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TTENTION-DEFICIT/HYPERACTIVITY DISORDER

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Introduction

Attention-deficit/hyperactivity disorder (ADHD) is an increasingly prevalent childhood disorder (Centers for Disease Control [CDC], 2013). The Mayo Clinic defines ADHD as a combination of problems to include sustaining attention, hyperactivity, and impulsive behavior. ADHD can also influence self-esteem, relationships, and school performance (2014).

The *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)* classifies ADHD as a neurodevelopmental disorder with its onset occurring during the developmental period (American Psychiatric Association [APA], 2013).

ADHD is classified as a chronic disorder. Children with ADHD typically do not outgrow the disorder, although they may experience some reduction in symptoms of hyperactivity. Studies report that as many as 80 percent of children diagnosed with ADHD will continue to show symptoms into adolescence and as many as 65 percent will remain symptomatic into adulthood (American Academy of Child & Adolescent Psychiatry [AACAP], 2007).

Numerous studies have documented youth with ADHD having serious chronic impairment in their social aptitude, emotional well-being, family relationships, and academic functioning (Anastopoulos et al., 1992; Anastopoulos et al., 1993; Barkley et al. 1992; Barkley et. al., 2001; Cunningham, Bennes, & Siegel, 1988; Whalen et al., 2002). Youth with ADHD are more likely than their non-ADHD peers to engage in risky behaviors, including tobacco and alcohol use (Sibley et al., 2011). Compared to their peers, these youth have more difficulty in school, are more likely to be retained a grade, and are less likely to graduate from high school. Moreover, these youth frequently experience peer rejection, academic struggles, and social difficulties, all of which may have long-term effects (Sibley et al.).

Recent Changes from the DSM-IV to the DSM-5

In 2013, the American Psychiatric Association released the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*. The *DSM-5* characterizes ADHD as a pattern of behavior, in

multiple settings, that can result in issues of performance. It also reclassifies ADHD as a neurodevelopmental disorder. While the behavioral pattern symptoms for ADHD remain the same in the *DSM-5*, it now provides specific examples of what that behavior might look like.

Changes in the *DSM-5* that could affect diagnosis criteria are as follows:

- The cutoff age for the onset of symptoms was raised from age seven to age 12 to reflect the fact that inattentive and/or hyperactive-impulsive symptoms can begin later in childhood.

This later onset date also reduces unreliable adult recall of childhood symptoms and the difficulty of establishing “precise childhood onset retrospectively.”

- ADHD and autism spectrum disorder (ASD) can be simultaneously diagnosed so that a co-occurring diagnosis of ASD no longer excludes a diagnosis of ADHD.
- Only five instead of six criteria are now required for diagnosis in individuals aged 17 years or older.
- The *DSM-5* provides criterion that allows children with ADHD to continue receiving care into adulthood (APA, 2013; French, 2015).
- The subtype, ADHD Not Otherwise Specified (NOS), has been replaced with the following two categories:

Other Specified ADHD encompasses symptoms similar to ADHD that cause significant distress or impairment, but these symptoms do not meet diagnostic criteria for ADHD (APA, 2013). The clinician here will specify why the diagnostic criteria are not met, such as “Other Specified Attention-Deficit/Hyperactivity Disorder with insufficient attention symptoms” (APA).

Unspecified ADHD encompasses symptoms similar to ADHD that cause significant distress or impairment, but these symptoms do not meet the diagnostic criteria (APA, 2013). However, the clinician does not specify why the diagnostic criteria are not met. This is often because the clinician does not have sufficient information to make a specific diagnosis (e.g., the child is being seen in the emergency room) (APA; French, 2015).

The *DSM-5* is a manual for assessment and diagnosis of mental health disorders and does not include information for treatment of any disorder. In the future, more evidence supporting treatments of disorders with *DSM-5* classifications will be available as clinical studies utilizing *DSM-5* criteria are conducted.

Characteristics of ADHD

ADHD is characterized by inattention and hyperactivity/impulsivity. The child must exhibit at least six symptoms for more than six months in one of the two categories to be diagnosed with ADHD (APA, 2013). Several of the symptoms must have been present before the age of 12, must be present in two or more settings, must interfere with quality of life, and must not occur exclusively during the course of schizophrenia or another psychotic disorder (APA).

ADHD is also broken down into three subcategories (APA 2013):

1. **Predominantly Hyperactive-Impulsive Type:** if hyperactivity-impulsivity criteria are met but inattention is not for the past six months.
2. **Predominantly Inattentive Type:** if the inattention criteria are met but the hyperactivity-impulsivity is not for the past six months. (Also referred to as attention-deficit disorder (ADD), although the preferred term is ADHD, Predominately Inattentive Type.)

3. **Combined Presentation:** if symptoms of both inattention and hyperactivity-impulsivity criteria are met for the last six months or more.

The symptoms of inattention according by the APA (2013) are as follows:

The child often:

- Fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities
- Has difficulty sustaining attention in tasks or play activities
- Does not seem to listen when spoken to directly
- Does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure of comprehension)
- Has difficulty organizing tasks and activities
- Avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)
- Loses things necessary for tasks or activities at school or at home (e.g. toys, pencils, books, assignments)
- Is easily distracted by extraneous stimuli
- Is forgetful in daily activities

The symptoms of hyperactivity and impulsivity, according to the APA (2013), are as follows:

The child often:

- Fidgets with or taps hands or feet or squirms in seat
- Leaves seat in the classroom or in other situations in which remaining seated is expected
- Runs or climbs in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
- Is unable to play or engage in leisure activities quietly
- Talks excessively
- Is “on the go” or acts as if “driven by a motor”
- Has difficulty waiting for his or her turn in games or in group situations
- Blurts out answers to questions before they have been completed
- Interrupts or intrudes on others (e.g., butts into other children's games)

ADHD can be in “partial remission” if fewer than the full diagnostic criteria were present for the previous six months or more. The symptoms must still impair social or academic functioning (APA, 2013). Levels of severity may be applied to a diagnosis.

- **Mild** – Few, if any, symptoms in excess of those required to make the diagnosis are present, and symptoms only impair social or academic functioning minimally.
- **Moderate** – Symptoms or functional impairment between “mild” and “severe” are present.
- **Severe** – Many symptoms in excess of those required for diagnosis, or several symptoms that are particularly severe, are present; or the symptoms cause noticeable social or academic impairment.

Prevalence

Since 2003, the Centers for Disease Control (CDC) have used national survey data to monitor the number of children with ADHD (CDC, 2013). The largest of these surveys is the National Survey of Children’s Health, which has been conducted every four years since 2003. Previous results from the 2003 and 2007 surveys found that 7.8 percent and 9.5 percent of U.S. children ages 4 to 17 years were diagnosed with

ADHD in 2003 and 2007, respectively. A more recent study used data from the third National Survey of Children’s Health, which was conducted between 2011 and 2012. The findings from this study provided information on ADHD diagnosis and treatment patterns, as well as the substantial impact that ADHD has on families. This study found that an estimated 11 percent of children and adolescents ages 4 to 17, or 6.4 million youth nationwide, have been diagnosed with ADHD (CDC; Visser et al., 2014). Kentucky was found to have the highest rate of ADHD in children, with almost 19 percent of children in Kentucky having been diagnosed with ADHD (Coyne, 2013). Over 11 percent of Virginia youth were diagnosed with ADHD, representing a population that has steadily risen over the last eight years as illustrated in Table 1 (CDC).

Table 1
Virginia Prevalence Rates of ADHD

2003	2007	2011
9.3%	10.2%	11.8%

Source: CDC, 2013.

ADHD is diagnosed more frequently in males than in females in the general population, with a ratio of approximately 2:1 in children and 1.6:1 in adults (APA, 2013). Females are more likely than males to present primarily with inattentive features (APA). Of high school students, almost 20 percent of boys and almost nine percent of girls had ADHD. Prevalence of ADHD is higher in households with parents who graduate from high school than in households with more or less education (Visser et al., 2014).

There has also been an increase in the overall rate of diagnosis. This increase is not without controversy. One physician believes the surge in diagnosis is merely a way to justify prescribing medication, which he calls “a national disaster of dangerous proportions” (Conners, as cited by Schwarz, 2013). Conversely, providers may be diagnosing ADHD more often because they have become more aware of the risks of untreated ADHD (Schwarz).

Causes and Risk Factors

As previously stated, the *DSM-5* categorized ADHD as a neurodevelopmental disorder (APA, 2013). Mounting evidence has demonstrated a neurological and a genetic basis for ADHD (AACAP, 2007). Studies in the past 20 years involving twins, adoptions, and molecular investigations suggest this genetic link. A child diagnosed with ADHD is more likely than one without ADHD to have family members with the disorder. The heritability of ADHD averages approximately 80 percent, rivaling the heritability factor for the trait of height (Barkley, 2006). In fact, according to the National Institutes of Health (NIH) one-third of fathers who have or had ADHD will have children who will be diagnosed with ADHD (National Institutes of Health, 2015).

Deficits in executive functioning in the frontal lobes of the brain are associated with the core features of ADHD (AACAP, 2007). Executive functioning serves to connect past experiences with present action. Essential functions such as planning, organizing, strategizing, and paying attention are all executive functions (NCLD, 2010). Brain imaging studies show differences between the structure and functioning in the areas of the brain responsible for executive functioning in individuals with ADHD as compared to brain images from individuals not diagnosed with ADHD (Bush, Valera, & Seidman, 2005; Castellanos et al., 2002; Sowell et al., 2003). A recent study revealed that those with ADHD had smaller brain volume in five subcortical regions, as well as an overall smaller brain volume (Hoogman et al., 2017). This phenomenon was greatest in children and less notable in adults.

Prenatal factors may also influence the likelihood that a child develops ADHD. Approximately 10 to 15 percent of youth with ADHD have been exposed to prenatal, perinatal, and postnatal influencers. Mothers who smoke or drink during pregnancy are two and a half times more likely to have a child with ADHD than mothers who abstain from both (Rostain, 2012). Additional prenatal influencers to ADHD development include premature birth, maternal respiratory infections, maternal anxiety, and high levels of phenylalanine in the mother (Rostain). Postnatal factors include head trauma, brain hypoxia, tumors or infection in the central nervous system, seizures, lead poisoning, leukemia, pediatric acute lymphoblastic leukemia, strep, and, like in mothers, high levels of phenylalanine (Rostain).

A study conducted by the National Institute of Mental Health (NIMH) linked ADHD to changes in production of the brain chemical dopamine (2007). Evidence suggests the involvement of a gene that codes for a receptor protein that binds to dopamine. Children possessing a variant of this gene had an increased risk of ADHD (NIMH). The report indicated that this version of the dopamine D4 receptor gene, called the 7-repeat variant, accounted for approximately 30 percent of the genetic risk for ADHD, making it by far the strongest candidate gene implicated in the disorder (NIMH). Traits linked to the 7-repeat version may include novelty-seeking and impulsiveness (NIMH). Researchers are following up with studies on the relationship between cortex thickness and the cognitive features present in ADHD (NIMH).

A study done by Rostain (2012) found the following variants of seven genes correlate with ADHD:

- Serotonin HTR1B receptor
- Serotonin transporter
- Synaptosomal-associated protein 25 (SNAP 25)
- Dopamine B-hydroxylase
- Dopamine transporter,
- Dopamine D5 receptor
- Dopamine D4 receptor

The 7-repeat variant of the D4 receptor increases the risk of ADHD when joined by dopamine transporter (SLC6A3 10 repeat) and/or maternal exposure to smoking. Combining two of the factors increases the risk of ADHD by 2.5 to 3.0 times, and combining all three increases the risk to nine times (Rostain).

In addition to dopamine production, serotonin may affect the likelihood of ADHD in youth. A study presented to the Society for Neuroscience suggests that when serotonin receptors are disrupted, mice develop aggression and impulsivity (Mientka, 2013). When scientists reintroduce those receptors in the mice, impulsivity is curbed but aggression persists (Nautiyal et al., 2013). Although this does not yet point to a treatment, it does begin to explain why some youth act negatively. A child with less control in his prefrontal cortex, which helps decision-making, has a reason for his reduced self-control (Mientka).

Environmental risks include abuse, poverty, or exposure to violence. A study of children with ADHD showed that most of ADHD development is genetically driven, but in certain cases, ADHD may also result from very early adverse childhood experiences (Webb, 2013). Children who have experienced negative experiences early in life are diagnosed sooner than those with only genetic connections. The associated impulsivity and inattention is more severe, while the hyperactivity is less severe than in those children without negative experiences (Webb).

Assessment

Careful assessment is critical to meeting the needs of youth with ADHD. A thorough and comprehensive assessment of ADHD includes gathering information from multiple sources, assessing functioning in multiple domains, ruling out alternative diagnoses, and eliminating comorbid conditions (AACAP, 2007). Qualified mental health professionals are the only individuals with the ability to diagnose and

subsequently treat ADHD (NIMH, 2007). Qualified mental health professionals include child psychiatrists, psychologists, developmental/behavioral pediatricians, behavioral neurologists and, in some cases, clinical social workers (NIMH).

A diagnosis of ADHD requires the symptoms affect multiple domains of the youth's life (APA, 2013). Accordingly, it is important to assess the youth's functioning at home, school, day care or in other settings (AACAP, 2007). Assessment should involve the youth, the parents/caregivers, and the youth's teachers. A multimodal strategy should be used to assess for the presence of ADHD. The necessary components of a comprehensive assessment of ADHD include the following:

- A complete history and physical examination involving the patient and one or more parents or primary caregivers;
- Contact with teachers or caregivers familiar with the child's functioning and behaviors; and
- A thorough investigation of co-occurring disorders or other conditions that may be the primary cause or are contributing to the patient's presentation (French, 2015).

Structured clinical interviews should be used to determine the presence, duration, and age of onset for each symptom. Validated behavior rating scales should also be completed by parents and teachers to compare the youth's behavior to established normative behavior (AACAP). Onset should be before age 12 and follow a chronic course (APA). Although most parents notice inattention, hyperactivity, and impulsivity before their child is school-age, these symptoms may go unnoticed until the child runs into problems at school (NIMH, 2003). An alternative diagnosis should be considered if the majority of symptoms began after age 12, there are patterns of remission, or symptoms are present in only one setting (e.g., at home or at school).

Comorbid conditions should also be assessed during an evaluation for ADHD. Comorbid disorders to ADHD include language deficits, impaired motor development, and social development delays. While these delays are not mutually exclusive of ADHD, they are frequently seen in youth with ADHD. Children may also show a lower tolerance to frustration, they may be irritable, or they may have mood lability (extreme fluctuations in mood) (APA, 2013). The presence of a comorbid disorder will influence treatment planning, especially pharmacological interventions. The diagnosis that is the most impairing to the child is usually the initial focus of treatment. In instances of disruptive behavior, the clinician must determine whether the disruptive behavior is the primary diagnosis or is secondary to ADHD (AACAP, 1994). If ADHD is the primary cause, it must be diagnosed and treated in most instances so that the secondary disruptive behavioral disorder can also be successfully addressed (AACAP). In other cases, the disruptive behaviors can be treated first. Similarly, other comorbid disorders, such as anxiety and depression, can be treated successfully either concurrently or before or after the treatment of ADHD.

Before diagnosing a child with ADHD, the clinician should rule out other potential reasons for the child's behavior. Behaviors that mimic ADHD may be the result of a sudden change in the child's life, undetected seizures, a middle ear infection causing hearing problems, medical disorders affecting brain functioning, a learning disability, communication disorders, anxiety, or depression (NIMH, 2003). Children should be referred to a specialist for additional testing if seizures or other medical disorders are suspected (AACAP, 2007). A qualified professional should administer tests of intelligence and learning achievement to rule out a cognitive impairment or a learning disability as the possible cause of ADHD-like symptoms (AACAP). Adolescents may be difficult to diagnose and, because ADHD is often diagnosed in younger children, clinicians and parents need to look for previous signs or symptoms of ADHD present earlier in the adolescent's life. Clinicians should also be aware of signs of comorbid or alternative diagnoses including substance abuse, depression, and anxiety (AAP, 2011).

Table 2 outlines evidence-based assessment tools for ADHD.

Table 2
Evidence-based Assessment Tools for ADHD

Name of Measure	Measure Type
NIMH Diagnostic Interview Schedule for Children-IV	Structured diagnostic interview
Schedule of Affective Disorders and Schizophrenia for School-Aged Children, Present and Lifetime Version (K-SADS-PL)	Structured diagnostic interview
Anxiety Disorders Interview Schedule (ADIS C/P)	Structured diagnostic interview
ADHD Rating Scale-IV	Behavior rating scales
Child Behavior Checklist/Teacher Report Form	Behavior rating scales
Conners Rating Scale (Parent, Teacher, and Adolescent Self-Report Scales)	Behavior rating scales
Disruptive Behavior Disorders Rating Scale (Parent, Teacher, Youth Report Scales).	Behavior rating scales
Home Situations Questionnaire-Revised (School and Home Situations Questionnaire-Revised)	Behavior rating scales
The Vanderbilt ADHD Teacher Rating Scale (VADTRS) and Vanderbilt ADHD Parent Rating Scale	Behavior rating scales

Comorbidity

According to the National Institute of Mental Health (2000), ADHD is not typically an isolated disorder and comorbidities may complicate research studies and diagnoses. For youth with ADHD, oppositional defiant disorder (ODD) co-occurs in approximately half of children with the combined presentation and about a quarter with the predominantly inattentive presentation (APA, 2013). Conduct disorder co-occurs in about a quarter of children or adolescents with the combined presentation, depending on age and setting (APA). Most children and adolescents with disruptive mood dysregulation disorder (recently added to the *DSM-5*) have symptoms that also meet criteria for ADHD. Specific learning disorder commonly co-occurs with ADHD. Anxiety disorders and major depressive disorder occur in a minority of individuals with ADHD but more often than the general population. Other disorders that may co-occur with ADHD include obsessive-compulsive disorder, tic disorders, and Autism Spectrum Disorder (ASD). The *DSM-5* allows for a comorbid diagnosis of ADHD with ASD (APA, 2013). This combination was not allowed in previous versions of the *DSM*. Nearly 30 percent of children with ASD also have ADHD (Kennedy Krieger Institute, 2013).

ADHD is associated with cognitive problems in attention, executive function, and memory tests. However, these tests cannot serve as a diagnostic tool due to their lack of sensitivity. Suicidal tendencies are higher in young adults who have ADHD and mood, conduct, and/or substance abuse disorder (APA, 2013).

New studies show that children with ADHD symptoms may run the risk of obesity and physical inactivity once they reach adolescence. The study extends previous research that exercise improves behavior in youth with ADHD to identify a long-term link between physical inactivity and inattention (Khalife, Kantomaa, & Glover et al., 2014).

Treatments

ADHD is a chronic disorder; therefore, management of symptoms is the goal of treatment. Treatment must be provided over long periods to assist those with ADHD in the ongoing management of their disorder. A variety of treatments should be used to treat ADHD. Foremost is education of the family and school staff about ADHD and its management. A comprehensive treatment plan involving the youth, parents, and school personnel should be implemented to address all relevant areas of impairment. Current research suggests that a combination of behavioral and pharmacological treatments is the most effective (AACAP, 2007; Pelham & Fabiano, 2008; Chorpita et al., 2011).

Effective treatment includes developing and utilizing an appropriate educational program; behavior modification; parent, child, and teacher education; counseling; and medication (Children and Adults with Attention Deficit Disorders [CHADD], 2001). Parents also need to advocate for their children in academic settings. Children with ADHD may be eligible for special educational services in the public schools under both the Individuals with Disabilities in Education Act (IDEA: Public Law 101-476) and Section 504 of the Rehabilitation Act of 1973 (Public Law 93-112). IDEA governs special education requirements and Section 504 provides for reasonable accommodations for children with disabilities (Gephart, 2002). Parental involvement can help to optimize positive outcomes. Treatments are outlined in Table 3 and in the paragraphs that follow.

Psychological Treatments

Behavior therapy is the psychological treatment of choice for ADHD (Pelham & Fabiano, 2008; AACAP, 2007). One behavior therapy that has consistently worked is behavioral classroom management. Another behavior therapy treatment approach that has been supported by research is behavioral parent training (Pelham & Fabiano).

Behavior therapy uses contingency management strategies (e.g., point/token reward systems, timeout, response cost) to reinforce appropriate behavior and reduce unwanted behaviors. Contingency management strategies employ reward systems that are designed to provide reinforcements to increase desired behaviors, including following directions, attentiveness, or turn-taking. Rewards systems can take many forms, including, but not limited to, points, stickers, poker chips, or other tokens that can be traded for small prizes or special privileges. Careful consideration must be taken to ensure that rewards are age appropriate and salient to the youth. Young children may benefit more from tangible rewards, while adolescents may appreciate point systems to earn special privileges. Response-cost programs remove a reinforcer, or desired object or activity, when an undesirable behavior occurs in order to reduce that behavior. This can include loss of points or tokens from a reward system, loss of privilege, or time-out. Time-outs—also called “time out from reinforcement”—are a form of response-cost used to decrease undesirable behaviors. For time-outs to be effective, they must remove children from a desirable activity (television, video games, contact with other children) and place them in a neutral location. Behavioral intervention systems can be put in place both in the classroom and at home (Evans et al., 2005; Barkley, 2000).

The following essential steps outline a behavior management program:

1. Specify acceptable and unacceptable behaviors.
2. Choose an unacceptable behavior to change, and explain the positive actions in observable and measurable terms.
3. Identify motivational items to help the youth stay on track.
4. Utilize an accounting system to measure rewards, punishment, and progress.
5. Draw up a contract, and renegotiate as success becomes more frequent (Rostain, 2012).

Table 3
Summary of Treatments for ADHD

What Works	
Behavioral classroom management (BCM)	BCM uses contingency management strategies, including teacher-implemented reward programs, token systems, time-out procedures, and daily report cards (DRCs). Clinicians or parents may work in consultation with teachers to develop a classroom treatment plan.
Behavioral parent training (BPT)	BPT teaches the parent to implement contingency management strategies similar to BCM techniques at home.
Intensive behavioral peer intervention (BPI)	Intensive BPI is conducted in recreational settings, such as summer treatment programs (STPs). STPs have demonstrated effectiveness and are considered well-established. However, STPs are less feasible to implement than other evidence-based practices.
Stimulant: d-Amphetamine	Short-acting: Adderall, Dexedrine, DextroStat Long-acting: Dexedrine Spansule, Adderall XR, Lisdexamfetamine
Stimulant: Methylphenidate	Short-acting: Focaline, Methylin, Ritalin Intermediate-acting: Metadate ER, Methylin ER, Ritalin SR, Metadate CD, Ritalin LA Long-acting: Concerta, Daytrana patch, Focalin XR
Serotonin and norepinephrine reuptake inhibitor (SNRI): atomoxetine	Atomoxetine is unique in its ability to act on the brain's norepinephrine transporters without carrying the same risk for addiction as other medications.
What Does Not Work	
Cognitive, psychodynamic, and client-centered therapies	Traditional talk therapies and play therapy have been demonstrated to have little to no effect on ADHD symptoms. ADHD is best treated with intensive behavioral interventions in the youth's natural environments.
Office-based social skills training	Once-weekly office-based training, either one-on-one or in a group setting, have not led to significant improvement in social skills. (However, intensive group social skills training that uses behavioral interventions, such as STPs, are considered well-established.)
Dietary interventions	Interventions include elimination of food additives, elimination of allergens/sensitivities, and use of nutritional supplements.
Antidepressants	These include bupropion (Wellbutrin), imipramine (Tofranil), nortriptyline (Pamelor, Aventil), clonidine (Catapres) and guanfacine (Tenex).

Through behavior management, parents, guardians, and other adults should focus on positive behaviors and seek to find the youth behaving properly as much as possible (Rostain, 2012). This will help shift the youth's energy to being good, and thus reduce the focus on poor behaviors.

Behavioral Classroom Management

Behavioral classroom management (BCM) has received the most support of any psychological treatment for youth with ADHD (Pelham & Fabiano, 2008). BCM are teacher-implemented behavior modification strategies. Effective classroom management strategies include reward programs, point systems, and time-outs. The Daily Report Card (DRC) (Jurbergs & Kelley, 2008) is another effective classroom management strategy included in many of the studies reviewing BCM (Pelham & Fabiano; Pelham, Wheeler, & Chronis, 1998). The DRC provides feedback to youth, parents, and mental health professionals about target behaviors occurring in the classroom, and bridges BCM and home-based interventions.

Behavioral Parent Training

Behavioral parent training (BPT) teaches parents behavior management and discipline skills to extend treatment from the therapist's office to the home in order to address a wide array of problematic behaviors. The behavioral techniques used in BPT programs include positive reinforcement, time-out from reinforcement, and/or response cost techniques. BPT takes many different forms, ranging from brief problem-focused programs to more extensive programs lasting 18 sessions or more in individual or group settings. The most frequent training method involves providing verbal instruction through one-on-one discussion with parents, followed by educational reading materials (Moreland et al., 1982). BPT has been shown to be effective in improving problematic child behavior and negative parent-child interactions (Chronis et al., 2004).

Pharmacological Treatments

Pediatricians, family physicians, specialized psychiatrists, and child psychiatrists most frequently prescribe stimulant medications for the treatment of ADHD. Studies have found a significant majority of children with ADHD derive benefits from these medications and that they are effective at reducing ADHD symptoms in the short-term (AACAP, 2007). Medications for ADHD act on dopaminergic pathways in the prefrontal cortex, striatum, and nucleus accumbens (Sauer, Ring, & Witcher, 2005) and increase the availability of dopamine in the brain.

Two frequently prescribed stimulant medications for ADHD are methylphenidate (i.e., Ritalin or Concerta) and amphetamines (e.g., Adderall) (National Institute of Drug Abuse [NIDA], 2014). The tolerability and safety of stimulant medications are comparable, with all medications demonstrating similar side effects, including effects on cardiovascular functioning, sleep disturbance, appetite suppression, and anxiety (Wernicke & Kratochvil, 2002). The major drawback of stimulant medications is the lack of selectivity on the subcortical regions upon which they act. There is a salient potential for abuse of stimulant medications due to their effects on the brain (Bymaster et al., 2002; Wee & Woolverton, 2004). As a result, methylphenidate and dexamphetamine are listed as Schedule II drugs with the U.S. Food and Drug Administration (FDA).

The FDA has also approved atomoxetine, a medication for treating ADHD that is not a stimulant (NIMH, 2003). Atomoxetine acts specifically on the prefrontal cortex to increase levels of dopamine and norepinephrine, which leads to improved executive functioning and reduced ADHD symptoms. Atomoxetine is unique in its ability to act on norepinephrine transporters in the prefrontal cortex without acting on striatum or nucleus accumbens regions of the brain (Bymaster et al., 2002; Wee & Woolverton, 2004). These benefits may also help reading in youth with dyslexia (Rostain, 2012).

The side effects of atomoxetine are similar to those of stimulant medications but are milder (Rostain, 2012). Despite side effects, atomoxetine is considered well-tolerated in most children and adults (Spencer et al., 1998). An examination of four clinical trials reported to the FDA showed the percentage of overall discontinuation of use due to adverse events was 3.8 percent (Wernicke & Kratochvil, 2002). Other

medications for ADHD, such as methylphenidate and dexamphetamine, act on the entire norepinephrine and dopamine regions, including the striatum and nucleus accumbens. Increases in dopamine in these regions of the brain activate the brain's reward system, which heightens the potential for abuse. Because atomoxetine does not act on these regions, it does not carry the same risk of addiction and is not a scheduled drug (Sauer, Ring, & Witcher, 2005; Rostain, 2012). Atomoxetine may be beneficial in those youth with anxiety and tic disorders (Rostain).

In 2009, alpha-adrenergic agonists, which include Clonidine and Guanfacine, were approved by the FDA for treatment of ADHD. This class of medications is frequently used when either symptoms do not respond to other approved medications (stimulants or atomoxetine) or the side effects of other medications are intolerable (e.g., the tics associated with stimulants) (Cruz, 2010; APA 2007). Alpha-adrenergic agonists help reduce irritability, over-arousal, explosiveness, and emotional lability in youth with ADHD (Rostain, 2012). Agonists are commonly used in conjunction with stimulants to treat ADHD, and are commonly used when there is a comorbid diagnosis of oppositional defiant disorder, Tourette disorder, or aggressive/impulsive behavior (Sallee, 2008). Guanfacine has shown to be an effective treatment for ADHD, but only in the short-term in children six to 12 years old (Bernknopf, 2011). The use of alpha-adrenergic agonists like Guanfacine has not been extensively tested and regular monitoring is recommended.

Unproven Treatments

There is a long list of other interventions for the treatment of ADHD, including dietary replacement, exclusion, or supplementation; various vitamin and mineral regimens; various types of talk therapy; and perceptual stimulation. Treatment approaches that were tested and found to have no support in recent studies include client-centered therapy, self-control training, skill development, and the combination of parent management training and self-verbalization (AACAP, 2007). It is important, however, to note that some of these treatments may offer benefits to the accompanying symptoms of ADHD, so further study is needed (Chorpita & Daleiden, 2007).

There is much anecdotal evidence on the effects of diet on ADHD. Unfortunately, many studies on diet lack the rigorous scientific methods necessary to draw conclusions about their efficacy. Several foods are mentioned as possible triggers, particularly casein (derived from milk). More recently, gliadin (derived from wheat gluten) has been frequently cited (Lilienfeld, 2005). There are also studies linking ADHD to certain food sensitivities. Some of the dietary elimination strategies showed intriguing results, suggesting the need for future research. One dietary study determined that food additives might have an impact on a child's hyperactivity level (Warner, 2004). Treatments focusing on mineral supplementation also merit further study, but current data suggest that mineral supplementation is useful only when true deficiency has been demonstrated. Although these approaches have generated considerable interest and there are studies exploring various treatment strategies, the research does not currently support their use.

Additional unproven treatments for ADHD include interactive metronome training (IM), wherein a patient synchronizes hand and foot exercises to audible tones. A study at Michigan State University found this beneficial for some children (Shaffer et al., 2001). The study was small, with 56 participants, 19 of whom received IM training, and all were male between ages six and twelve.

A study by Sonuga-Barke and his colleagues (2013) questioned the efficacy of neurofeedback as a treatment for ADHD and suggested that further study is needed to support it. However, a letter to the editor of the *American Journal of Psychiatry* (Arns & Strehl, 2013) questioned the method of comparison and resulting statistical analysis. As a result, neurofeedback is still yet-unproven, but may become an appropriate treatment for ADHD in the future, if researchers can provide more empirically-based data.

Antidepressant medications are sometimes prescribed “off-label” for the treatment of ADHD, meaning they have not been approved by the FDA for the treatment of ADHD. These include Bupropion, Imipramine, and Nortriptyline (AACAP, 2007).

Cultural Considerations

Research also suggests that even though ADHD is not more prevalent in different ethnicities, the rate of diagnosis is different. This may be attributable to different diagnostic practices, cultural variation in attitudes, and/or differing interpretations of children’s behaviors (APA). Caucasian youth are more likely to be diagnosed and receive treatment for ADHD (Eiraldi et al., 2006). The lack of culturally sensitive assessment tools and the prevalence of stereotypes also play a role in under-diagnosis or misdiagnosis (Eiraldi et al.). As a result, it is critical that health care professionals receive training in multicultural mental health issues to ensure proper diagnosis and treatment (Morgan et al., 2013). Recommendations include understanding how minority families perceive the youth’s behavior, the use of culturally sensitive assessment methods, and education about the causes and treatment of ADHD, while maintaining respect for cultural beliefs.

Overview for Families

All children show inattention, distractibility, impulsivity, or hyperactivity, but children with ADHD show increasingly severe and frequent symptoms (AACAP 2013). The symptoms must begin before the age of 12, and they can continue into adulthood (APA, 2013).

A child with ADHD often shows some of the following:

- Trouble paying attention
- Inattention to details and makes careless mistakes
- Easily distracted
- Loses school supplies; forgets to turn in homework
- Trouble finishing class work and homework
- Trouble listening
- Trouble following more than one instruction at a time
- Blurts out answers
- Is impatient
- Fidgets or squirms
- Leaves seat and runs about or climbs excessively
- Seems “on the go”
- Talks too much and has difficulty playing quietly
- Interrupts or intrudes on others (AACAP, 2008)

ADHD may coexist in children with conduct disorder, anxiety disorder, depressive disorder, bipolar disorder, autism spectrum disorder, or learning disabilities (AACAP 2013; APA 2013).

A child with ADHD struggles with schoolwork and can experience increased failures when teachers and/or family do not recognize a health problem. Children with ADHD also struggle with friendships and can experience low self-esteem as a result. Therefore, a child with ADHD symptoms should have a comprehensive evaluation. Parents should ask their pediatrician or family physician to refer them to a child and adolescent psychiatrist, who can diagnose and treat this medical condition (AACAP, 2008).

Special education services in public schools may be available for children with ADHD. The Individuals with Disabilities in Education Act (IDEA) and the Rehabilitation Act provide special education accommodations and require public schools to offer certain services. Section 504 of the Rehabilitation

Act of 1973 states any school receiving federal aid is required to provide a certain level of education to all children regardless of disability (National Resource Center, [NRC], 2012). Therefore, all children must be given the opportunity to participate in all academic and non-academic services offered by a school. A student qualifying for services under the Act must have a physical or mental disability that substantially impairs a “major life activity.” In relation to ADHD, “major life impairments” include reading, thinking, concentrating, and communicating with others. Examples of accommodations include:

- Reducing the number of homework problems without reducing level or content of material
- Providing students with a quiet place to take exams or study
- Providing students with additional time on exams
- Providing the student with access to counseling services (NRC, 2012)

Students receiving these benefits must achieve at the same level as their peers and participate in all state-required assessments (NRC, 2012). Individual Education Programs (IEPs) ensure students are achieving short- and long-term educational goals.

Resources and Organizations

American Academy of Child & Adolescent Psychiatry (AACAP)

ADHD Resource Center

http://www.aacap.org/AACAP/Families_and_Youth/Resource_Centers/ADHD_Resource_Center/Home.aspx

American Psychiatric Association (APA)

Parents Med Guide

<http://www.parentsmedguide.org/>

Attention Deficit Disorders Association – Southern Region

<http://www.adda-sr.org/>

Centers for Disease Control and Prevention (CDC)

Attention-Deficit/Hyperactivity Disorder

<https://www.cdc.gov/ncbddd/adhd/>

Children and Adults with Attention Deficit Disorders (CHADD)

<http://www.chadd.org/>

U.S. Department of Education

Identifying and Treating Attention Deficit Hyperactivity Disorder: A Resource for School and Home

<https://www2.ed.gov/rschstat/research/pubs/adhd/adhd-identifying.html>

Virginia Resources and Organizations

Children and Adults with Attention Deficit Disorders (CHADD)

<http://www.chadd.org/>

Central Virginia Chapter

804-385-3139

Northern Virginia CHADD

24-Hour Information Line - 703-641-5451

CHADD of Tidewater

866-633-4871 (Toll free)

CHADD Shenandoah Valley Satellite

540-241-4754

Parent Educational Advocacy Training Center

www.peatc.org

Virginia Commonwealth University

Center for ADHD Research, Education, and Service

<http://www.adhd.vcu.edu/clinical-services/>

Virginia Department of Education

Attention Deficit/Hyperactivity Disorder

http://www.doe.virginia.gov/special_ed/disabilities/other_health_impairment/specific_conditions.shtml

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DISCLOSURE STATEMENT

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