



Maureen Murphy-Ryan

# HELPING CHILDREN WITH ATTENTIONAL CHALLENGES IN A MONTESSORI CLASSROOM: THE ROLE OF THE PHYSICIAN

by Maureen Murphy-Ryan

*Maureen Murphy-Ryan offers a clinical look at attention deficit hyperactivity disorder (ADHD). Her thorough definition of ADHD and the diagnoses that may occur simultaneously offer teachers an awareness of what this could look like in a classroom. However, it is only with professional medical input that a true diagnosis can be made and appropriate interventions can be put in place. Behavioral interventions are outlined, as well as the extremely sensitive issue of medication. By partnering these support systems with the Montessori environment and creating a conversation that includes the needs of the child and family, there is a greater chance to successfully help children find their focus.*

## PURPOSE

Approximately 12% of children in the United States have attentional difficulties meeting criteria for a diagnosis of attention deficit and hyperactivity disorder (ADHD) according to the CDC's 2011 National Survey of Children's Health. This number has risen 43% in just 8 years. ADHD is considered a chronic neuropsychiatric

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syndrome. Montessori classrooms, like traditional classrooms, will have students across the spectrum of attentional abilities. The Montessori method is uniquely suited to help children with attentional challenges develop their capacity to focus and learn. Montessori teachers need knowledge of the variety of neurophysiological and psychological bases of attentional challenges, they need to know about genetic contributions to ADHD and the importance of developing a supportive working relationship with parents, and they need to know when to seek partnerships with medical specialists. Children with ADHD are at high risk and Montessori teachers need to know why early intervention and support can save lives. The most severely attention-impaired children require clinical attention for diagnosis and treatment in order to prevent or reduce future risk of negative outcomes such as substance addiction, legal infractions/incarceration, or suicide.

The purpose of this paper is to help the Montessori educator to:

1. Know the components of a clinical diagnosis of ADHD.
2. Identify children who would benefit most from the involvement of a medical specialist; be able to name several important considerations for when to refer parents to a developmental pediatrician, child/adolescent psychiatrist, or pediatric neuropsychologist.
3. Have a basic understanding of the brain changes underlying ADHD, the genetic basis for these brain differences, and how stimulant medications work.
4. Become familiar with disorders that present similarly to ADHD or may be present alongside ADHD (differential diagnosis and comorbidity).
5. Communicate with parents why it is crucial that children with attentional challenges receive the help they need.

6. Become prepared to participate in an educational-medical care team applying multiple treatment modalities to help the child with attentional challenges be successful in and benefit from a Montessori environment.

### HOW IS ADHD DIAGNOSED?

We all know what ADHD looks like—or do we? Children can be inattentive and/or over-active for a variety of reasons, including ADHD, and in order for us to know how to help these children be successful in a Montessori environment, we need to know what is driving these behaviors. How do we distinguish ADHD from other causes?

The text used to define psychiatric syndromes, including ADHD, in the United States is the *Diagnostic and Statistical Manual*, currently in its fifth edition (*DSM-5*). ADHD is a disorder defined as some combination of severe inattention, hyperactivity, and impulsivity that begins in childhood and often persists into adult years. The symptoms must cause functional impairment across multiple settings and must be developmentally relevant.

The first description of ADHD was in 1798 by Scottish physician Sir Alexander Crichton, who wrote about “the incapacity of attending with a necessary degree of constancy to any one object” and stated, “when born with a person it becomes evident at a very early period of life and has a very bad effect, inasmuch as it renders him incapable of attending with constancy to any one object of education. But it seldom is in so great a degree as totally to impede all instruction; and what is very fortunate, it is generally diminished with age” (Crichton). The similarities to later diagnostic criteria and understanding of the natural history of ADHD is striking, particularly the inborn (genetic) nature of ADHD, the importance of

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educating these children to the extent of their capacity, and the natural diminishing of symptoms over the lifespan.

Over a century later, German physicians Franz Kramer and Hans Pollnow described a “Hyperkinetic disease of infancy” in 1932, equivalent to the modern diagnosis of hyperactivity-predominant ADHD, characterized by marked motor restlessness, where such children “cannot stay still for a second, run up and down the room,” (7) “climb about preferring high furniture in particular,” (10) “are displeased when deterred from acting out their motor impulses” (7). The children Kramer and Pollnow studied “had difficulties completing difficult tasks, which may cause learning deficits and make it difficult to assess their intellectual abilities” (21). While children with attentional difficulties may have marked academic difficulties, their intelligence should not be assumed to be limited on this basis (Lange, et al.).



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Charles Bradley, M.D., 1902-1979

Pediatric psycho-pharmacology started out under the purview of pediatricians. Medical treatment of hyperactivity was first reported in 1937 by American pediatrician Dr. Charles Bradley. Bradley was studying children with mood, learning, and behavioral disorders. Bradley administered mixed amphetamine salts, known as Benzedrine sulfate, and was surprised to find that there was remarkable improvement in school performance for half of the thirty children he systematically tested. The treated children were “more interested in their work and performed it more quickly and accurately” (Gross 299). They also showed a decrease in motor activity: “It appears paradoxical that a drug known to be a stimulant should produce subdued behavior in half of the children” (582). This reflects our current understanding that children and adults with ADHD process stimulants differently due to underlying differences in brain structure and function.

Child psychiatry developed as a distinct specialty from pediatrics over the past one hundred years, parallel with the psychological study of normal child development. Child psychiatrists have completed four years of medical school and earned an M.D. or D.O., have completed three or four years of an adult psychiatric residency, and two years of fellowship in child and adolescent psychiatry. Modern child psychiatry understands childhood to be a unique stage of life (children are not small adults), utilizes appropriate standardized psychometric measurements to assess functional impairment, and provides evidence-based behavioral and pharmacological interventions with parents and teachers as essential collaborators.

The *DSM-5* (2013) made changes across multiple domains. Examples of behaviors at different ages were added to criterion items to facilitate application across the life span. The cross-situational requirement (symptoms in at least two settings) was strengthened to “several” symptoms in each setting. Some symptoms of ADHD must now be present before age twelve; this was previously age seven and was increased in part to reflect older average age of diagnosis in girls. A comorbid diagnosis with autism spectrum disorder is now allowed. A symptom threshold change has been made for adults, to reflect their substantial evidence of clinically significant ADHD impairment. For an adult diagnosis to be made, the patient only

needs to meet five symptoms, instead of six required for younger persons, in either of the two major domains: inattention and hyperactivity/impulsivity.

In the *DSM-5*, a child is assigned one of three ADHD subtypes according to clinical observation. Children may switch from one subtype to another as symptoms change over the life span. In order to be a biologically relevant distinction, research must demonstrate that children in the three different ADHD subtypes have different responses to treatment, different etiology, and/or different prognosis; none of these is yet conclusively proven, but research is ongoing. Schizophrenia is a complex mental illness in which biologically meaningful subtypes were elucidated using advanced genetic analysis (Arnedo, et al.).

### **DSM-5 Criteria for ADHD**

People with ADHD show a persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development:

**Inattention:** Six or more symptoms of inattention for children up to age sixteen, or five or more for adolescents seventeen and older and adults; symptoms of inattention have been present for at least six months, and they are inappropriate for developmental level:

- Often fails to give close attention to details or makes careless mistakes in schoolwork, at work, or with other activities.
- Often has trouble holding attention on tasks or play activities.
- Often does not seem to listen when spoken to directly.
- Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (e.g., loses focus, side-tracked).
- Often has trouble organizing tasks and activities.

- Often avoids, dislikes, or is reluctant to do tasks that require mental effort over a long period of time (such as schoolwork or homework).
- Often loses things necessary for tasks and activities (e.g., school materials, pencils, books, tools, wallets, keys, paperwork, eyeglasses, mobile telephones).
- Is often easily distracted
- Is often forgetful in daily activities.

**Hyperactivity and Impulsivity:** Six or more symptoms of hyperactivity-impulsivity for children up to age sixteen, or five or more for adolescents seventeen and older and adults; symptoms of hyperactivity-impulsivity have been present for at least six months to an extent that is disruptive and inappropriate for the person's developmental level:

- Often fidgets with or taps hands or feet, or squirms in seat.
- Often leaves seat in situations when remaining seated is expected.
- Often runs about or climbs in situations where it is not appropriate (adolescents or adults may be limited to feeling restless).
- Often unable to play or take part in leisure activities quietly.
- Is often "on the go" acting as if "driven by a motor."
- Often talks excessively.
- Often blurts out an answer before a question has been completed.
- Often has trouble waiting his/her turn.



- Often interrupts or intrudes on others (e.g., interrupts into conversations or games)

In addition, the following conditions must be met:

- Several inattentive or hyperactive-impulsive symptoms were present before age twelve years.
- Several symptoms are present in two or more settings, (such as at home and at school). There is clear evidence that the symptoms interfere with, or reduce the quality of social, school, or work functioning.
- The symptoms are not better explained by another mental disorder (such as a mood disorder, anxiety disorder, dissociative disorder, or a personality disorder). The symptoms do not happen only during the course of schizophrenia or another psychotic disorder.

Based on the types of symptoms, three kinds (i.e., presentations) of ADHD can occur:

- **Combined Presentation:** if enough symptoms of both criteria—inattention and hyperactivity/impulsivity—were present for the past six months;
- **Predominantly Inattentive Presentation:** if enough symptoms of inattention, but not hyperactivity-impulsivity, were present for the past six months;
- **Predominantly Hyperactive-Impulsive Presentation:** if enough symptoms of hyperactivity-impulsivity but not inattention were present for the past six months. Because symptoms can change over time, the presentation may change over time as well.

A child psychiatrist will use these explicit *DSM-5* criteria for diagnosis, obtain history from more than one setting (parent and teacher) using questionnaires (e.g., Connor's scales, Vanderbilt scales,

Child Behavioral Check List (CBCL), other ADHD rating scales). Their evaluation will determine the level of functional impairment and screen for coexisting conditions that may also need treatment. Two to three visits may be scheduled for a full work-up.

ADHD is most commonly identified during elementary school years when inattention becomes more prominent and impairing. While excessive motor activity may be seen when the child is a toddler, these symptoms are difficult to distinguish from highly variable normative behaviors before age four years. In preschool, the main manifestation is hyperactivity. In kindergarten, children with weaker inhibition and working memory capacities are more likely to exhibit high levels of disruptive behaviors and ADHD symptoms. Disruptive behaviors at these young ages may be more related to impaired executive function (i.e., ADHD) than oppositionality; so care should be taken when inferring intent from a child's disruptive behavior that may be better understood as symptoms of hyperactivity. This is why an accurate diagnosis is essential to providing effective assistance. It is critical that teachers and parents understand that disorderly/disruptive/destructive/"dangerous" behaviors in young children may not be willful disobedience.

### WHO GETS ADHD?

The prevalence of ADHD is on the rise. Teachers in Montessori schools and traditional schools are grappling with this new reality. What do we know about this population? It is more complicated than you may think.

A basic understanding of genetic inheritance helps the teacher understand how a child may have no other family members with obvious attentional challenges, or multiple family members who carry a diagnosis of ADHD. Studies of first-degree family members show that subtle traits may be present throughout the family based on lesser genetic loading, for example schizophrenia, autism, and ADHD. ADHD is a familial disorder; put another way, even though a child may be the first family member to receive intervention for severe attentional problems, subclinical features of ADHD can be found in other family members if they are clinically tested—the tree does not grow far from the apple. Such studies tell us that

attentional capacity exists on a much wider and subtler spectrum than previously thought.

ADHD is a heterogenous condition with many known contributing factors leading to the ADHD phenotype (attentional symptoms). Risk factors and prognostic factors for ADHD include the inborn temperament of the child (those personality characteristics most strongly influenced by genetics), environmental influences in childhood (i.e., being raised in a stable environment conducive to developing attention can attenuate features of ADHD), genetics (family history of ADHD make a child more at risk to have attentional challenges), physiological factors (endocrine function, for example), and course modifiers (treatment with therapy, medication, developmentally appropriate classroom environment).

One way scientists examine how much of a complexly inherited disorder is due to genetics is through studies of identical twins raised apart. This has been applied to ADHD as well as other neurodevelopmental thought and mood disorders. Take schizophrenia, which has one of the highest genetic contributions. In prospective studies of cohorts of identical twins, where one twin is known to have schizophrenia, there is an approximately 40% chance the other will develop schizophrenia or related severe thought disorder. The other 60% of the total risk for schizophrenia is considered to be environmental: genetic + environmental risk = 100%. As a practical example, consider a young adult woman who was raised apart from her identical twin sister who has developed schizophrenia. She is worried about the chances she too will develop schizophrenia. A genetic counselor can tell her that there is a greater than 50% chance she will not develop schizophrenia. In comparison, if one identical twin had ADHD, the genetic risk for the other to develop ADHD is 75%, or three out of four. ADHD, indeed, has the highest heritability (genetic risk) of any mental disorder. First degree relatives of a child with ADHD have a five to nine times greater risk of having ADHD than the general population.

Environmental risk factors, representing 25% of the total risk for ADHD, include: low birth weight; prematurity; in-utero exposure to maternal stress, cigarette smoking, alcohol, certain prescription drugs (i.e., paracetamol), or illicit substances; environmental toxins

at a young age or in utero (lead, organophosphate pesticides); nutritional deficiencies (zinc, magnesium, polyunsaturated fatty acids); nutritional surpluses (sugar, artificial food coloring); head injury; extreme early life social deprivation; and excessive screen time.

The study of how disease and disorders, like severe attentional challenges, are represented in populations is called epidemiology. Population surveys conducted by epidemiologists suggest that ADHD occurs across cultures in about 12% of children and about half as many adults, reflecting the natural history of attentional difficulties attenuating with age. Approximately one-third of children diagnosed with ADHD meet the full diagnostic criteria in adulthood, and approximately two-thirds of children with ADHD have symptoms that persist into adulthood. In other words, most children with ADHD diagnoses will still have subclinical symptoms in adulthood. The most common persistent symptom is inattentiveness, with hyperactivity symptoms improving the most with age. About 60% of children diagnosed with ADHD will also have an additional psychiatric diagnosis by adulthood.

Boys have a 2-9 times higher risk of developing ADHD than girls. This gender gap has been lessening over the decades of study as criteria becomes more inclusive, capturing girls who are often identified later. The ratio of males to females with ADHD in the general population is 2:1 in children and 1.6:1 in adults. Girls are more likely than boys to present primarily with inattentive features. As with schizophrenia, which is present in approximately 1% of the population around the world, ADHD rates are expected to be similar geographically and across ethnic groups. However, cultural variation does exist in attitudes toward and interpretations of childhood behaviors, and clinical identification rates of ADHD for African-American and Latino populations in the United States tend to be lower than for Caucasian populations.

The contribution of temperament, character, and personality development have also been studied in ADHD. Adults with ADHD report high novelty seeking and high harm avoidance according to Cloninger's biopsychosocial model of personality. In both autism spectrum disorder and ADHD, overall cooperativeness is relatively lower than the general population, reflecting a high prevalence of

personality pathology that is found in both groups. Adults with ADHD are more likely to be diagnosed with a cluster B personality disorder (e.g., borderline personality disorder) than the general population (Anckarsäter).

#### **WHAT CAUSES ADHD? GENE TO BRAIN TO FUNCTIONAL IMPAIRMENT**

It is very important for Montessori teachers to understand that children with ADHD are not being willfully disobedient; their attention is not fully within their control, even when they are observed concentrating on preferred activities, especially activities involving electronic screens. Children with ADHD have structural and chemical differences in their brains, differences which cause real barriers to their ability to function in the same way that children without ADHD can.

The ADHD brain is fundamentally different from the typical brain. The nucleus accumbens (NA) is the primary brain structure implicated in ADHD, as well as addictive disorders; it is an aggregate of neurons within the core of the brain (subcortex). The NA is important for motivation, aversion, pleasure, reward, reinforcement learning, as well as emotional response to music, rhythmic timing, and experiencing the pleasure in response to seeing a cute baby. It is controlled by nearby areas of the brain through neurotransmitter signaling, specifically dopamine and norepinephrine. In ADHD, subcortical functions are dysregulated at the NA through an intrinsic deficiency of dopamine and norepinephrine. This in turn dysregulates connected cortical activities, primarily in the frontal lobe regions, which manifests as executive function difficulties. ADHD can be described as an executive function disorder.

Widespread structural brain alterations can be seen on MRI. Reduced total grey matter and altered basal ganglia volumes correlated with higher familial ADHD risk. There is some evidence that stimulant medication normalizes brain structure and function, with other studies showing grey and white matter abnormalities persisting into adulthood. The reality is likely a combination of these two situations.

On the molecular level, many genes of interest have been identified that each contribute a tiny amount to the genetic risk for ADHD. For

example, there is a malfunctioning variant of the dopamine transporter gene, with the addition of ten repeating DNA bases, that is associated with ADHD. Studies indicate this gene variant may play a role in brain structure and function in children with ADHD, including response to stimulants. Studies of the influence of this variant on prefrontal cortex thickness in children with ADHD showed that having two copies of the variant led to thinner cortex in the right lateral prefrontal cortex, which is involved in executive processing and dopamine function. This gene variant in a general population sample was linked to impaired executive function and increased sub-clinical ADHD symptoms. The big picture is that different genetics produce different neurological structure and chemistry, with unique responses to stimulants. As a result, caffeine, adrenaline, or amphetamines will often have a paradoxical calming effect on children with ADHD as compared to other children; i.e. the adolescent who drinks coffee before bed because "It helps me relax!"

The competent therapist will regularly review and revise targets, goals, and strategies with the child, the parent, and the teacher. The therapist will also closely collaborate with the Montessori teacher to seamlessly integrate the behavioral tools with the Montessori methods and materials in the classroom and include planned fading of these tools as the child achieves independence.

#### DIFFERENTIAL DIAGNOSIS AND COMORBIDITY

Children can be inattentive for many reasons: anxiety, sensory over/under stimulation, dyslexia, or ADHD. It is very important for teachers to understand the importance of an accurate determination of the cause or causes of a child's inability to attend in order to be effective in helping them. There are many disorders that look like ADHD, but require very different treatments. A differential diagnosis is needed to determine the exact cause or causes; this is carried out by a multidisciplinary team of medical specialists (preferably including a child psychiatrist or developmental pediatrician, an occupational therapist, and, in some cases, a language therapist). It is also very important for teachers to know that, more often than not, there may be multiple causes or comorbid conditions (other disorders present at the same time).

True comorbidity can result from overlapping symptomatology, one disorder manifesting itself as an earlier form of the other, and shared risk factors. Research supports this mechanism for ADHD and substance use disorders. Coexisting conditions must also be evaluated; 30%-50% of ADHD may be comorbid with other diagnoses. The most common include: oppositional-defiant disorder (ODD), characterized by a pervasive pattern of negativistic, defiant, disobedient, and hostile behaviors toward authority figures; conduct disorder (CD), characterized by a repetitive pattern of violating major age-appropriate social norms or rules; mood disorders (unipolar depression in 10%-20%, bipolar affective disorder, often seen in other family members as well). Teens with comorbid ADHD and mood disorders have worse outcomes than those with ADHD alone, including a higher risk for suicide. Anxiety disorders are present in 25% or more of children with ADHD. The most common comorbidity of all is specific learning disorders (SLD), particularly reading disorders. Learning disorders are found in up to 60% of children with ADHD seen in specialty settings.

ADHD comorbidity (disorders that may be inherited along with ADHD):

- Oppositional-defiant disorder: 30%-45%
- Conduct disorder: 20%
- Disruptive mood dysregulation disorder
- Specific learning disorder: up to 60%
- Anxiety disorders: 25% +
- Major depressive disorder: 10%-20%
- Intermittent explosive disorder
- Substance use disorders
- Antisocial and other personality disorders
- Obsessive-compulsive disorder

- Tic disorders
- Autism spectrum disorder

ADHD Differential Diagnosis (disorders that can present similarly to ADHD):

- Oppositional-defiant disorder
- Intermittent explosive disorder
- Other neurodevelopmental disorders
- Specific learning disorder
- Intellectual disability (intellectual developmental disorder)
- Autism spectrum disorder
- Reactive attachment disorder
- Anxiety disorders
- Depressive disorders
- Bipolar disorder
- Disruptive mood dysregulation disorder
- Substance use disorders
- Personality disorders
- Psychotic disorders
- Neurocognitive disorders

The reader will notice that some disorders, such as oppositional-defiant disorder, appear on both lists, because they both share some features and may be present at the same time.



If ADHD presents with intellectual disability, appropriate genetic screening may include Fragile X Syndrome, Tuberous Sclerosis, 22q11 microdeletion, and Williams syndrome. These conditions have high risk for ADHD, ADHD-like features, autism, as well as schizophrenia. The overlap between mental illnesses even in genetically “straightforward” (a few known genes involved) syndromes is impressive. We now have the technology to read every base-pair of nucleotides (building blocks of DNA) in the entire human genome through whole genome sequencing. There was hope that by comparing a sufficient number of genomes of people with specific mental illnesses to those without, several “big player” genes would be found only in those with the mental illness and would explain a large part of the inheritance of severe mental illness. However, once the data was available, it became clear that for ADHD, bipolar affective disorder, and schizophrenia, there were actually hundreds of genes each contributing a small amount to the total heritability of those illnesses, and many of which contribute to multiple diagnoses. This overlap of hundreds of genes each with a < 1% contribution to overall risk does explain the complex symptom comorbidity between certain diagnoses. For instance, some gene combinations are risk factors for multiple disorders as in ADHD and substance use disorder, bipolar affective disorder, and ADHD, etc.

### WHY TREAT ADHD?

Many sympathetic parents and teachers believe that they are protecting the child from stigma when they do not seek medical advice or assistance for the child’s challenging behaviors: They believe that they can just hold things together and survive them. This denial of the child’s differences and lack of acknowledgement of the child’s very real struggles to do what other children do effortlessly puts the ADHD child at great risk for serious accidents (due to impulsivity), drug abuse (self-medication), and premature death (accident, suicide, overdose).

The consequences of not treating ADHD when clinically indicated can be quite serious. ADHD confers an increased risk of attempted and completed suicide (in a study of over 51,000 Swedish patients with ADHD, even after adjusted for comorbid psychiatric disorders, the odds ratio for attempted suicide was 3.62 [95% CI > 3], and for

completed suicide was 5.91 [95% CI 2.45-14.27]). The CI (confidence interval) is a range of values for which there is a specific chance, in this case a 95% chance, that the *true* value falls within it. There is an increased (presumed genetic) risk for suicide attempts among first degree relatives OR (odds ratio) 2.42 [95% CI 2.36-2.49], this risk is lower in more genetically distant family (Ljung, et al.). The odds ratio describes the ratio of an event happening with a specific exposure compared to without; an odds ratio less than 1 indicates the exposure decreases the likelihood of the event, such as exposure to baby aspirin decreasing the likelihood of heart attacks in a given population. ADHD is an independent predictor of greater overall number of driving offenses, higher frequency of driving without a seatbelt, greater likelihood of having driven without a valid license, more at-fault accidents, and disqualified driver's license (Kaye, et al.).

Children with ADHD are more likely to develop conduct disorder in adolescence and antisocial personality disorder in adulthood and are more likely to develop substance use disorders and experience incarceration. ADHD is overrepresented in jail and prison inmates. For example, approximately one quarter of female prison inmates in Germany have ADHD. Female prisoners with ADHD are younger at first incarceration and have longer incarceration periods than those without (Retz, et al.). Boys with ADHD are two and a half times more likely to have community correction records or incarceration records. Girls with ADHD are three times more likely to have community correction records and seven times more likely to have an incarceration record (Silva, Colvin, Glavert, & Bower).

Functional consequences of ADHD include reduced school performance and academic attainment, social rejection, poorer occupational performance/attainment/attendance. There is also a higher probability of unemployment as adults, elevated interpersonal conflict, traffic accidents and violations, and obesity. Research has demonstrated lower health-related quality of life in untreated ADHD including greater parent reported problems of emotional-behavioral role function, behavior, mental health, self-esteem, lower parental emotional health, impaired parents' time to meet their own needs, and interference with family cohesion and activities (Klassen, Miller, & Fine).

Optimal treatment (behavioral and psychopharmacological) of the symptoms of ADHD is the most effective way to reduce the incidence of substance use disorders and has been proven to decrease the rate of substance use disorders. As a case in point, ADHD symptom severity has been shown to be associated with risk for cocaine use; put in other words, the more effective a treatment regimen is at alleviating ADHD symptoms, the lower the risk for cocaine use.

#### INTERVENTION STRATEGIES: BEHAVIORAL INTERVENTIONS

At first glance, behavioral supports seem to be antithetical to Montessori educational principles; however, some children who cannot be successful in an “authentic” Montessori environment, are able to function, learn, and gain independence through the skilled application of behavioral tools within a scientific pedagogical approach, as advocated by Montessori. We must remember that Montessori spent her life developing a curriculum and approach for typical children. Children with ADHD are not “typical” in the way they function in the world and require supports to scaffold their way up developmentally. Behavioral supports can be designed such that they are individualized for the child/children who need them, such that the other children in the environment are not disturbed or negatively influenced, and such that a clear path is built toward optimal engagement with the Montessori curriculum and maximum independence.

A working alliance between the parent, the child, and the teacher is crucial for successful outcomes in the clinical management of ADHD. A dynamic, ongoing alliance between parents, child, teachers, and medical providers promotes maximal adherence to appropriate behavioral and pharmacological intervention and best clinical outcomes. Young children may not be able to describe their internal states, so developmentally relevant vocabulary must be used when working with children and families.

A good clinician will match the intervention(s) to the needs of the child and family. Parental factors contributing to poor adherence to behavioral or pharmacological interventions include ambivalence regarding the need for the intervention, guilt about having “caused” the condition, feelings of “inadequate” parenting, feeling responsible

for “poor” gene contribution, or inadequate parental surveillance of adherence to the intervention. Parents may be guided by misinformation from Internet sources or general public perception (Coleman, Walker, Lee, Friesen & Squire). The child may feel “damaged” or very different because of the need for intervention. Parents and teachers should be coached on how to ascribe improvement/benefits from treatment more to student effort than to medication. The teacher’s input is essential for ongoing functional assessment.



Maria Montessori surrounded by children, Italy, 1920

Behavioral therapies target a specific behavior with specific interventions to modify the environment with a goal of changing the behavior. Behavioral interventions may be employed by any trained school staff: teachers, aides, assistants, therapists, coaches, bus monitor. Behavioral interventions may be used in home, at school, or in community settings. A child behavioral therapist or clinician will identify and prioritize treatment targets, assess current level of functioning, create specific, measurable, meaningful treatment goals, develop individualized strategies to reach these goals, and track the child's progress. The competent therapist will regularly review and revise targets, goals, and strategies with the child, the parent, and the teacher. Furthermore, in an ideal world, the therapist will also closely collaborate with the Montessori teacher to seamlessly integrate the behavioral tools with the Montessori methods and materials in the classroom and include planned fading of these tools as the child achieves independence.

Cognitive and cognitive-behavioral therapies address how people think about things or perceive things. Psychosocial interventions involve how the child interacts with others. Academic interventions may include modified general instruction, small-group or individual instruction, specialized instruction techniques, or specific skill instruction.

In summary, when implementing behavioral interventions, the trained provider will think about the context/setting, be specific in their goals and prioritize them, increase external structure and support as needed, reinforce appropriate behaviors, respond immediately if further supports are required, think about how this skill fits into the child's life, remove these external structures and supports the moment the need for them is overcome, and make appropriate recommendations to other caregivers.

#### INTERVENTION STRATEGIES: MEDICATION

For children with ADHD, medication could save their lives—both figuratively and literally—whether it is reducing impulsivity so they don't run into the street and get hit by a car, or improving their attentiveness in order to keep them from failing or dropping out of school and then getting into trouble with drugs, sex, and

other thrill-seeking, dangerous behaviors. Nevertheless, giving ADHD medication is a very complex issue and is often fraught with side-effects and requires close monitoring and adjustments of dosage by a specialist: a child/adolescent psychiatrist, developmental pediatrician, or pediatric neuropsychologist.

Medication is a supportive tool for success in daily life and facilitates learning self-regulation and compensatory life skills in children who could not otherwise participate fully. Medications work best in combination with other interventions such as social and executive skills training, parental training, lifestyle management (physical exercise, healthy diet, sleep). Physiologic differences in childhood require lower dosing and slow titration on a weight-based scale. Shorter psychotropic medication half-lives in children may require more frequent dosing than adults. Gender differences across development also affect medication half-life and distribution.

The most effective and widely used class of medication in the treatment of ADHD is the psychostimulants. Stimulants “stimulate” certain areas of the brain to focus better. The FDA classifies a substance as “psychostimulant” if the nucleus accumbens is activated. Stimulants have been in use for “behavioral disorders” in children since Bradley’s discovery in the 1930s with many studies to document safety and efficacy. Response to stimulants does not confirm a diagnosis of ADHD as evidenced by the abuse of stimulants as “study drugs” in high schools and college.

Benefits of treatment with stimulant medication include improved focus, concentration, attention span; and reduced hyperactivity, impulsivity, and fidgeting. Adverse reactions and side effects include irritability, stomachache, headache, dysphoria, anxiety, zoned-out effect, appetite suppression and weight loss, sleep problems, height velocity slow-down (<10%). Amphetamine formulations may produce more sleep/ appetite problems, especially at higher doses. Transient tics (9%), chronic tics (<1%), mild or moderate tics occur in a significant number of patients with or without ADHD pharmacotherapy. A simple or complex tic will be experienced by 5%-8% of all school children in their lifetime. Tics during ADHD treatment may improve even while psychostimulants are used.

Adverse reaction to a specific stimulant does not contraindicate the use of other stimulants.

At high doses, psychostimulants may impair performance, memory, sequence coordination, and thought clarity. Drug toxicity may manifest as “cognitive constriction,” adventitious movements, paranoia, and disruptive outbursts. Serious side effects of psychostimulants are very rare. Sudden cardiac death has been reported primarily in patients with pre-existing cardiac conduction defects. Clinicians minimize this risk by asking about history of sudden tachycardia, fainting, and family history of sudden cardiac death prior to initiating stimulant therapy. In the rare case of psychosis related to excessive dopaminergic activity, the clinician will discontinue the stimulant medication and if absolutely necessary may restart later at a lower dose. Growth suppression may occur, but height potential is likely to be made up in late teens or during “drug holidays” (medication-free periods usually during academic vacations). Children with nausea and vomiting are especially at risk for delayed growth. The clinician should plot heights every three months to ensure proper growth velocity (Molina, et al.)

A clinician has to know when a youth “needs” the psychostimulant (e.g., early in the morning for school only or including for homework, peer activities, weekends). Parents and teachers are asked to observe efficacy and side effects through the day (teachers) and into the evening (parents). Teacher input is essential to create the optimal medication regimen. Fine tuning medication regimens requires accurate information about the child’s performance “over the day.” Clinicians will provide psychometric scales to the teacher, such as the Vanderbilt scale or Connors rating scale and will incorporate their feedback and change the medication regimen as needed.

Short- and long-acting psychostimulant preparations may be combined. A child psychiatrist may also “mix and match” with other nonstimulant anti-ADHD drugs. Nonstimulant medications include atomoxetine (brand name Strattera), which increases norepinephrine, bupropion (Wellbutrin), which increases dopamine and norepinephrine, guanfacine (Tenex, an alpha2A-agonist that calms the central nervous system), clonidine (similar to guanfacine,

important to monitor for hypotension). Failure to use input from school can result in errors in dosing medications.

Omega-3 supplementation was investigated as a possible intervention for ADHD based on meta-analysis showing decreased omega-3 fatty acids in adults with ADHD. Omega-3 supplementation was first reported to help one quarter as much as established medications. However, omega-3 supplementation was not proven more effective than placebo by a Cochrane Review and is not considered an evidence-based therapy.

For any medication, response is frequently unpredictable, and clinicians will use a “start low, go slow” approach. Rebound symptoms may be experienced if medications are abruptly discontinued or doses missed, a clinician may increase dosing frequency with a smaller dose if this occurs. The absence of response within two weeks may signify treatment failure for a particular medication or dose. Stimulants are contraindicated in a child experiencing acute mania or with a history of psychosis. Children with less hyperactive symptomatology improve on smaller doses of stimulants but also have higher failure rates.

### CONCLUSIONS

With the increasing prevalence of ADHD, Montessori teachers are faced with meeting the needs of more and more of these challenging children in their Montessori environments. In order to provide the child with ADHD the individualized treatments and supports needed to be successful, first a differential diagnosis is required to determine (1) if the challenging behaviors are a result of ADHD and (2) if there are other comorbid disorders present that also need to be treated. Next, based on these identifications, the parents and teachers can reach out to the relevant medical specialists to partner in designing, creating, experimentally testing, and modifying, as needed, a support structure of behavioral tools, executive function coaching, counseling, modified teaching and materials of instruction, and, if needed, medications. As the child/adolescent develops executive function skills, the ability to self-regulate, and control of their will, many supports—including medication—may be faded over time if they are no longer necessary to function.



ADHD is a clinical diagnosis in both youth and adults. There are several subtypes with different presentations. Child and adolescent psychiatry is the field of medicine specializing in the diagnosis and treatment of ADHD. Teachers and parents are asked to complete psychometric assessment of the child's functioning as part of the diagnostic process for ADHD and to determine ongoing functional needs. Once a diagnosis is established, behavioral interventions should be tried first, both at home and in the classroom. In more severe cases, psychopharmacology may be added. Psychostimulants and atomoxetine are prescribed most commonly.

## RESOURCES

### Digital Resources

#### Classroom Strategies and Modifications

- [www.schoolpsychiatry.org](http://www.schoolpsychiatry.org)

#### Parent Education and Empowerment

- [www.parentshelpingparents.com](http://www.parentshelpingparents.com)
- [www.schwablearning.org](http://www.schwablearning.org)
- [www.greatschools.net](http://www.greatschools.net)
- [www.chadd.org](http://www.chadd.org)
- [www.aacap.org](http://www.aacap.org) (Amer Acad of Child & Adol Psychiatry: Facts for Families)
- [www.parentsmedguide.org](http://www.parentsmedguide.org) (antidepressants)
- [www.add.org](http://www.add.org)
- NAMI ([www.nami.org](http://www.nami.org))

#### Psychometric Scales for ADHD

- Connors rating scales (CPRS, CTRS, CAAARS) and scoring instructions are sold by Multi-Health Systems: 908 Niagara Falls Blvd., North Tonawanda, NY 14120-2060, (800) 456-3003.

- Vanderbilt Scales for rating ADHD are available free of charge at <http://www.brightfutures.org/mentalhealth/pdf/tools.html>
- Wender-Reimherr Adult ADD Scale is available at <http://www.add-pediatrics.com/add/wender.html>

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