Attention Deficit/Hyperactivity Disorder

Keith Radley
University of Utah

Attention Deficit/Hyperactivity Disorder as defined by the Diagnostic and Statistical Manual 4-TR(American Psychiatric Association, 2000) is broken into three different subtypes: ADHD Predominately Inattentive Type, ADHD Predominately Hyperactive-Impulsive Type, and ADHD Combined Type.

In order to meet diagnostic criteria for ADHD Inattentive Type, six or more of the following symptoms must have been observed for a minimum of six months, with enough severity as to be considered maladaptive: fails to give close attention to detail; has difficulty sustaining attention in tasks or play; often does not seem to listen when spoken to; often does not follow through on instructions and fails to finish work; has difficulty organizing tasks and activities; often avoids tasks that require sustained mental effort; often loses things necessary for tasks or activities; is easily distracted by extraneous stimuli; and is often forgetful in daily activities.

As with ADHD Inattentive Type, six or more of the following symptoms must be present for a minimum of six months in order to meet diagnostic criteria for ADHD Hyperactive-Impulsive Type: often fidgets with hands or feet or squirms in seat, often leaves seat in classroom or other situation in which remaining seated is expected; often runs or climbs excessively; is often “on the go” or often acts as in “driven by a motor”; often talks excessively;

often blurts out answers before questions have been finished; often has difficulty awaiting their turn; and often interrupts or intrudes on others.

Combined Type ADHD is diagnosed when an individual meets diagnostic criteria for both Inattentive and Hyperactive-Impulsive types of ADHD, and has demonstrated maladaptive symptoms for a minimum of six months. It is also important to note that individuals must show some onset of hyperactive-impulsive or inattentive symptoms before the age of seven in order to meet diagnostic criteria for Inattentive, Hyperactive-Impulsive, or Combined type ADHD. It is also important that some impairment or observation of symptoms occur in two or more settings, such as at home and at school.

For individuals that do not meet all the diagnostic criteria for one of the three previously discussed subtypes of ADHD, a diagnosis of Attention-Deficit/Hyperactivity Disorder Not Otherwise Specified is available. For example, an individual may receive a diagnosis of ADHD-NOS if they meet the criteria for ADHD, Predominately Inattentive Type, but who exhibit an onset of symptoms after the age of seven. The diagnosis of ADHD-NOS may also be given to individuals who demonstrate inattention, but have a pattern of symptoms that does not meet full criteria for diagnosis of ADHD, Predominately Inattentive type. Individuals diagnosed with ADHD-NOS may display a behavior pattern of sluggishness, daydreaming, and hypoactivity.

DSM-IV TR diagnostic criteria may be observed in several different ways, depending on age and setting. In a school setting, inattention may be observed through failure to carefully complete assignments or in work that is messy and unorganized. The same characteristic is observed differently in social settings, such as an appearance of daydreaming or frequent changing of activities. Due to difficulty sustaining attention, individuals with ADHD often attempt to avoid activities that require prolonged attention. Inattention may also be manifest through general forgetfulness of everyday activities. Impulsivity may be displayed as impatience, difficulty waiting for one's turn, and interrupting others. As children enter adolescence, symptom manifestation may change. Instead of excessive running, talking, and fidgeting, adolescents may manifest hyperactivity through difficulty participating in quiet activities and feelings of restlessness. Similar to symptom manifestation changing as the individual matures, manifestation of symptoms also varies across settings. As situations require increased attention or mental effort, manifestation of symptoms tends to increase. It has also been observed that symptom display is more likely to occur in group settings (American Psychiatric Association, 2000). As previously stated, it is necessary that the individual display some level of dysfunction in at least two different settings.

A number of disorders are frequently observed in conjunction with Attention-Deficit/Hyperactivity Disorder. Of children referred for ADHD, half also meet diagnostic

criteria for Oppositional Defiant Disorder or Conduct Disorder. This co-occurrence of ADHD and said behavioral disorders is more especially pronounced in individuals diagnosed with Hyperactive-Impulsive and Combined subtypes of ADHD. Mood, anxiety, communication, and learning disorders are also frequently observed in individuals with ADHD. While most individuals with ADHD do not have Tourette's Disorder, approximately 50% of individuals diagnosed with Tourette's Disorder also meet diagnostic criteria for ADHD.

Data suggests that 3%-7% of school-age children meet the diagnostic criteria for ADHD (Kessler, Chiu, Demler, & Walters, 2005), although prevalence rates vary with different methods of sampling and population differences. While much data exists on childhood prevalence of the disorder, information on adult prevalence is more limited. A recent study (Kessler, Chiu, Demler, & Walters, 2005) found that ADHD affects approximately 4.1% of adults between the ages of 18 and 44. It is also important to note that the disorder is more frequently observed and diagnosed in males than in females (American Psychiatric Association, 2000). The ratio of males to females diagnosed with ADHD varies significantly by type, ranging from 2:1 to 9:1.

Barkley, DuPaul and McMurray (1990) suggest that most ADHD children can be identified by age 4, several years before the diagnostic criteria of onset before age 7. ADHD symptoms typically appear during preschool, manifesting with increased motor activity, non-

compliance, and activity. It is important to note that not all preschool-age children demonstrating these behaviors could be diagnosed with ADHD, as many of these behaviors are typical of developing children. While most children out grow said behaviors, children with ADHD maintain these behaviors through the elementary-ages—making school adjustment especially difficult (American Psychiatric Association, 2000). For most, ADHD symptoms are stable through adolescence, with excessive motor behaviors/hyperactivity decreasing as the child continues to mature to adulthood. An estimated 43-85% of children with ADHD will continue manifesting symptoms in adolescence (Barkley, Fischer, Edelbrock, & Smallish, 1990; Biederman, Faraone, Milberger, Guite, et al., 1996). Studies have found that aggressive and defiant behaviors of children with ADHD may be exacerbated during adolescence due to decreased adult supervision (Barkley, Fischer, et al., 1990). Perhaps even more shocking is Weiss and Hechtman's (1993) study finding that adolescents with ADHD are at significant risk for not finishing high school. Weiss and Hechtman suggest that up to 30% of adolescents with ADHD may fall short of finishing high school. For this reason, it is extremely important the effective, evidence-based interventions be implemented for children and adolescents with ADHD.

As previously stated, approximately 4.1% of adults meet diagnostic criteria for one of the ADHD subtypes. Several studies have attempted to determine what percentage of

children diagnosed with ADHD maintain that diagnosis through adulthood. Unfortunately, the research is unclear, suggesting that anywhere between 8% to 65% of children with ADHD could retain that diagnosis through adulthood (Fischer, Barkley, Fletcher, & Smallish, 1997; Mannuzza, Gittelman-Klein, Bessler, Malloy, & LaPadula, 1993; Weiss & Hechtman, 1993). Common characteristics of adults with ADHD include interpersonal problems and low self-esteem (Weiss & Hechtman, 1993). More severe outcomes include juvenile convictions for 23% to 45% of individuals (Farrington, Loeber, & van Kammen, 1987; Mannuzza et al., 1993), and alcoholism in in 27% or more of individuals diagnosed with ADHD as children (Loney, Whaley-Klahn, Kosier, & Conboy, 1981).

A number of measures are used to assess ADHD in both school and clinical settings. Most assessment measures can be divided into two categories: broadband measures and ADHD specific measures. Broadband measures often take the form of checklists that evaluate many aspects of psychopathology. Ostrander et al. (1998) evaluated the usefulness of the Behavior Assessment System for Children (BASC) in correctly identifying children with ADHD, as well as the utility of the Child Behavior Checklist (CBCL) in doing the same. It was found that the BASC correctly categorized 97.7% of children as having or not having ADHD. The CBCL was also found to be useful in identifying children with ADHD, especially those who met criteria for Inattentive-type ADHD. Overall, Ostrander et al. felt that the BASC model of

identifying children with ADHD was simpler, and therefore more accurate. However, the CBCL proved to be a valuable instrument in evaluating symptomology of children with inattentive characteristics.

Additional research has been devoted to evaluating the utility of the CBCL in correctly identifying children with ADHD. A sample of 121 children with and without ADHD was used to evaluate the CBCL (Chen, Faraone, Biederman, & Tsuang 1994). A series of regression models were first used to test the CBCL in the initial sample, as well as a cross-validation sample of 122 children and a sample of 219 siblings of sample members from the original sample and the cross-validation sample. It was found that the Attention Problems scale of the CBCL had a high ability to individuals with ADHD. The authors of the article suggest that the CBCL could be used as a rapid method of identifying individuals with ADHD, as well as identifying siblings that may have ADHD.

ADHD-specific scales have also been found to be effective in identifying ADHD in children and discriminating between other disorders. Several studies (Achenbach, 1991; Conners, Sitarenios, Parker, & Epstein, 1998a; Conners, Sitarenios, Parker, & Epstein, 1998b) have evaluated the Conners Parent and Teacher Rating Scales, scales widely used in the identification of ADHD. On teacher rating scales, the Conners was able to correctly identify 84.7% of children, while the parent report yielded an even higher degree of accuracy of

identification, 93.4% correct. One useful trait of the Conners rating scales is their ability to detect treatment effects produced by behavioral and pharmacological interventions. This allows the Conners to be used as a progress monitoring tool, as well as an accurate identifier of ADHD.

Other options for assessment of ADHD symptomology are available, such as structured interviews. The Diagnostic Interview for Children and Adolescents-Revised (DICA-R; Reich & Welner, 1988) is a broadband diagnostic interview designed to be administered to parents and children, with the purpose of identifying a wide range of psychiatric conditions. In addition to assessing ADHD, the DICA-R also evaluates Conduct Disorder, Oppositional Defiant Disorder, and depressive disorders. Boyle et al. (1993) evaluated the efficacy of the structured interview format in assessing ADHD in a sample of 251 children. Boyle et al. found that the DICA-R provided a high level of internal consistency for parent-completed interviews, with parental assessments of ADHD being higher for older children. It was also found that DICA-R, along with another structured interview used to assess ADHD in children, the Diagnostic Interview Schedule for Children (Schaffer et al., 2000) provided stability of diagnosis over 1-3 years.

Measures of impairment have also demonstrated utility in evaluation of ADHD. Measures of impairment, such as the Children's Global Assessment of Functioning (Bird et al., 1990) and the Child and Adolescent Functional Assessment Scale (Hodges, Doucette-Gates, & Liao, 1999), are typically clinical completed measures, based on multiple sources of information

gathered by the clinician. An analysis of several measures of clinical impairment (Pelham, Fabiano, & Massetti, 2005) found that measures of impairment demonstrated stability of diagnosis and reliability, as well as an excellent ability to discriminate between clinical and non-clinical cases. Although their validity has not been found to be as high, parent completed measures of impairment (Columbia Impairment Rating, Bird et al., 1996; Vanderbilt Rating Scale, Wolraich et al., 2003) have also demonstrated sufficient reliability to be useful in assessment of ADHD in children.

Functional Behavior Assessments play a central role in the assessment and intervention plan creation. FBAs allow the clinician to develop an accurate description of the presenting problem, defining what behaviors are observed, in what setting said behaviors occur, what antecedents may be triggering the target behavior, and current consequences of the behavior. The utility of FBAs in the assessment of ADHD in children is made clear by Pelham, Fabiano, and Massetti (2005), who suggested that no intervention other than pharmacological interventions could be effectively developed without a functional behavior assessment. If behavioral interventions are to produce the desired changes, it is essential that the target behaviors be operationalized and analyzed.

There are many hypotheses about possible causes and contributory factors of ADHD. Initially, brain damage was assumed to be the primary cause of ADHD, as evidenced by the

"minimal brain damage" label previously applied to the ADHD symptom cluster. While brain damage is no longer assumed to be the principal cause of ADHD, brain damage to the prefrontal cortex has been found to produce ADHD-like symptoms (Fuster, 1989). MRI studies have revealed that individuals with ADHD have significantly reduced regions in the prefrontal cortex, corpus collosum, and right cerebellum, resulting in increased difficulty with behavioral inhibition (Baumgardner et al., 1996). Similar studies have revealed decreased blood flow and electrical activity in the prefrontal cortex and striatum of individuals with ADHD (Seig, Gaffney, Preston, & Hellings, 1995; Kuperman, Johnson, Arndt, Lindgren, & Wolraich, 1996).

Recently, a large portion of ADHD research has been devoted to examining the link between symptomology and genetics. Studies of familial genetics have found that 10% to 35% of immediate family members of children diagnosed with ADHD would likely meet diagnostic criteria for the disorder (Biederman et al., 1992). Biederman et al. also found that siblings of individuals with ADHD have a 32% chance of being diagnosed with ADHD. Later studies by Biederman, Faraone, et al. (1995) found that children's risk of having ADHD is strongly correlated with the parent's diagnosis of ADHD. When a parent was previously diagnosed with ADHD, it was found that a child's risk of having ADHD increased to 57%. Clearly, strong evidence exists for a hereditary basis of ADHD. Additional evidence of genetic influence on manifestation of ADHD symptoms has been discovered through twin studies. Gilger,

Pennington, and DeFries (1992) found that monozygotic twins were both diagnosed with ADHD at a much higher rate than either dizygotic twins or non-twin siblings. It was found that if one twin from a monozygotic pair was diagnosed with ADHD, the other twin had a 81% chance of being diagnosed with ADHD. In comparison, only 29% of dizygotic twins were diagnosed with ADHD after their twin was diagnosed, a number that does not differ from non-twin siblings.

While genetics has proven to be strongly linked with diagnosis of ADHD, many other factors have been hypothesized to have a strong influence on manifestation of ADHD, only to be found lacking strong evidence of said influence. While few theories of ADHD have placed central influence on environment, twin studies have shown that sharing an environment contributes little to explaining individual differences (Sherman, McGue, & Iacono, 1997). It is, however, important to note that outcome of the disorder is somewhat affected by environmental factors. More popular than the view that ADHD manifestation is influenced by environment is the view that manifestation is influenced by diet and nutrition. At the current time, it is easy to encounter a variety of information claiming that ADHD is the result of food additives, sugars, gluten, and allergens. While much has been claimed, the majority of research has not found significant correlations between diet and nutrition and ADHD (ex., Wolraich, Milich, Stumbo, & Shultz, 1985; Wolraich, Wilson, & White, 1995).

A variety of treatment options exist for ADHD, but treatment should begin with behavior management. Behavior management techniques often implemented with children with ADHD include beep tapes and reminder cards, both of which attempt to refocus the attention of the child. Increasing novelty of assignments, in addition to reduction of complexity, has also been found to produce declines in ADHD behaviors (Zentall, 1985). It has also been found that repetition of instructions increases performance of students with ADHD (Douglas, 1983). Such behavior management techniques can effectively be taught through parent and teacher training, resulting in decreases of problem behaviors. Due to lack of generalization of treatment effects when interventions are only applied in one setting, it is essential that behavioral treatments for ADHD be applied across all settings (Barkley, 1998).

In the classroom, contingency management has been found to produce effect sizes from .60 to 1.40 (DuPaul & Eckert, 1997)—what could be classified as medium to large effects (Cohen, 1988). DuPaul and Eckert's meta-analysis also examined the effects of peer tutoring and manipulation of curriculum (ex., reducing task length), which produced effects similar to those of contingency management. Response cost procedures have been found to produce similar effects, surpassing the effects of methylphenidate in increasing attention and productivity (Rapport et al., 1982). While there are treatment options that have been shown to be effective in producing positive behavioral changes, other commonly used school-based interventions have

not been found to be effective. Cognitive behavioral therapy and exclusive use of positive reinforcement were among those interventions found to be ineffective in a school setting (DuPaul & Eckert, 1997; Pfiffner & O'Leary, 1987).

In the non-school settings, behavior modification can also be implemented in a similar fashion as in the schools. Parents can be trained on how to best manage their child's behavior, using techniques such as contingency management and reduction of complex directions. In addition to behavior management, pharmacological treatments are another option for treatment in the clinical setting. Administration of stimulant medication is the most common pharmacological intervention for ADHD, resulting in increased attention, and decreased impulsivity and irrelevant behavior (Swanson, McBurnett, et al., 1995; Barkley et al., 1998). Stimulants, such as methylphenidate, are fast acting—producing their desired effects in 30 to 45 minutes (Barkley et al., 1998). While fast acting, stimulants effects are also fleeting. A typical dose of stimulant medication produces improvements in behavior for 3 to 7 hours. Findings suggest that academic productivity may increase with the use of stimulant medication, due to increased ability to maintain attention on difficult or uninteresting tasks (Rapport & Kelley, 1993). However, stimulant medication treatments have often shown an inability to effect long-term increases in academic achievement (Schachar & Tannock, 1993).

Other medications are also administered in clinical settings as treatments for ADHD, although their use is only recommended when stimulants cannot be used or have been ineffective. Antidepressants are often used as ADHD treatment when significant mood disorders coexist with ADHD (Ryan, 1990). Antidepressants have been found to produce decreased impulsivity and disruptive behavior, and increased sustained attentional abilities. Compared to stimulants, antidepressants take longer to have an effect on behavior and are longer lasting. Antidepressants are often considered used when stimulants do not produce the desired effects due to increased risk of serious side effects associated with use. Especially dangerous are the effects of an overdose of antidepressants commonly prescribed for ADHD: tachycardia, coma, and death (Viesselman et al., 1993). Antihypertensive medications have also been prescribed to treat ADHD. Due to reports of deaths associated with using a combination of antihypertensive medications and stimulants, antihypertensive medication use is only recommended when other forms of medication have been found to be ineffective (Werry & Aman, 1993).

While behavior modification, parent and teacher training, and pharmaceutical treatments all have positive aspects, optimal treatment plans should consist of multiple evidence-based practices (Carlson et al., 1992). As previously stated, interventions are most effective when they are applied in multiple settings, and are based on information gathered through a functional

behavior analysis (Barkley, 1998). From research conducted on combined treatment plans, a treatment consisting of contingency management and stimulant medications is superior to any one evidence-based treatment (Gadow, 1985).

A simple web search for "ADHD treatments" will produce a wide variety of treatments that claim to be effective. Indeed, a number of studies have been conducted that have labeled treatments as effective, but often studies rely on anecdotal information, or less than ideal research methodology and design. One of the most popular interventions with questionable evidence is diet management. More often than not, diet interventions for ADHD involve removing artificial additives, colorings, or sugars from the individuals diet. Other diet interventions suggest that the individual consume high doses of vitamins and minerals. Despite being an extremely popular intervention, relatively no empirical evidence supports its use (Wolraich et al., 1995). Other interventions have attempted to treat ADHD through vestibular stimulation, biofeedback, nuerofeedback, and electroencephalographic feedback. As with dietary interventions, these interventions have claimed to be effective, but lack well-designed and documented studies and replications of previous studies.

Other interventions have focused less on biological factors, instead encouraging individuals with ADHD to engage in running. It is not hard to imagine the cathartic effect that running could possibly have for individuals suffering from hyperactivity, but the running

intervention has also been found to lack empirical support (Hales & Hales, 1985). Others have attempted to remedy the symptoms of ADHD through social skills training. Reviews of research have found that social skills programs for children with ADHD are not effective in improving poor social interactions between children with ADHD and their peers (Hinshaw, 1992). Cognitive-behavioral therapy has produced similar discouraging results (Baer & Nietzel, 1991).

Recent research has examined additional treatment options for individuals with ADHD. Meyer (2005) evaluated the usefulness of training children and parents in a homework completion system. The study attempts to expand the understanding of self-monitoring programs, which have previously been found to be effective in encouraging improved performance and on-task behaviors. Children that participated in this study were divided into three groups: one group that participated in self-monitoring only, and one group that consisted of parent monitoring of homework completion, and one group that received no treatment. The study employed a between groups design to compare treatment effects of the three groups. A total of 42 students were included in the study, between 6^{th} and 8^{th} grade, coming mainly from Caucasian, middle-class families. All of the students had previously been diagnosed with ADHD, and diagnoses were confirmed through administration of the Conners Parent Rating Scales (Conners, 1997), ADHD Rating Scale-IV (DuPaul, Power, Anastophulous, & Reid, 1998), and the Anxiety Disorders Interview Schedule for DSM-IV, Parent and Child Versions

(Silverman & Albano, 1996). The majority of participants were male, as males outnumber females in ADHD prevalence rates. Participants were described by teachers as often lacking preparation for class.

A variety of measures were used to determine the efficacy of the self-monitoring, parent monitoring, and no treatment groups. The Homework Problem Checklist (Anesko, Schoioch, Ramirez, & Levine, 1987), Classroom Performance Survey (CPS; C.H.A.D.D., 1996), grades received on homework, and the Consumer Satisfaction Questionnaire (Forehand & McMahon, 1981) were all administered to determine the efficacy of the various interventions implemented.

Intervention instructions varied by group assignment. Students assigned to the parent monitoring group used checklists constructed using the SQ4R study method. Both students and parents were trained on how to correctly complete the checklist and to monitor homework completion. Parents were instructed to review and verify the accuracy of the child-completed checklist each night, and were told to reward participants based on checklist completion (80% complete required for reward). The self-monitoring group used the same checklist as the parent-monitoring group. Instead of students and parents being trained on how to use the checklist and monitor homework, students were trained on how to develop a proper homework routine and on how to correctly complete the checklist. Parents in the self-monitoring group were encouraged to reward their child for checklist completion (80%), but were told not to verify the accuracy of

the checklist at the end of each day. The no-treatment group continued homework behaviors as normal.

The findings of the Meyer study found that both parent and self-monitoring groups resulted in significant reductions in homework problems. While both treatments were found to be effective, neither self-monitoring or parent monitoring was found to be significantly more effective than the other. Both teachers and parents rated both interventions as being highly favorable and effective in improving student preparation. Homework completion increased from an average of 65% to 90% in the self-monitoring group, and from 67% to 91% in the parent monitoring grouop. Perhaps the most important finding of the study was that teachers reported that improvements in homework completion were maintained at follow-up. This study provides evidence as to the efficacy of monitoring programs, as well as contingency management, in managing ADHD symptoms in a school setting. Such an intervention could be quickly implemented in a school if homework completion is determined to be a significant problem to a student through a FBA.

Due to the proportion of children that are diagnosed with ADHD and the potential negative effects of the disorder, it is important that effective interventions be implemented by both school and clinical personnel in a timely fashion. Behavioral interventions, such as contingency management and response-cost procedures, should be among the first interventions

implemented. Pharmaceutical interventions provide another effective treatment option. While both treatment options have their benefits, it has been found that combined treatments hold the most promise for managing the symptoms of ADHD in children.

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