary AD/HD symptoms are a "persistent pattern of inattention and/or hyperactivity-impulsivity that is more frequently displayed and more severe than is typically observed in individuals at a comparable level of development" (APA, 2000, p. 85). The *DSM-IV-TR* classifies AD/HD into three subtypes: (a) Predominantly Hyperactive-Impulsive Type; (b) Predominantly Inattentive Type; and (c) Attention-deficit/Hyperactivity Disorder, Combined Type, which includes both hyperactive-impulsive and inattentive symptomology. Although the specific behavioral symptoms presented in the *DSM-IV-TR* are relatively self-explanatory, other diagnostic requirements appear to require further elaboration and are discussed below.

Although not currently specified in diagnostic criteria, leaders in this field have argued that the Predominantly Inattentive Type of AD/HD can be diagnosed significantly later than AD/HD Hyperactive-Impulsive Type and AD/HD Combined Type (e.g., Barkley, 1998). According to the *DSM-IV-TR* "Academic deficits and school-related problems tend to be most pronounced by the types marked by inattention …, whereas peer rejection and, to a lesser extent, accidental injury are most salient in the types marked by hyperactivity and impulsivity" (APA, 2000, p. 88). Due to differences such as these, Barkley (1997a; 1998) has suggested AD/HD Inattentive Type may be a separate and distinct disorder, rather than a subtype of AD/HD.

Symptom Onset

Even though a clinical diagnosis of AD/HD may come later, symptoms of inattention and/or hyperactivity-impulsivity that compromise daily functioning should be observed prior to a child's 7th birthday. However, this does not mean that a diagnosis must be made prior to the age of 7. In fact, it can be made in adulthood if careful verification of symptom onset prior to 7 years of age is made. To document age of onset, review of records and clinical interviews with parents and teachers may be required.

It is important to note that, since toddlers and preschoolers are typically very active, it is recommended that developmentally appropriate behaviors be taken into consideration and diagnosis of AD/HD be made with caution in the preschool years. A diagnosis of AD/HD prior to age 7 should be made only in cases where children are significantly more active than their developmental peers, so as to avoid the tendency to over-diagnose the disorder in preschoolers (Loughran, 2003). Conversely, if symptom onset

occurs subsequent to 7 years of age (particularly in cases of hyperactivity) the cause may be something other than AD/HD. For example, the cause of "AD/HD-like" behaviors in the older child or adolescent might include substance abuse (Burke, Loeber, & Lahey, 2001), learning disabilities, or physical illness (Root & Resnick, 2003).

Symptom Duration

According to the *DSM-IV-TR*, the pattern of symptoms for each subtype of AD/HD must be present for a minimum of six months prior to diagnosis. Symptom duration is critical when differentiating AD/HD from other disorders and normative developmental transitions, including school adjustment or temporary family stress. To document duration of symptoms, review of records and clinical interviews with parents and teachers may be required.

Symptom duration of at least six months is particularly important in assessment and diagnosis of AD/HD in preschool children. This is because it has been estimated that from 15% to 29% of this population is rated as inattentive and overactive by their parents at some point prior to age 5 (Gimpel & Kuhn, 1998; Loughran, 2003). However, in the majority of these cases concerns remit within 12 months (Campbell, 1990). In other words, significant inattention and hyperactivity/impulsivity in the 3- to 4-year-old child is not necessarily indicative of a pattern of AD/HD, but may be considered developmentally appropriate behavior (Barkley, 1998).

Multiple Settings

According to the *DSM-IV-TR*, the impairments resulting from the symptoms of hyperactivity/impulsivity and/or inattention must be observed in at least two distinct settings, such as home, school, work, and social situations (APA, 2000). For example, symptoms could be present at home and school, or at school and after-school programs. The presence of symptomology in only one setting would not be sufficient for a diagnosis. Typically, the severity of symptoms varies between settings. For example, inattentiveness and hyperactivity/impulsivity are typically more problematic in situations of limited interest or novelty or those that require sustained mental effort. Traditional classroom lectures and lengthy repetitive tasks typically fall into this category. To document that symptoms are problematic in multiple settings, information from direct observations or the use of rating scales by various informants (e.g., parents and teachers) may be appropriate.

Clinical Significance

The *DSM-IV-TR* specifies that "clear evidence of social, academic, or occupational functioning" (APA, 2000, p. 93) impairments must be considered before a diagnosis of AD/HD is made. Specifically, for a child or adolescent to receive a diagnosis, their symptoms must negatively impact their academic performance, social interactions, and family relationships. For example, if an inattentive and/or hyperactive/impulsive child is able to obtain passing grades, follow classroom and playground rules, and develop appropriate peer relationships, clinically significant impairments may not exist and an AD/HD diagnostic assessment (let alone the diagnosis itself) would not be appropriate. To document clinically significant impairments, review of records and clinical interviews with parents and teachers may be required.

Developmental Level

Symptoms of inattentiveness and hyperactivity are often observed among children with low intellectual functioning when they are placed in inappropriate educational settings (APA, 2000). Inattentive and hyperactive behavior that results from inappropriate school placement must be distinguished from true AD/HD. In cases of children who have been diagnosed with mental retardation, "an additional diagnosis of AD/HD should be made only if the symptoms of inattention or hyperactivity are excessive for the child's mental age" (APA, 2000, p. 91). For example, if a 12-year-old with a developmental functioning level of 6 years demonstrates behavior typically observed among 6-year-olds, this criterion for a diagnosis of AD/HD would not be met. In this case the behavior is commensurate with developmental level. However, if this same 12-year-old demonstrated inattentiveness and/or hyperactivity similar to that observed among 4-year-olds, a diagnosis of AD/HD may be appropriate.[1] To document that symptoms are developmentally inappropriate, norm referenced psycho-educational assessments may be required.

Differential Diagnosis

Finally, AD/HD diagnostic requirements require that other conditions with similar symptoms be ruled out before an AD/HD diagnosis is made (APA, 2000). In addition, the differential diagnosis of this disorder requires that age-appropriate behaviors among younger children (e.g., jumping, running, and yelling among preschoolers), mental retardation, under-stimulating environments, oppositional behavior, learning disorders, and other mental disorders (e.g., Pervasive Developmental Disorders; Psychotic Disorder; and Other Substance-Related Disorder, Not Otherwise Specified) be considered and ruled out as primary causes of the observed behaviors before the diagnosis of AD/HD is made. This requirement highlights the fact that a variety of conditions may generate AD/HD-like behaviors and that the diagnostic evaluation must include evaluation tools designed to consider these alternative explanations for AD/HD behaviors (Brock, 1999). Thus, even in those instances where the school psychologist is not making the AD/HD diagnosis, a comprehensive psycho-educational evaluation may be necessary to differentiate AD/HD from other similar disorders.

COMPONENTS OF THE AD/HD DIAGNOSIS

To identify frequently recommended components of an AD/HD diagnosis, the authors conducted a comprehensive review of the literature published within the past 15 years. Making use of the PsycINFO database, 48 articles, books, or book chapters, published since 1990 were identified based upon the use of the following words in the publication's title: "attention deficit" and "diagnose" or "diagnosis" or "assessment." Next the authors evaluated whether the source was specifically intended to give practical guidance to health and/or mental health care professionals regarding how to diagnose AD/HD in childhood (i.e., did the publication have as one of its goals instructing readers on how to diagnose this disorder). From these selection procedures, 42 sources were identified as being appropriate for this literature review. Analysis of these sources revealed that a variety of different diagnostic procedures are recommended. However, most of these can be classified into one of several specific categories. Table 1 provides a summary of these diagnostic procedure categories and the sources that advocate their use. Table 2 provides an overview of the questions addressed by each procedure and offers examples of

1 Similarly, intellectually gifted children may demonstrate inattentiveness when they are placed in under-stimulating academic environments (APA, 2000). In the case of gifted children, obtaining historical information from several informants may help define their ability to regulate behavior across settings and help to determine if behaviors are isolated to the school or if they meet the multiple setting criteria.

TABLE 1. *AD/HD Diagnostic Procedures Recommended in Recent Publications*

	RS	INT	L/T	DO	ME	SR	PA
1. Am. Acad. of Pediatrics (2000)	✓	✓	✓			✓	
2. Anastopoulos & Shelton (2001)	✓	✓	✓	✓	✓		
3. Atkins & Pelham (1991)	✓			✓			✓
4. Barkley (1990)	✓	✓	✓	✓	✓	✓	
5. Barkley (1991)	✓	✓	✓	✓			
6. Barkely (1997b)	✓	✓	✓	✓			✓
7. Barkley (1998)	✓	✓	✓		✓	✓	
8. Barkley (2006)	✓	✓	✓		✓	✓	
9. Brown (2000)	✓	✓	✓	✓			
10. Burcham & DeMers (1995)	✓	✓	✓	✓			
11. Casat et al. (2001)	✓	✓	✓		✓	✓	
12. Cipkala-Gaffin (1998)	✓	✓	✓	✓	✓		
13. Detweiler et al. (1999)	✓	✓	✓		✓		
14. DuPaul et al. (1991)	✓	✓	✓	✓			
15. DuPaul & Stoner (1994)	✓	✓		✓		✓	
16. Guevremont & Barkley (1992)	✓	✓	✓	✓			
17. Guevremont et al. (1990)	✓	✓	✓	✓			
18. Hardy et al. (2004)	✓	✓	✓				
19. Hechtman (2000)	✓	✓	✓	✓	✓	✓	
20. Hinshaw (1994)	✓	✓	✓	✓			
21. Leach & Brewer (2005)	✓	✓	✓	✓			
22. Learner et al. (1995)	✓	✓	✓	✓		✓	
23. Martin (2003)	✓	✓	✓		✓		
24. Meyer (1999)	✓	✓	✓		✓		

25. Nahlik (2004)	✓	✓	✓	✓			
26. Oesterheld et al. (2003)	✓	✓	✓				
27. Pelham et al. (2005)	✓	✓		✓			
28. Quinlan (2000)	✓	✓	✓	✓			
29. Quinn (1997)	✓	✓	✓	✓	✓		
30. Rapport (1993)	✓	✓	✓	✓			
31. Robin (1998)	✓	✓	✓	✓	✓		
32. Root & Resnick (2003)	✓	✓	✓	✓	✓	✓	
33. Schaughency & Rothlind (1991)	✓	✓		✓			✓
34. Searight et al. (1995)	✓	✓	✓				
35. Shelton & Barkley (1994)	✓	✓	✓	✓			
36. Shelton & Barkley (1995)	✓	✓	✓	✓			
37. Silver (1999)	✓	✓	✓				
38. Silver (2004)	✓	✓	✓				
39. Slomka (1998)	✓	✓	✓	✓			
40. Swanson & Smith (1996)	✓	✓	✓	✓	✓		
41. Wolraich et al. (2005)	✓	✓	✓			✓	
Totals	**100%**	**98%**	**90%**	**68%**	**34%**	**24%**	**7%**

specific techniques. As can be seen, the four nearly universally recommended procedures are rating scales, interviews, laboratory/psychological assessments, and direct behavioral observations. Thus, these procedures will be discussed first. Subsequently, a discussion of other less frequently recommended procedures, including medical evaluations, school record reviews, and peer ratings is provided.

Rating Scales

Rating scales are the most widely advocated procedure for evaluating children with AD/HD, with 100% of the sources reviewed for this paper endorsing their use. As stated by Hinshaw (1994), "…rating scales are an indispensable element of the assessment of children with suspected attention deficits and hyperactivity" (p. 32). In some cases, rating scales can effectively differentiate children with AD/HD from others without this disorder (Barkley, 1998). In addition, they are time and cost effective (Anastopoulos & Shelton, 2001). While for the school psychologist many other data sources are readily accessible, for the diagnostician not based in a school setting, rating scales are generally the only practical

TABLE 2. *Summary of Recommended AD/HD Diagnostic Procedures*

Procedure	Diagnostician	Sample Techniques	Sample Questions
Rating Scales	Mental Health Professional Educational Specialist	Conners' (1997) Rating Scales Behavior Assessment System for Children 2 (Reynolds & Kamphaus, 2004)	Are AD/HD symptoms present? How deviant are symptoms for the norm? Are there comorbid conditions?
Parent, Teacher, Child Interviews	Mental Health Professional Medical Professional	Structured interview techniques (e.g., Diagnostic Interview Schedule for Children [Shaffer et al., 1996]) Unstructured interview techniques Semi-structured interviews (e.g., developmental & health history)	Are AD/HD symptoms present? When was the onset of AD/HD symptoms? How long have symptoms been present? Is the environment a factor? Is there a family history of AD/HD? Is the developmental/ medical history significant? Are there comorbid conditions?
Direct Behavioral Observations	Mental Health Professional Educational Specialist	Observation of test taking behavior Classroom and play-ground observations	Does the child display AD/HD behavioral symptoms? Does the child display AD/HD symptoms?

Psychological Pscho-Educational Tests	Mental Health Professional Educational Specialist	Executive functioning tests (e.g., Test of Everyday Attention for children [Manly et al., 1999]) Intelligence testing Achievement testing	Does the child demonstrate neuro-psychological or processing deficits? What is the child's ability level? What is the child's academic level?
Medical Evaluation	Pediatrician General Practitioner Psychiatrist	Medical interview Physical examination Other medical tests as indicated	Are symptoms secondary to a medical condition?
Neuroimaging	Medical Specialist	PET MRI fMRI SPECT	Is there abnormal brain functioning during tasks that require planning, attention, and impulse control?
School Records	Mental Health Professional Educational Specialist	Cumulative file review School work sample review	Is there a history of AD/HD symptoms? When was the onset of AD/HD symptoms?

way to obtain information from classroom teachers, since more time-consuming clinical interviews and observations may be difficult to arrange (Wender, 2004).

Rating scales provide a structured format for documenting the presence and degree of AD/HD symptoms using a normative frame of reference (Anastopoulos & Shelton, 2001; Burcham & DeMers, 1995; Landau & Burcham, 1995; Nahlik, 2004). Additionally, rating scales also allow the diagnostician to obtain information used in assessment of treatment effectiveness (Landau & Burcham, 1996). In other words, rating scales may be administered during the diagnostic process and again, later, when treatment has been initiated to determine the effect of intervention.

Several rating scales, such as the *ADHD Symptoms Rating Scale* (ADHD-SRS; Holland, Gimpel, & Merrill, 2003), *ADHD Rating Scale-IV* (DuPaul, Power, Anastopoulos, & Reid, 1998), and the *Conners' Rating Scales* (Conners, 1997), assess symptom severity specific to AD/HD. General purpose rating scales, such as the *Behavioral Assessment System for Children-Second Edition* (BASC-2; Reynolds & Kamphaus, 2004) and the *Child Behavior Checklist* (CBCL; Achenbach & Rescorla, 2001), are also available. These measures are helpful because they provide information about symptoms related to AD/

HD and other frequently occurring disorders or comorbid conditions (Anastopoulos & Shelton, 2001; Landau & Bircham, 1996). As such, they assist in the consideration of alternative hypotheses for AD/HD-like symptoms. Both types of scales (i.e., symptom-specific and general purpose) are recommended.

Despite their utility, as with all other diagnostic procedures, a rating scale should never be used in isolation to diagnose AD/HD (Nahlik, 2004). According to Rucklidge and Tannock (2002), this is particularly important, since some rating scales, one example being the Brown ADD Scale, may be most useful for screening out AD/HD rather than diagnosing it due to the measure's low sensitivity (i.e., the probability that a child with AD/HD is accurately identified as having AD/HD is low; Rucklidge & Tannock, 2002).

Different raters, responding to the same rating scale, often provide different results. For example, agreement between parent and teacher ratings on diagnosis and actual symptoms has been shown to be low, possibly due to observations occurring in distinct settings (Wolraich et al., 2004). Yet comparison between raters may show discrepancy related to subtypes, they often correspond at an overall diagnostic level (Mitsis, McKay, Schulz, Newcorn, & Halperin, 2000).

Similar findings have been obtained in relation to self-report and teacher report measures of behavior in the diagnosis of AD/HD. Self-report behavioral ratings have been found to underestimate activity levels as well as attentional problems compared to parent and teacher report (Danckaerts, Heptinstall, Chadwick, & Taylor, 1999; Smith, Pelham, Gnagy, Molina, & Evans, 2000). Finally, use of teacher rating scales for adolescents appears questionable. Possibly due to the large size of many high school classes and the relative brevity of each class meetings, teacher agreement is lower for adolescent behavior (Molina, Pelham, Blumenthal, & Galiszewski, 1998).

Interviews

Another frequently recommended AD/HD diagnostic procedure is the clinical interview, with 98% of the sources reviewed for this paper endorsing their use. Clinical interviews are typically conducted by a mental health professional, such as a psychologist or social worker, or by medical professionals, including pediatricians or family practitioners. Interviews may be conducted with parents, teachers, and/or the student who was referred for assessment. According to Root and Resnick (2003) they are "the most important part of the evaluation process" (p. 36). According to Hinshaw (1994) and Nahlik (2004), clinical interviews address diagnostic issues including: (a) Whether AD/HD symptoms are present and under what conditions are they observed, (b) The onset of the AD/HD symptoms?, (c) The duration of symptom presentation, (d) The presence of environmental factors, (e) Family history of AD/HD, (f) The developmental history relative to AD/HD, (g) The presence of learning difficulties, and (h) The presence of emotional difficulties. Although relatively costly and time consuming, an interview can expand upon the results of behavioral rating scales since it "provides the opportunity to query the informant and make a better judgment about the symptom in question" (Wender, 2004, p. 48).

Formats for clinical interviews include structured, semi-structured, and unstructured procedures. A structured interview is conducted using an interview schedule, or a set of questions that are designed to probe areas of specific concern. Interview questions are read in the order they are written and responses are recorded categorically (Anastopoulos & Shelton, 2001). Structured diagnostic interviews have been defined as the "preferential method of diagnosis because of their exhaustive and direct correspondence to the *DSM* criteria" (McGrath, Handwerk, Armstrong, Lucas, & Freman, 2004, p. 350). Semi-structured interviews incorporate a specific set of questions while allowing the clinician to engage in open-ended inquiries to obtain further information about relevant points. An unstructured interview is conducted

through the use of open-ended questioning.

Parent interviews. The parent interview is considered an indispensable part of the AD/HD evaluation (Barkley, 1998; Landau & Burcham, 1996). In fact, it has been asserted that the "diagnosis of ADHD and/or other psychiatric comorbidities should be based largely on the information gained in the interviews" (Nahlik, 2004, p. 2). This is because parents are typically able to provide the most detailed and ecologically relevant information to the assessment process (Barkley, 1998). Interview data can effectively guide development of a holistic picture of the child and his or her experiences, filling in the gaps that may remain subsequent to use of other assessment techniques.

In addition to offering information about AD/HD symptoms, semi-structured parent interviews can provide relevant information about a child's developmental, school, family, and psychiatric history (Barkley, 1998; Hinshaw, 1994). According to the *DSM-IV-TR* diagnostic criteria, specific data regarding the onset of AD/HD symptoms and family history of AD/HD should be obtained (APA, 2000) and, accordingly, this information can be provided by the child's parents or caregivers. While the parent interview yields critically important information, it can be subject to bias and therefore not provide a true picture of the student's functioning (Guevremmont, DuPaul, & Barkley, 1990). Thus, triangulation of data sources is required. In addition, it is important to note that Barkley (1998) asserts that the reliability and validity of parent interviews depends largely on the clinician's ability to conduct the interview and to ask relevant and specific questions.

Teacher interviews. Of equal importance to the AD/HD assessment and diagnostic process, is the teacher interview. Both accurate diagnosis and evaluation of treatment effects have been reported to be dependent on teacher observation of student behavior. Thus, the teacher interview is critical given the significant amount of time spent at school and the importance of attention in relation to academic success (Molina et al., 1998). As is the case with the parent interview, the teacher interview is an important complement to teacher behavior rating scales (Molina, Smith, & Pelham, 2001), and for the school psychologist is a readily accessible data source.

Student interviews. The student interview may also be incorporated into the AD/HD diagnostic process. Information obtained directly from children can be helpful, particularly if other psychopathologies, such as depression or psychosis, are suspected. However, regarding externalizing behavior disorders (e.g., AD/HD) it is important to acknowledge that children commonly report fewer symptoms than do adults (Hart, Lahey, Loeber, & Hanson, 1994; Volpe, DuPaul, Loney, & Salisbury, 1999). Nevertheless, at least in the case of adolescents, interviews may be particularly important in obtaining their collaboration in acceptance of the AD/HD diagnosis, as well as ensuring treatment compliance (Nahlik, 2004).

Laboratory/Psychological Testing

The use of laboratory and/or psychological tests is also common in the diagnosis of AD/HD, with 90% of the sources reviewed for this paper endorsing their use. According to Anastopoulos and Shelton (2001), standardized, norm-referenced measures are widely used due to "concerns that interviews and rating scales are not objective, are not pure measures of attention, and do not permit a component analysis of the construct of attention" (p. 106). However, Barkley (1998) argues that "the fact that a series of tests is characterized as neuropsychological does not guarantee it actually taps into relevant neuropsychological processes" (p. 299). In other words, just because a test is purported to measure attention, does not mean it is a valid and reliable measure of a child's ability to focus, inhibit and/or sustain responses in natural or clinic settings.

Cognitive assessment. A significant amount of research has been conducted regarding the relevance

of IQ testing to the AD/HD diagnosis. Findings have been mixed, with some research indicating that children with AD/HD are likely to perform several points lower than peers on IQ tests (Doyle, Biederman, Seidman, Weber, & Faraone, 2000; Fischer, Barkley, Fletcher, & Smallish, 1990). Others have found that AD/HD and IQ function independent of one another (Shuck & Crinella, 2005). While controversy about the relationship between intelligence test results and AD/HD persists, determining a child's IQ remains important given the *DSM-IV-TR* (APA, 2000) diagnostic criterion that rules out the diagnosis if a student's level of hyperactivity, impulsivity and/or inattention is commensurate with his or her developmental level.

Psycho-educational assessments. Psycho-educational assessment can provide unique information to the diagnostic process as it provides information related to problems that can be either associated with AD/HD or that might serve as alternative explanations for the symptoms. For example, in some cases comorbid learning (Barkley, 1998; Barry, Lyman, & Klinger, 2002), language (Barkley, 1998; Cohen et al., 2000; Riccio & Jemison, 1998) and processing (Bedard, Martinussen, Ickowicz, & Tannock, 2004) disorders may best account for the behaviors often associated with AD/HD. Consequently, some have recommended tests of academic achievement and other measures that assess these abilities be a part of the diagnostic process (Selikowitz, 2004).

Neuropsychological assessments. Some sources reviewed suggested neuropsychological tests to be sensitive to aberrant cognitive processes associated with AD/HD (e.g., inattention and impulsive response patterns; Dige & Wik, 2005; Kaplan & Stevens, 2002). The neuropsychological evaluation may also contribute to understanding children with attentional difficulties who do not meet *DSM-IV-TR* criterion for a diagnosis of AD/HD (Baron, 2004).

Research has offered some support for the sensitivity of certain neuropsychological tests as measures of attention skills (Roth & Saykin, 2004). For example, measures such as the *Wide Range Assessment of Memory and Learning, Second Edition* (WRAML 2; Sheslow & Adams, 2003), the *California Verbal Learning Test, Children's Version* (CVLT-C; Delis, Kramer, Kaplan, Ober, & Fridlund, 1998), and the *Wisconsin Card Sorting Test* (WCST; Heaton, Chelune, Talley, Kay, & Curtis, 1993) have been suggested to be sensitive to neuropsychological functions including attention span, sustained attention, both single- and repeated-trial learning, response inhibition, and working memory. In addition, individually administered assessment batteries designed specifically to measure executive functions related to AD/HD have recently been developed. These include the *Delis Kaplan Executive Functioning System* (DKEFS; Delis, Kaplan, & Kramer, 2001) and the *Test of Everyday Attention for Children* (TEA-Ch; Manly, Robertson, Anderson, & Nimmo-Smith, 1999). These tools are designed to measure functions associated with AD/HD, such as sustained attention and vigilance and response inhibition.

Computerized neuropsychological assessments designed to evaluate specific aspects of AD/HD were also recommended by some of the sources reviewed. Among these are the *Conners' Continuous Performance Test* (Conners, 2000), the *Test of Variables of Attention* (TOVA; Greenberg, Corman, & Kindschi, 2001), and the *Gordon Diagnostic System* (Gordon, McClure, & Aylward, 1996). These tools purport to evaluate a child's vigilance and sustained attention using computerized formats and are commonly used in evaluation of suspected AD/HD. These measures of sustained attention typically require a child to listen to or look at a series of numbers or letters and respond (often by pressing a button whenever certain stimuli or pairs of stimuli are presented). Scores are usually calculated according to correct responses, errors of omission (correct answers that were overlooked by the child), and errors of commission (incorrect answers that were selected by the child).

While neuropsychological testing has been advocated by some to be an important part of the AD/

HD diagnostic process, it is important to acknowledge that the use of these tests as part of the assessment and diagnostic process is controversial. Because the sensitivity and specificity of neuropsychological measures has been brought into question, they should not be utilized in isolation (Barkley, 1998; Doyle et al., 2000; McGee, Clark, & Symons, 2000). To date researchers suggest that neuropsychological assessment tools cannot accurately differentiate between subtypes of AD/HD (Geurts, Verté, Oosterlaan, Roeyers, & Sergeant, 2005), although they have been reported to effectively distinguish AD/HD children from those with other diagnoses (Dunn & Kronenberger, 2003).

Direct Behavioral Observation

As part of the assessment and diagnosis of AD/HD, direct observations are frequently recommended, with 68% of the sources reviewed for this paper endorsing their use. Direct observation is typically conducted by either mental health or educational professionals and frequently occurs in the school setting. They are designed to compliment rating scale and clinical interview data (Parker, 1992), as well as to assess interpersonal and social skills (Hinshaw, 1994).

Despite its relatively high cost (when compared to rating scales and interviews), direct observation of behavior is often recommended because of its importance to the differential diagnosis of AD/HD (Anastopoulos & Shelton, 2001). In fact, Barkley (1990) asserted that observations of student behavior is "…likely to prove as useful as (or more useful than) any other sources of information in the evaluation, because they directly assess the actual AD/HD symptoms of concern to the child's teacher" (p. 339). However, in the 2006 edition of his book, *Attention Deficit Hyperactivity Disorder: A Handbook for Diagnosis and Treatment,* Barkley argues that formal behavioral coding is not practical. He states, "Although a number of studies support the benefit of incorporating structured classroom observations into the diagnostic process, they are not enough to justify the considerable cost and effort they involve" (p. 383). However, it is important to acknowledge that Barkley is a clinician and not a school-based professional. Unlike most clinical psychologists, the school psychologist has easy access to this important data source. Thus, his criticism of the use of direct behavioral observation may not be applicable to the school psychologist.

If a behavioral observation is included in the AD/HD diagnostic process, it may be informal and unsystematic, or formal and systematic. When conducting a behavioral observation in a natural setting, such as the child's classroom, formal procedures include defining behaviors of concern, observing them at regular intervals (e.g., internal time sampling procedures), calculating the rate of a behavior, and comparing these rates to those of non-referred peers. Formal structured coding systems have been developed. For example, the *BASC* offers a paper-and-pencil and a Portable Observation Program (Reynolds & Kamphaus, 2004).

Tempering the possible utility of direct behavioral observations is the finding that direct behavioral observation has been shown to be highly correlated with teacher behavior rating scale data. Given this finding, it has been argued by some clinicians that this assessment technique often does not provide unique assessment data (Lett & Kamphaus, 1997), and given its relatively high cost may not be necessary in all cases. However, it should be acknowledged that behavioral observations are an important diagnostic strategy for confirming the AD/HD diagnosis and monitoring AD/HD symptoms, and given that they are readily accessible to the school psychologist, they should be employed whenever possible.

Medical Evaluations

A medical evaluation was recommended as a component of the AD/HD diagnostic process in 34% of the sources reviewed for this paper. In fact, some authors have argued that the "best person to make a diagnosis is a specialist pediatrician with an interest and expertise" in the area (Selikowitz, 2004, p. 123). Others, however, have noted that a medical evaluation is by itself inadequate to diagnose AD/HD (Barkley, 1990) and that: "Routine physical examinations of children with ADHD frequently indicate no physical problems and are of little help in diagnosing the condition or suggesting its management" (Barkley, 2006, p. 360). Perhaps most importantly, the findings of a medical evaluation can support the diagnostic process, particularly by providing information important to differential diagnosis by ruling out those relatively rare medical conditions that may be the cause of the AD/HD-like symptoms such as pinworms and absence seizures (Anastopoulos & Shelton, 2003; Robin, 1998).

When employed in the diagnostic process, the medical evaluation commonly includes a medical interview and a physical examination. The physician typically assesses for genetic syndromes, neurological abnormalities, gross sensory motor, hearing, vision, and physical impairments (Robin, 1998; Selikowitz, 2004). It has been suggested that the medical examination is especially critical for children with histories of a seizure disorder. Approximately 30% of children with a seizure disorder develop AD/HD, or have its symptoms worsened with anticonvulsants, such as Dilantin or Phenobarbital (Wolf & Forsythe, 1978). Furthermore, research investigations indicate that children with AD/HD demonstrate differential brain wave patterns as compared to control subjects (Clarke et al., 2003; Lazzaro, Gordon, Whitmont, Meares, & Clarke, 2001), and this difference can be detected using electrophysiological assessment procedures. Given these findings and the significant number of children with seizure disorders who also have AD/HD, it is not surprising that electrophysiological measures (e.g., EEG) are among the most commonly utilized medical testing procedures in the diagnostic assessment of AD/HD (Loo & Barkley, 2005).

Although a higher rate of AD/HD is not observed among children with asthma (Daly, Biederman, & Bostic, 1996), commonly prescribed asthma medications are reported to affect attention span and may exacerbate a preexisting case of AD/HD (Barkley, 1990; Parker, 1992). Furthermore, Albuterol, a commonly used inhalant medication for asthma, can cause side effects such as increased heart rate, tremor, and nervousness, which may be confused with AD/HD symptoms (Robinson & Geddes, 1996)

Diagnostic imaging. The use of diagnostic imaging (e.g., PET [positron emission tomography] scans, CAT [computed axial tomography] scans, MRIs [magnetic resonance images]) has increased in recent years, although it remains controversial. None of the sources meeting literature review search criteria recommended the use of these techniques as part of the diagnostic evaluation. However, another paper that addressed "executive dysfunction" was located that did identify neuroimaging techniques as a part of their recommended AD/HD diagnostic process (Roth & Saykin, 2004). Some experts, such as Robin (1998), have argued that "there is no evidence for the utility" for PET scans, CAT scans, MRIs, regular or enhanced EEGs in routine clinical assessments (p. 86). Many of the studies using neuroimaging techniques in the assessment and diagnosis of AD/HD have utilized very small samples and, therefore, have limited generalizability. However, some researchers have suggested these measures to have the ability to differentiate between AD/HD and non-AD/HD children (Kim, Lee, Shin, Cho, & Lee, D.S., 2002; Kim, Lee, Cho, & Lee, 2001; Rubia et al., 1999).

From the findings mentioned above, it is not surprising that diagnostic imaging techniques, such as MRI, CAT scans, and PET scans, are rarely used in clinical diagnoses. However, they have provided important insights into the brain of the child with AD/HD. For example, MRI studies demonstrate differ-

ential activation of the left and right prefrontal cortex, left anterior cingulate, basal ganglia, and cerebellum on tasks that require selective attention (Roth, & Saykin, 2004; Schulz et al., 2005; Willis & Weiler, 2005). Similarly, PET scans have indicated differential neurotransmitter and receptor binding in the brains of AD/HD children (Jucaite, Fernell, Halldin, Forssberg, & Farde, 2005).

Review of School Records

Examination of school records was also suggested by this literature review to be helpful in the diagnosis of AD/HD, with 24% of the sources reviewed for this paper endorsing their use. Given that the *DSM-IV-TR* (APA, 2000) diagnostic criteria require symptom onset to occur prior to the age of 7, it is likely the impulse control, hyperactivity, and attention difficulties of children will be documented throughout their school careers. Review of school records, including report cards and disciplinary histories, may yield information regarding when symptoms were first observed and their severity across time (Brock, 1999). Additionally, they can provide information related to a child's work habits, task completion, and academic functioning.

Peer Assessments

Peer nominations and peer ratings are another set of procedures suggested by three sources (7% of the sources reviewed) to be useful in the diagnosis of AD/HD. The utility of these procedures is based upon the well-documented social difficulties experience by AD/HD children (Whalen & Henker, 1985) and that the severity of these difficulties is an indicator of later adolescent and adult adjustment (Hinshaw, 1994; Weiss & Hechtman, 1986). Peer nominations typically require children to nominate those classmates whom they like the most, and those whom they like the least. Atkins and Pelham (1991) report that AD/HD children are usually rated as less popular and more disliked then children without this disorder. Peer ratings, on the other hand, obtain from classmates information regarding specific behaviors that lead to rejections, neglect, and popularity. Regarding these procedures, Schaughency and Rothlind (1991) suggest that ". . . peers are able to identify attention problems among their classmates who are referred for adjustment difficulties and to differentiate among their classmates who are referred for adjustment difficulties and to differentiate among the externalizing behavior problems of their classmates" (p. 196).

CONCLUDING COMMENTS: IMPLICATIONS FOR THE SCHOOL PSYCHOLOGIST

No one diagnostic procedure, or set of procedures, has been identified that will diagnose AD/HD with perfect reliability. The diagnosis of this disorder is complicated due to the nature of its symptoms, many of which can be attributed to other psychiatric disorders observed in childhood; and among younger children, to be similar to normative developmental behavior. Given the challenges of making an accurate differential diagnosis of AD/HD, the importance of working with a multidisciplinary team of medical and educational professionals, along with the family, the teacher, and the referred child should be clear.

As discussed at the beginning of this paper there are important legal reasons for the school psychologist being involved in AD/HD diagnoses (i.e., the combination of child find regulations and requirements that children be assessed in all areas of suspected disability). However, from this literature review it should be clear that in addition to these legal motivations, there are also practical reasons for the school

psychologist being an important part of the AD/HD diagnosis. Specifically, there is no one mental health professional that has more access to the multiple information sources and diagnostic procedures (i.e., rating scales; parent, teacher, and student interviews, psychological testing, and behavioral observations) considered to be required for an AD/HD diagnosis. For example, the classroom observational data that some working in clinical practice (e.g., Barkley, 2006) have come to argue are too costly to include in the standard diagnostic process, are readily accessible to the school psychologist.

While the diagnosis of AD/HD is complicated and perfect diagnostic reliability has yet to be obtained, from this review of the literature it is clear that there is significant consensus among authorities in the field regarding what the comprehensive evaluation of the child suspected to have AD/HD should involve. Specifically, it would appear that rating scales, interviews, psychological testing, and behavioral observations are the most commonly recommended procedures. Awareness of this consensus can not only help to guide practice, but can also be used to support the ability of the school psychologist to make this diagnosis. Specifically, it is clear that not only do school psychologists have ready access to the most frequently recommended diagnostic elements, but they also have as a part of their standard pre-service preparation training in the use of these techniques (i.e., how to use rating scales, conduct interviews, administer and interpret psychological tests, and conduct behavioral observations). Thus, given the appropriate supervised practice, it is argued that the school psychologist is well positioned to assist in the AD/HD diagnosis. At the very least, knowledge of the consensus regarding elements of the AD/HD diagnosis will be indispensable when evaluating the adequacy of the many students who present to their school psychologists with AD/HD diagnoses made by other (typically non-school based) health and mental health professionals. It is hoped that this paper has provided information that will assist these school psychologist in critically evaluating these independent AD/HD diagnostic assessments.

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