Attention-Deficit/Hyperactivity Disorder and Academic Strategies

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Abstract

Attention-Deficit/Hyperactivity Disorder (AD/HD) is a neurobiological based developmental disorder with impaired executive function (EF). This impairment includes the ability to plan, organize information, and problem solve. Children affected with this disorder experience challenges at home, school, and in social settings. This Master’s Project reviews empirical research examining: executive and neurocognitive function, subtypes of ADHD, medication and other treatment options, co-morbid disorders such as Conduct Disorder (CD), and Oppositional Defiance Disorder (ODD). In addition, empirical data will reveal how ADHD affects family life; academic deficits will be addressed along with strategic skill for the ADHD child to use at home and in school for higher achievement success.
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Attention-Deficit/Hyperactivity Disorder and Academic Strategies

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder, generally diagnosed in childhood. Symptoms tend to persist into adolescence and adulthood. This disorder affects 3% to 5% of all school aged children, and is one of the most frequently diagnosed and extensively studied psychiatric disorders (Toplak et al., 2009). It manifests itself with symptoms varying in severity from categories of inattentiveness and hyperactive/impulsive behaviors. Individuals are easily distracted, making concentration and organization difficult in most areas of life (2009).

There has been an increased interest in assessments of executive function (EF) for children over the past 10 years (Epsy, Kaufman, Glisky, & McDiarmid, 2001). EF involves developing and implementing approaches to perform tasks that are not habitually performed (Mahone & Hoffman, 2002). Early development of skills supporting EF includes the ability to maintain problem-solving attributions of future goals (Welsh & Penninton, 1988), and includes inhibited actions, restrain and delay responses, deficits with selectivity, self-regulate, problem solving, being flexible, goals, plan, and shift set (Senn, Epsy, & Kaufman, 2004).

These children are at a significant risk for poor multiple outcomes with academic underachievement, one of the most prominent concerns for parents and educators (Huang-Pollock & Karalunas, 2010). Development of performance-based tests measuring EF constructed for preschool children with ADHD lag behind children without this disorder (Mahone, Pillion, Hoffman, & Hiemenz, 2005).

Dealing with ADHD’s primary symptoms is associated with three subtypes, subsets of symptoms, and the degree of severity, including co-morbid disorders,
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according to DeLisi, Vaughan, Beaver, Wexler, Barth, & Fletcher, 2011). These symptoms are often challenging for families, teachers, clinicians, and peers. The Diagnostic and Statistical Manual of Mental Disorders, 4th edition, text revision (American Psychiatric Association, 2000) describes ADHD as a heterogeneous disorder, providing hyperactive impulsive (ADHD-HI), primarily inattentive (ADHD-IA), and combined type (ADHD-C). The questions of ADHD subtypes remain controversial at the present time (Laurent & Berquin, 2009).

According to Lowe, Kirley, Hawi, Sham, Wicklam, & Kratochvil, (2004), ADHD rarely occurs by itself. Children living with this disorder have high levels of co-morbid disorders including conduct disorder (CD), oppositional defiance disorder (ODD), anxiety, depression, developmental coordination disorder, bipolar disorder, and autism spectrum disorder. These adolescents often lack friendships, and have poor relationships with peers. Emotional difficulties, early pregnancies, low academic scores, substance abuse, and problems with authorities can also persist into adulthood (Martel, Goth-Owens, Martines-Torteya, & Nigg, 2010).

Molecular genetic studies reveal that genes play an important role in the etiology of ADHD. It has been shown to be a highly heritable disorder, leading to an increase in genetic studies. Family studies have shown that 30-35% of biological siblings of ADHD probands tested met the criteria for ADHD, while the base rate in the population were considerably less (Slaats-Willemse, Swabb-Barneveld, Sonneville, & Buitlar, 2007). “Gender effects in siblings seem to play an important role in ADHD endphenotype research suggesting girls with ADHD show greater cognitive impairments that do boys, even though girls’ behavioral problems are milder,” according to Gershon (2002).
Medication has assisted children in maintaining focus, and can improve behavioral control (Semrud-Clikeman, Pliszka, & Liotti, 2008). Research indicates that medication may not help the child’s learning capability but can be beneficial with classroom behavioral issues and self regulation. Approximately 13% of children diagnosed with ADHD are prescribed treatment with stimulant medications. Stimulant medications most commonly prescribed are methylphenidate and dexamphetamine (Snyder, Maruff, Pietrzak, Cromer, & Snyder, 2008).

The socioeconomic impact on the individual and families experiencing this disorder can be overwhelming. Due to the complexities stated earlier, there is a direct need for integrative multi-modal treatment, explained by Rojas & Chan (2005). The use of complementary and alternative medicine (CAM) for treatment of ADHD has become widespread in the primary care population. Controversies such as the elimination of artificial food additives, colors, preservatives, and the effect of sugar on the behavior of children have been well supported but lack evidence as the sole treatment for ADHD (Pelsser, Frankena, Toorman, Savelkoul, Pereira, & Buitelarr, 2009). Essential fatty acids supplementation, yoga, massage, biofeedback, restricted diets, green spaces, and homeopathy suggest potential benefits as part of the overall ADHD treatment plan, but further research is needed.

Parents of children with ADHD report less marital satisfaction, frequent fighting, and are more negative than positive compared to parents without an ADHD child. Research indicates a link between severities of the ADHD child’s behavior and marital discord (Wymbs, Pelham, Gnagy, Moilna, Wilson, & Greenhouse, 2008). These parents have a greater risk of divorce compared to couples without an ADHD child. Co-morbid
disorders such as oppositional defiant disorder (ODD) and conduct disorder (CD) have an even greater rate of marital dissatisfaction.

The main focus of this paper is to gain an understanding of ADHD. Empirical research studies will be used to examine neurological functions of the brain, focusing on the prefrontal cortex (pfc) where executive functioning takes place. Co-morbid disorders that are often associated with ADHD, such as oppositional defiance disorder (ODD), conduct disorder (CD), depression, and anxiety will be discussed. Research will also reveal challenges children face with academics, peers, teachers, and family.

In addition, this paper will describe the three subtypes of ADHD and their degrees of symptom severity, along with the role that genetics and environmental factors contribute to the life of the ADHD child. The rate and predictors of divorce and conflict among parents of youth with ADHD will be presented. Gaining popularity is complementary and alternative medicines (CAM). These options, as well as an integrative multi-modal treatment including other interventions such as medication will be addressed.

Since children with ADHD have significant struggles with organization, and working memory especially in the academic arena, this paper will address these challenges and strategies to implement at home and in the classroom for greater academic success.

**Neurological and Executive Functioning**

Attention deficit-hyperactivity disorder (ADHD) is clinically depicted as a disorder of attention with difficulties in impulse control and hyperactivity. ADHD is characterized by an early onset of developmentally abnormal and impairing levels of
inattention and/or hyperactivity-impulsivity (Castel et al., 2010). It produces impairments for daily adaptive functioning, and is persistent over time. Research suggests that up to 80% of children diagnosed with ADHD will continue to meet clinical diagnostic criteria in adolescence. Up to 67% will have continued symptoms to a significant degree into adulthood (Murphy et al., 2001).

Moreover, ADHD is associated with neuropsychological deficits. According to Castel et al., it affects such areas as cognitive flexibility, problem solving, and working memory (WM). Working memory involves active maintenance and manipulation of information, and is governed by executive control processes (2010). In 2010, a research study conducted by Huang-Pollock & Karalunas tested WM on a control group of children with ADHD. The study examined the relationship between the process of cognitive skills under differential WM between alphabet math and finger math. As hypothesizes, WM of the “to-be-learned task” affected the ability of the children with ADHD to develop automaticity for complex cognitive skills. ADHD related impairments in the development automaticity for complex cognitive skills, were also found for alphabet arithmetic, but not in finger math (2010).

Other researchers, Castel et al., examined how children with and without ADHD performed on incentive-based selectivity memory tasks. The results suggested that overall memory capacity and the ability to selectivity encode high-value items are empirically distinct. Even though all children recalled more high-value items than low-value items and showed improvement in selectivity with practice, children with ADHD-combined type (ADHD-C) did not efficiently maximize memory performance compared to those with ADHD-inattentive type (ADHD-I). This research suggests a specific deficit
in the strategies and efficient encoding and recall of high-value items for the ADHD-C group (2010).

Additional neurological deficits in working memory include difficulties in planning, forethought, and self-directed private speech. Those cognitive deficits are associated with the concept of executive function involving self-regulation and future directed behaviors. A study by Murphy et al. discovered corroborative evidence for a recent theory of ADHD that predicts widespread deficits across the major domains of EF in this disorder. Problems in five domains of EF were noted in the young adults with ADHD, such as response inhibition, poor sustained attention, interference control, and two realms of working memory, verbal and nonverbal (2001).

Since the prefrontal cortex (pfc) occupies the front one third of the brain, it is the most evolved part of the brain where functioning takes place. It supervises or governs the focus of behavior, while directing the brain (Amen, 1998). The ability to communicate and plan ahead is heavily influenced by this section of the brain. Children with ADHD have deficits in this area of the brain, causing such symptoms as short attention span, lack of perseverance, impulse control, hyperactivity, chronic lateness, disorganization, procrastination, and unavailability of emotions, in addition to symptoms of misperceptions, poor judgment, trouble learning from experience, short term memory problems, social and test anxiety.

The capacity to formulate goals, plan ahead, and communication skills are greatly influenced by this section of the brain (Amen, 1998). The pfc helps you think about what your going to say before saying it. For example, when a disagreement occurs with an
employer and pfc is good, a thoughtful response is generally made. If deficits exist in the pfc, chances are higher something would be said making the situation worse.

In addition, pfc is used for problem solving and being able to decide which decisions are best for the current situation. The pfc helps people learn from their mistakes. It does not prevent mistakes from happening; rather, it helps keep people from making the same mistake over and over again.

According to Brokaw (2004), signs of pfc deficits affect the following areas for adolescents:

- Chronic Underachiever
- Often Distracted by External or Internal (Overactive Mind)
- Very Forgetful
- Difficulty Getting Anything Organized
- Impatience and Low Tolerance for Frustration
- Inability to Conceptualize Time
- Restless or Hyperactive
- Sudden Mood Swings
- Inability to Recognize Impact on Others
- Chronic Procrastinator
- Tendency to Worry
- Tendency toward Addictive Behavior
- Poor Problem Solving and Doesn’t Ask for Help
- Lives in the Moment with No Concern for Past or Future (Spontaneous)
- Difficulty Getting Started and Staying to Completion
Easily Bored

In an empirical research study by Murphy et al. (2001) compared EF and olfactory identification in young adults with and without ADHD. The ADHD group performed significantly worse on 11 measures. These findings reveal further evidence for a recent theory that ADHD has widespread deficits across major domains of EF. Contrary to their hypothesis, these EF deficits did not appear to be a function of ADHD subtypes. Comparisons between the combined-hyperactive and predominately inattentive types in this study were not significant for any measure.

Children with ADHD can have sensory process difficulties (SPD). Researchers Engel-Yeger & Ziv-On (2011) believes sensory processing impairment can occur in some or all sensory systems. This can be expressed by extreme behaviors to sensory stimuli, ranging from over-responsively to under-responsively and behavior sensory seeking. They found individuals with over-responsively sensory issues tend to respond to sensation faster, with more intensity for longer periods of time than those with typical sensory responsiveness. Children with ADHD who are sensory seekers crave an unusual amount of sensory impute. They engage in actions that add more intense sensation to their bodies. This can have a great impact on social interactions with peers.

Therefore, with all the challenges and complex behavioral, sensory, and EF issues, the following section addresses some of the specific clinical challenges associated with ADHD diagnostic assessment procedures.

Subtypes of ADHD

According to the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2000) some impairment must be present in at least
two settings, such as at home and in school. There must be clear evidence of interference with social, academic, and school functioning. Some impairment must have been present before the age of 7.

ADHD diagnoses are assigned depending on the degree of two underlying symptoms of inattention and hyperactivity according to the American Psychiatric Association (American Psychiatric Association, 1994). The three subtype diagnoses include the following: Predominantly Inattentive Type (ADHD-I), Predominantly Hyperactivity-Impulsive Type (ADHD-H), and Combined Type (ADHD-C). All three subtypes can occur in a mild, moderate, or severe form. Children who experience more intense and frequent symptoms of ADHD with co-morbid disorders (CD) have higher levels of maternal depression, and dysfunction in the family environment.

ADHD-I subtype includes inattentiveness in academics, social, and family relationships. Children with this disorder may fail to pay close attention to details and make careless mistakes in their work and tasks. Often, their work is messy and incomplete without considered thought. They often appear to have their minds elsewhere, making it difficult to pay attention or sustain attention. It is difficult to persist with a task until completion. There can be frequent shifts from one uncompleted task to another. Organizing, especially tasks that require sustained mental effort, often requires additional help (American Psychiatric Association, 2000).

ADHD-H, predominately hyperactive and impulsive tendencies include displays of getting upset easily, being overly active, upsetting easily, over-reacting, difficulty waiting or taking turns, and having issues of regulating behavior with poor impulse
control. These impulsive actions often lead to social conflicts at home, school, and in social settings.

The combined subtype ADHD-C has both inattentive and hyperactive-impulse symptoms (APA, 2000). ADHD-C has symptoms from ADHD-I and ADHD-H. A child with ADHD-C subtype also needs to experience six or more persistent symptoms of inattention and six or more symptoms of hyperactivity-impulsivity for at least six months (American Psychiatric Association, 2000).

A study by Harrington and Waldman (2010) proposed that substantial heterogeneity appears to exist within the DSM-IV-defined subtypes. This has led some researchers to propose that ADHD-I and ADHD-C are best characterized as “distinct and unrelated disorders” within the subgroups. This particular study aimed to identify more homogeneous subgroups within ADHD-I, using parent reports of cluster symptoms. These symptoms include forgetfulness, daydreaming, and sluggishness/drowsiness. In addition, there does not appear to be replicable differences between the ADHD-I and ADHD-C on neuropsychological and cognitive tasks.

It is important for children to be assessed early in childhood. If they are not diagnosed and do not receive proper care and treatment, they could be at high risk for developing other psychological, behavioral, or emotional problems. Diagnostic assessment of ADHD can be a long and complex project. Clinicians are required to collect as much information as possible from various sources to make an accurate diagnosis under the recommended diagnostic guidelines.

The most common coexisting conditions to develop are Oppositional Defiant Disorder (ODD), Learning Disorder (LD), Conduct Disorder (CD), Depression, Anxiety
Disorder, and Substance Use Disorder (SUD). Therefore, co-morbid disorders along with ADHD can lead to increased marital difficulties, social maladjustment, and occupational issues.

**Co-morbid Disorders**

Coexisting conditions that receive the most attention in studies for these children are Conduct Disorder (CD) and Oppositional Defiant Disorder (ODD). The Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2000) defines CD as a persistent pattern of behavior that violates the basic rights of others or major age-appropriate societal norms or rules. ODD is defined as, a persistent pattern of negativistic, hostile, and defiant behavior.

As well as exhibiting core symptoms of inattention, hyperactivity and impulsivity, children with ADHD often experience co-morbid problems. Between 30-50% of children have oppositional defiant disorder (ODD), and/or conduct disorder (CD) (Biederman et al., 1991. There is also a co-occurrence of anxiety in 20-30% of cases, and bipolar disorder between 11 and 22% according to Biederman (1998). Between twenty to thirty per cent have a learning disorder such as spelling, reading, arithmetic, and writing. To minimize these problems, Brokaw (2004) believes it is crucial that “Parents should educate themselves about ADHD and advocate for the child to get all the help they need to deal with this disability” (p. 14). Early diagnosis of this disorder may ward off some of these disorders, or lessen their affects.

Brokaw (2004) reports that when advocating for your children the following questions are important to ask:

- Is this problem due to a disability?
- Has the child been able to do this on a consistent basis over time?
- Is there a skill that needs to be taught to do what is asked?
- Is there something the child can do that results in a change in behavior?
- If none of the above, what is the goal for this behavior and how can the child achieve that goal in a more useful way?
- What rule or choices need to be established and what will be the consequence?

Caregivers, teachers, and parents need to be alerted to other conditions that can accompany ADHD and may pose a more serious challenge with an additional set of symptoms similar but different from ADHD. Empirical data shows children with ADHD and co-morbidity could affect parents differently according to Pfiffner & McBurnett (2006). Different parenting skills and psycho education might be needed. Children with ADHD and co-morbidity have a poorer prognosis than children without ADHD. In addition, as many as one-quarter to one-half of ADHD cases also meet criteria for one or more co-morbidity anxiety and depressive disorders.

Another co-existing condition is CD. According to the DSM-TR-IV, CD is linked with Mood Disorders, Somatoform Disorders, and Substance Disorders (American Psychiatric Association, 2000). In 2009, a group of empirical investigators, Barnett et al., examined the relationship between co-morbid ODD and CD on symptom levels in ADHD and the relationship between neurological impairment and ADHD symptom severity. Finding revealed that there were no differences in neurocognitive function between children with ADHD and without ODD or CD.
A study conducted by Murphy et al. (2002) found that adults with ADHD-C type with ODD “were more likely to be arrested, had more interpersonal hostility and paranoia, and received more group therapy than those who had ADHD-I type or control groups” (p. 215). The EF deficits did not appear to be a consequence of co-morbidity with other disorders. The low frequency of CD in both the ADHD control groups means that this condition was not likely to account for group differences in EF. According to Murphy et al. (2001), “These findings lend confidence to an earlier study showing that EF deficits are most likely a result of ADHD and not common co-morbid disorders such as ODD, CD, and major depressive disorder (MDD)” (p. 217).

Researchers, Fischer, Barkley, Smallish, & Fletcher, (2002) revealed their discovery that the presence of childhood conduct problems is significantly associated with the development of passive-aggressive, borderline, and antisocial personality disorders, even after the severity of childhood ADHD was controlled.

According to Fergusson, Boden, & Hornwood (2010) “a second issue concerns the extent to which symptoms of CD, ODD, and ADHD predict future developmental outcomes, including crimes, mental health disorders, substance abuse, relationship and parenthood difficulties, and educational achievement and related outcomes, when due allowance is made for the comorbidity of these disorders and potentially confounding factors that may be associated with the disorder and later outcomes” (p. 701). Further long-term studies are needed for CD, ODD, and ADHD in terms of a wide range of outcomes.

In this study, Fergusson et al., (2010) also found an increase in severity of these disorders when related to increased risks of adverse outcomes. Clear evidence for
discriminate validity of CD, ODD, and ADHD had a distinct pattern of longer term consequences. CD was associated with “pervasive increases in psychosocial, educational, and economic outcomes” (p. 701). The affects of ADHD were confined to educational and related outcomes. The adverse outcomes of ODD were confined to increased risks of later crime and elevated risks of internalizing problems.

**Genetics**

This section of the paper incorporates genetic empirical research with recent findings in regard to ADHD and heritability. Various molecular genetic studies have been predominately focused on dopamine genes, including dopamine receptor and transporter genes. Deficient response inhibition may be a core aspect of an executive function deficit in ADHD, and cognitive dysfunction is likely to be influenced by genetic factors (Slaats-Willemse, Swaab-Barneveld, Sonneveld, & Buitelaar, 2007).

Genetic predispositions, heredity, or neurobiological factors are largely responsible for producing ADHD. ADHD has a high probability of hereditary transmission. Barkley (1990) reports approximately 15% to 20% of the mothers and 20% to 30% of fathers of children with ADHD, also have ADHD.

Twin studies have shown that individual differences in ADHD are largely due to genetic influence. Faraone (2004) and Biederman (2005) reviewed numerous studies of ADHD and have reported high heritability in the aetiology of ADHD. High heritability estimates for ADHD implies a large genetic contribution and a lower level of measurement error, which is a major contribution to environmental influences. Some identified environmental effects on ADHD such as maternal drinking or smoking during
pregnancy are by definition common to both members of a twin pair born to such a mother (Levy, Hay, & Bennett, 2006).

In genetic studies of ADHD the most replicated molecular genetic findings relate to the dopamine system. According to Levy et al. (2006) “So far a number of candidate dopamine genes—the dopamine transporter (DAT1), dopamine receptor D4 (DRD4), and dopamine receptor D5 (DRD5)—have been investigated for association with ADHD” (p. 12). The human DRD4 is one of the most variable genes.

In study by Neuman, Heath, Reich, Maddemm & Sun (2001) LCA was used to assess the role of genetic influences overlapping between ADHD, ODD, separation anxiety, and depression in a sample of 2,904 adolescent female twins. LCA analysis revealed three different categories of ADHD and an inattentive subtype without comorbidity, a second inattentive subtype with increased number of ODD symptoms, and a combined inattentive/hyperactivity impulsive type with elevated levels of ODD, a second ODD class co-occurring with increased separation anxiety and depression, and a pure depression group. The pattern of latent classes was thought to be consistent with a genetic hypothesis for ADHD. Each one of the above classes potentially reflected a unique genetic subtype.

ADHD rarely occurs by itself. Therefore, understanding what tends to be comorbid with ADHD (Levy et al., 2006), and why such comorbidity might occur becomes important in future research. In a twin study by Thapar, Hervas, & McGuffin (1995) examined 2,082 twin pairs found that the overlap of conduct problems and ADHD was explained by common genetic and non-shared environmental factors. Findings greatly overlapped in the genetic and environmental influences on ADHD, Conduct
Disorder (CD), and Oppositional Defiant Disorder (ODD). There are indications of shared aetiological factors for disruptive behaviour syndromes (Levy et al., 2006).

Deficient response inhibition is widely viewed as a core cognitive deficit in ADHD. In a study by Slaats-Willemse et al. (2007) examined whether attentional control and mental flexibility, which are two important aspects of executive functioning, are potential endophenotypes of ADHD. This study hypothesized that siblings of ADHD probands although not behaviorally expressing the disorder, have ADHD-associated deficits in areas of attentional control and mental flexibility.

The results supported the hypothesis that the unaffected siblings did not differ from their ADHD sibling in regards to fluctuation in tempo on a continuous performance task, but did differ significantly from the control group on this measure. The significant trend of measure across the groups did reflect an intermediate position of the unaffected siblings between ADHD proband and control participants. No group differences were found in mental flexibility, the results were equivocal (Slaats-Willemse et al., 2007).

According to Slaats-Willemse et al. (2007) “Our findings are consistent with problems in attentional control in many, but not all unaffected siblings” (p. 757). It was determined that some unaffected siblings may carry the genes for the condition. However, it is also possible that all the unaffected siblings might carry the genes coding for ADHD related problems in attentional control, but that the effects of these genes are too subtle to allow their consistent detection.

More interdisciplinary research is needed to provide insight into the relationship between persistent deficits in attentional control, the deficient frontocerebellar and frontostriatal circuits, and the candidate gene found for ADHD. Cognitive research
should also focus and the relationship of attentional control to other areas of executive function.

Family Dynamics

Since ADHD is highly genetic, raising children with ADHD can be particularly challenging for parents. Equally challenging is the prevalence of marital conflict among families of children with ADHD. Parents of children with ADHD report less marital satisfaction and more negative verbalizations during the years of child-rearing, than do parents of children without an ADHD child (Wymbs, et al., 2008). This study highlights the links between severity of child behavior and interparental discord reporting greater discord among parents of youths with ADHD and co-morbid disorders such as oppositional-defiant disorder (ODD), and conduct disorder (CD) among parents of youths with ADHD alone.

The prevalence and severity of conflict between parents of children having ADHD are concerning. Given data suggesting specific conflict resolutions predict later divorce, in finding by Wymbs, et al., (2008). Couples observed revealed elevated levels of maladaptive problem-solving methods stand a higher chance of divorce. Parents of youth’s diagnosis with ADHD in childhood were more likely to divorce by the time their children were 8 years of age (22.7%) than were parents of youths without ADHD (12%).

Science has repeatedly shown that children play a significant role in shaping the behavior of their parents. Child effects on negative parenting behavior is a well-established phenomena. In a recent study by Wymbs (2011) found that disruptive child behavior causes discordant interparental communication, by testing whether parent affect and parenting behavior mediate child effects on interpersonal communications. Parents
rated their own affect, as well as the quality of their partners parenting and communication, after an interaction.

According to Wymbs (2011) “Research indicates that parent affect is both sensitive to child behavior and predictive of relationship difficulties” (p. 875). Parents interacting with the disruptive child reported higher levels of anxiety, depression, and hostility compared to parents that interacted with a nondisruptive child. The severity of conduct problems exhibited by their children increased the propensity of divorce.

Another proximal parent risk factor, particularly relevant for parents of children with externalizing disorders, is anti-social behavior. Evidence supports a hereditary link between parental antisocial personality disorder and child ADHD/ODD/CD (Wymbs et al., 2008). Such a link may represent a distal variable contributing to the risk of divorce in these families. “Antisocial adults exhibit harmful interpersonal behaviors such as aggression, which is a reliable predictor of divorce in potential findings” (p. 763). There is need for future research examining roles that parental antisociality may play in escalating divorce among families of children with ADHD.

Burke et al. (2008) conducted empirical research to examine the reciprocal relationship between parenting and child behavior over time, especially in terms of clinical manifestations of disruptive behavior. The study revealed how challenging it is for parents to consistently maintain effective child rearing practices when dealing with an ADHD child. Parents dealing with the difficult behaviors over a period of time may experience frequent burn out, anger frustrations, hopelessness, or helplessness. This could lead to martial discord, parental separation, or divorce.
In fact, prolonged exposure to negative parent-child relationships may exacerbate ADHD symptoms and place parents at an even greater risk of developing parental psychopathology including maternal depression, anxiety disorder, paternal antisocial personality disorder (APD), or substance abuse disorder (SUD), than for parents of children without ADHD.

Drabick, Gadow and Loney (2008) report, “Children who are oppositional and/or avoidant may be more challenging for parents, who may lead to critical and inconsistent parenting behaviors. Over time, these negative interactions between the parent and child may increase the child’s oppositional behaviors, which could lead to higher levels of parental inconsistencies and negative emotions, plus elicit a negative pattern of parenting behavior.

A significant amount of experimental research shows that family context may be exacerbated both by the ADHD symptoms, and the associated behaviors. On the other hand, the impact of children’s behaviors on parents’ stress levels is only beginning to be examined. Findings by Wymbs (2011) revealed that “parents who interacted with the disruptive child reported lower positive affect and higher negative affect than parents who interacted with a typical non-ADHD child” (p. 873).

Research further indicates that parent affect is both sensitive to child behavior and predictive of relationship difficulties (Wymbs, 2011). Parents interacting with the disruptive child reported higher levels of anxiety, depression, and hostility compared to parents that interacted with a nondisruptive child. The severity of conduct problems exhibited by their children increased the propensity of divorce.
In fact, prolonged exposure to negative parent-child relationships may exacerbate ADHD symptoms and place parents at an even greater risk of developing parental psychopathology including maternal depression, anxiety disorder, paternal antisocial personality disorder (APD), or substance abuse disorder (SUD) than for parents of children without ADHD.

Drabick, Gadow and Loney (2008) report that “Children who are oppositional and/or avoidant may be more challenging to parents and may lead to critical and inconsistent parenting behaviors” (p. 167). Over time, these negative interactions between the parent and child may increase the child’s oppositional behaviors, which could lead to higher levels of parental inconsistencies and negative emotions and elicit a negative pattern of parenting behavior.

A significant amount of experimental research shows that family context may be exacerbated both by the ADHD symptoms, and the associated behaviors. On the other hand, the impact of the children’s behaviors on parents’ stress levels is only beginning to be explored. The burdens placed on parents as caregivers of children with ADHD, as well as how parents cope with this burden, is of great interest to parent support groups, researchers, and clinicians (Podlski and Nigg, 2001).

Joining an ADHD support group can be an option for parents. Parents of children with ADHD can acquire new coping skills, share their struggles and concerns with other parents in a safe and supportive environment. Parents can exchange feedback and information regarding treatment options and methods, as well as acquiring referrals to qualified specialists or get various perspectives on parenting strategies.
Many families and children with ADHD have found additional relief through medication and alternative and complementary treatment options (CAM). The next section of this paper addresses the prevalence of medication use and how it could be affective in calming relationships in families experiencing ADHD.

**Understanding Medication**

Barkley (2000) reported that “Medication is probably the most widely publicized most hotly debated treatment for ADHD” (p. 269). Hundreds of studies continue to indicate stimulants and certain antidepressants as being significantly helpful. Stimulants have been shown to be effective for improving behavior, developing greater social skills, and higher achievement in academics.

Medication is one of the most important multimodal treatments for ADHD. Since ADHD is a neurobiological disorder with genetic or heritability basis, medication can be significantly effective. Chemical imbalances in the brain impair executive function, deficiencies in emotional self-regulation, and impaired psycho-motor skills, are major characteristic of the ADHD child.

Barkley (2004) believes it is important to ask the physician specific questions before placing a child on medication. Barkley recommends asking the following questions:

- “What are the effects and side effects, both short-term and long-term, of this particular medication?”
- “What doses will be used, and by what schedule should they be given.”
- “How often should you see my child for reevaluation while he (she) is taking medication”
• “Are there foods, beverages, or other substances my child should not consume while taking this medication, because will they interfere with its effects in the body?”

• “If the child accidently takes an overdose of medication, what procedures should I follow?”

• “Do you have a fact sheet about medication that I can have to read?” (p. 271).

A study conducted by Snyder, et al., (2008) compared the nature and magnitude of impairments on separable aspects of EF on children with ADHD. They were tested with and without the use of stimulant medication in areas of nonverbal EF and visuomotor speed. Findings indicate that children with ADHD were slower and made significantly more errors in prepotent response inhibition and the ability to maintain simple rules to complete tasks, when unmedicated.

Further, findings by Biederman & Faraone (2005) conclude that ‘Treatment with stimulant medication will reduce, and often normalizes impairments in ADHD and their association with frontostriatal neurocognitive and behavioral impairments” (p. 237). With regard to cognitive effects from stimulant medication, immediate-release such as methylphenidate improves performance most reliable on inhibitory control, attention/vigilance, and planning/cognitive flexibility tasks (Snyder et al. 2008). Further research is needed to examine the subtypes of response inhibition that could be associated with ADHD, and whether stimulant medication differentially affects the performance in these cognitive areas of the brain.
Epstein et al. (2007) conducted a study to find correlations between medication-related brain activity for children and adults with ADHD. Using brain imaging, the results showed the stimulant medication trial increased activation in the striatum, as well as in cerebellar regions. Increases in activity were displayed in prefrontal regions in youths, but not in adults.

Medication can effectively treat the underlying chemical imbalance in the brain by resorting dopamine and serotonin to the optimal levels. Improving neurotransmitter signals may lead to significantly reduced hyperactivity, and improve focus and concentration levels for these children.

Parents may debate if medication is the right treatment plan. These concerns include the possibility that the medication could be habit forming leading to dependency or addiction, and whether it poses serious and long-term side effects. Parents should have a clear understanding of the purpose, risks, and benefits associated with the treatment of stimulant medication. Parents are strongly encouraged to learn about the potential side effects and weigh them against the benefits before making a decision.

Medication has been suggested to assist with ADHD in maintaining focus and improving behavioral control. Researchers, Semrud-Clikeman et al. (2008) evaluated the effects of children previously on stimulants, which discontinued use for this study. Findings suggest that children who used stimulants in the past showed better executive and academic functioning even when un-medicated, compared to children with ADHD that had never received stimulant medication.

No single treatment method can address all the symptoms of ADHD, or effectively treat all aspects of this disorder. A diagnostic assessment early on requires
health care professionals to pool data from multiple sources under the recommended standard diagnosis guidelines. Clinicians should create an individualized treatment plan reflecting the differences in impairments, since each child is unique (Barkley, 2000).

**Complementary and Alternative Medicines**

However, as effective as stimulant medications are, many parents and health care providers of young children with behavioral or developmental problems such as ADHD and co-morbid disorders, are choosing complementary and alternative treatment options (CAM) as all, or part of the treatment plan for their children with ADHD (Rojas & Chan, 2005). As is often the case, broad arrays of treatment options have been tried and continue to be used, but only a few have been scientifically validated as safe and effective. Cormier & Elder (2007) discover that “Despite their questionable efficacy, the use of complementary and alternative therapies, in particular dietary interventions, has become widespread” (p. 138).

This section of the paper will review complementary treatment options for children with ADHD, and children with behavioral disorders. Other CAM modalities include biofeedback, modified diet, sugar elimination, essential fatty acids, homeopathy, yoga, message, and green outdoor settings.

Rojas & Chan (2005) found that “Biofeedback uses visual and auditory stimuli to provide the subject with information about psychophysiolectric process, which are often outside of their immediate awareness and control” (p. 116). EEG as a treatment for children with ADHD is based upon the initial observation that children with ADHD and learning disabilities (LD) had higher rates of EEG abnormalities compared to control
groups. EEG training seeks to normalize these rhythms and alter hyperactivity, attention, and memory.

Sensorimotor rhythm (SMR) in biofeedback is believed to be important in inhibiting motor activity, theorizing that children with hyperactivity could decrease their muscle tension and become more still with enhanced SMR activity (Rojas & Chan, 2005). One example is a novel EEG biofeedback-based system called Play Attention. It has been gaining attention from both medical professionals and the public. “The goal of this particular system is not so much to change the brain waves but to achieve learning and to form new neural networks” (Rojas & Chan, 2005, p. 117).

This system works on computer-based video games focusing on learning tasks such as attention, auditory processing, social cues, and memory. The program coaches the child through specific tasks, such as maintaining concentration for a period of time. It also relies on cognitive learning theory and operant reinforcement principles to achieve results. During each session the child wears a helmet equipped with sensors that record theta and beta wave activity. These can be purchased for in-home use or found worldwide in training centers.

However, studies conflict as to whether increases or decreases of alpha wave rhythms activity improve alertness in children. Researchers explain, “Although there is a large amount of literature promoting the efficacy of EEG feedback for ADHD, most studies have serious methodological flaws, including small samples sizes, heterogeneous subjects, lack of control or comparison group, limited measurement of behavioral and cognitive outcomes in addition to altered EEG outcomes, and lack longer-term follow-up” (p. 117).
With mounting concern about the efficacy and safety of medications, dietary interventions have become popular. In a randomized controlled trial study by Pelsser et al. (2009) a group of twenty-seven children with ADHD were placed on a restrictive diet for 5 weeks. The diet consisted of rice, turkey, lamb, vegetables, fruits, margarine, vegetable oil, tea, pear juice, and water. All foods were free of preservatives, additives, colors, and sugars. Results revealed that seventy percent of the children showed substantial changes in behavioral improvements of 50% or more according to rating of teachers and parents. “These children no longer met the DSM-IV criteria for ADHD” (p. 17).

The oligoantigenic diet is gaining in popularity. The notion is that hyperactivity in children with ADHD can result from sensitivity to a number of foods that could contribute to food allergies. Several investigators have taken the original Feingold diet, or commonly know as the additive-free diet, generally focuses on children with hyperactivity, and hypothesized that an extended diet on a regimen not only eliminating additives and dyes, but also sugars, diary products, wheat, corn, yeast, soy, citrus, egg, chocolate, and nuts. Rojas & Chan (2005) report “that 14 of the 24 boys demonstrated improved parent Conners Abbreviated Symptom Questionnaire scores after the experimental diet, with 10 of the 14 exhibiting approximately 50% improvement in scores” (p. 121).

According to Brokaw (2004) “Diet will not cure AD/HD since AD/HD is a genetic disorder” (p. 31). Some things can reduce ADHD symptoms while others aggravate them. Diets high in proteins are recommended. Some of the high protein
foods are cheese, nuts meat, fish, poultry, protein drinks, soy, and yogurt. Brokaw recommends having protein at all meals including mid afternoon and bedtime snacks.

In addition, Brokaw (2004) recommends the following:

- A Good Multivitamin/Mineral preferably without dyes or preservatives.
- Elimination of sugar as much as possible if hyperactivity is a problem.
- Elimination of food dyes, preservatives, grain, dairy, salicylates, and corn products if food allergies are a problem.

Allergies to certain types of food can result in behavioral problems, sleep problems, and concentration problems. A good way to test for allergies is to eliminate items from the child’s diet and see if change occurs. Eliminate one food at a time to determine if any of these aggravate the problem. If not, then ADHD might not be the problem.

Sinha & Efron (2005) conducted a CAM study on the possible benefits of a modified diet, vitamins and/or minerals, dietary supplements, aromatherapy, and chiropractic. “Overall, most families who tried CAM modalities, found at least one type to be helpful” (p. 25). Modified diet was the most commonly tried. Conversely, chiropractic therapy was more common and more helpful than first expected in this sample. For families who tried CAM, 50% did so hoping to replace CAM for stimulant medication. Interestingly, over 58% found CAM useful, suggesting motivation for ongoing use. Of the families in this study 64% did report the use of CAM to their pediatricians.

Pervasive among parents and the lay public is also the assumption that refined sugars could have an adverse effect on the behavior of children. A common perception consists that children who eat too much sugar could lead to hyperactive behavior.
However, few studies provide evidence supporting an association between the amount of sugar and hyperactivity. Brokaw (2000) claims it important to “Eliminate sugar as much as possible if your child is hyperactive” (p. 31). Since sugar can increase energy!

Although these diets have been extensively studied, the scientific merit of many of the published studies bears closer scrutiny. These studies show promise as potentially effective treatments for ADHD, the overall body of evidence currently does not support their use as sole therapy for ADHD.

Omega-3 and omega-6 chain polyunsaturated fatty acids (LCPUFAs), are crucial to brain development and function (Germano et al., 2007). Increasing evidence indicates that deficiencies or metabolic imbalances of these fatty acids might be associated with childhood developmental and psychiatric disorder including ADHD. Omega-3 are often lacking in modern diets. “Preliminary evidence suggests that supplementation with omega-3 LCPUFAs, might help manage ADHD which is linked to behavioral and learning difficulties” (p. 6).

Another CAM treatment is classic homeopathy. This treatment emphasizes the highly individualized selection of one remedy to address the totality of a child’s significant symptoms or symptom profiles. These profiles include restlessness, difficulty concentrating, irritability, learning difficulties, hyper-excitability, impulsivity, and social isolation (Rojas & et al., 2005). These treatments seek to stimulate the bodies own defense mechanisms. Despite many case reports of the use of homeopathy in ADHD, only three clinical trials exist. Of these trials “All reported improvements in parent ratings of behavior on both non-standard and standard rating scales” (p. 127).
Yoga can be beneficial in addition with medication. According to a controlled trial of 14 boys with ADHD who were stabilized with medication, demonstrated improvements in some parent Conners subscale (Rojas, et al., 2005). These subscales include hyperactive/impulsive and perfectionism. “Yoga participants significantly improved their parent rated Oppositional, ADHD Index, and Global Index Restless/Impulsive subscale scores” (p. 127). More rigorous studies are needed to convincingly demonstrate yoga’s efficacy as a treatment alternative to standard therapies for ADHD. These results suggest that yoga may have a role as an adjunct to conventional ADHD treatments.

Rojas & Chan (2005) explain that “Massage has surged in popularity as a way to promote relaxation and well being in the lay press as well as in the medical literature” (p. 127). Massage has been found to help children with ADHD relax by reducing their muscle tension. In two published clinical trials using massage in ADHD with 28 clients who were emotionally disturbed ADHD male adolescents, were treated with 10 days of massage reported improved mood levels and were rated as less fidgety after the treatment sessions, compared to those treated with relaxation therapy. After two weeks of treatment, teachers reported less classroom hyperactivity in the massage group, compared with the relaxation group. Although promising, the results are preliminary and the sample size was small.

Although school-based environmental therapies such as classroom accommodation and preferential seating are commonly used as part of an ADHD treatment plan, very few other environmental therapies have been considered for or studies. A recent controversial study examined the impact of green outdoor settings on
children with ADHD. The rationale of green outdoor spaces as a potential treatment for ADHD is based on the environmental psychology literature demonstrating evidence of enhanced attention after exposure to natural environments in non-ADHD populations. Rojas et al. (2005) describes “The body of research speculates that the attention fatigue caused by prolonged focus on a task or activity may have the same underlying neuronal mechanisms based in the right prefrontal cortex as ADHD” (p. 128).

According to Rojas et al. (2005), “It may be beneficial to the provider-patient relationship to consider CAM as part of an overall ADHD treatment plan if the family is interested in pursuing these therapies and both parties are willing to work closely together to systematically evaluate each therapy’s effects, side effects, and potential interactions” (p. 128). Some therapeutic modalities, such as the oligoallergenic diet, fatty acid supplementation, and some herbal remedies may have side effects or interactions that require close monitoring.

Others, such as yoga and activities in the outdoor green spaces, are likely to extended general physical and emotional well being without serious side affects or interactions that need monitoring. These can be recommended as adjuncts to standard ADHD treatment regiments. According to Rojas et al., (2005) “Although several of the controversial therapies reviewed in this article show some promise as potentially effective treatments for ADHD, we believe that the overall body of evidence currently does not support their use as sole therapy for ADHD” (p. 128).

In addition, responsive parents pay close attention to the current needs of the child anticipating their child’s energy level. For example, finding a positive and practical outlet for children with ADHD can make a significant difference in their physical and
psychosocial well being. Parents can improve ADHD symptoms in children by spending time together outside in a physical activity such as basketball, bicycling, playing Frisbees, or letting the child play on the playground.

It is important to create opportunities for children with ADHD. This can lead to finding new friends with similar interests, or finding a mentor or role model. Participating in sports such as swimming, hockey, gymnastics, basketball, football, and martial arts can teach self-discipline, self-control; improve self-esteem, cooperation and respect for others. Parents, who are realistic, resourceful, supportive and encouraging with their ADHD children, can open doors of opportunity.

No single treatment method can successfully address all the needs. Therefore, it is important to have a diagnostic assessment from health care professionals to collect all data from multiple sources under the recommended standard diagnostic guidelines assuring to make an accurate diagnosis. The treatment process must also involve a high level of coordinated clinical efforts and the above approaches in a multimodal intervention strategy.

Clinicians, teachers, and parents should carefully create an individualized treatment plan with goals that reflect the individual and the family in regards to socioeconomics, commitment, impairments, abilities, and disabilities varying within each unique child. Academics are a large part of the child’s psychosocial development. It is critical that teachers, parents, and the child work together to create an academic plan. Therefore, the next section of this paper looks into why children with ADHD fall behind academically, and strategic skills for greater academic success.
Academics

Children with ADHD are at significant risks for poor multiple outcomes, with academic underachievement being one of the more prominent areas of concern for parents and teachers. According to Huang-Pollack et al. (2010), “By adolescence, approximately 30% of children with ADHD (vs. 10% of non-ADHD children) have failed a grade, over half (56%) have received some form of academic tutoring and, as suggested by adult outcome studies, children with ADHD tend to complete less schooling (with a 30% high school drop out rate) and have a lower occupational and socioeconomic status that do their non-ADHD counterparts” (p. 175).

To complicate these facts further, more than half of all children with ADHD also have serious problems with oppositional behaviors (Barkley, 2000). These statistics help explain why between 15% and 25% of these children will be suspended or even expelled from school due to conduct problems. Therefore, the fact remains that “the single most important part of the child’s success at school, are teachers” (p. 227). However, teachers are generally not fully informed about the affects of ADHD and the abnormalities in the brain. Parents must take an active role informing teachers of their child’s learning deficits.

As well as exhibiting core symptoms, individuals with ADHD often experience other co-morbid problems: 30-50% of ADHD children also experience oppositional defiant disorder (ODD), and/or conduct disorder (CD). There is a co-occurrence of anxiety in 20-30% of cases, and bipolar disorder in between 11 and 22%. Twenty to thirty per cent of children with ADHD have an associated learning disorder of reading, spelling, writing and arithmetic (Biederman et al., 1991). Neuro-imaging studies of
children with ADHD have shown a decreased size of the prefrontal cortex (Hill, et al. 2002).

Therefore, there are expected deficits in areas of the prefrontal executive functions, such as response inhibition and working memory (Barkley, 1997). Research into underlying neuropsychological deficits of ADHD generally falls into one of two areas: that ADHD is a disorder of dysregulation of thought and action associated with poor inhibitory control (Schachar, Mota, Logan Tannock & Kim, 2000), and that ADHD is a manifestation of a motivational style associated with altered reward mechanisms (Sonuga-Barke, Williams, Hall, & Saxton, 1996).

In a study conducted by Saolanta, Abikoff, Sonuga, Schachas, Logan, Wigal, Hechtman, Hinshar & Turkel (2001), these opposing accounts of ADHD were measured against each other, with a theoretical camp selecting what they viewed as the best. It was concluded that they are independent coexisting characteristics of ADHD measurement of theoretical construct. The results revealed that the constructs were not correlated but, when combined, were both highly diagnostic of ADHD cases (Sonuga-Barke, 2002).

The interaction of core ADHD symptoms with co-morbid problems and neuropsychological deficits suggests that individuals with this disorder experience problems in most academic setting. One cannot expect a child with ADHD to operate successfully in academic environments if they are inattentive, disruptive, and aggressive, or having difficulty with working memory, planning and organization.

Structural abnormalities and/or reduced activity in the prefrontal cortex (pfc), cortices, caudate, and cerebellum, have been found and are believed to result in the EF weaknesses observed in substantial portions of children with ADHD. The ability for
these children to learn is a complex set of explicit rules, such as those needed to master basic academic concepts (Huang-Pollock et al., 2010). It is dependent on the health and development of neuroanatomical structures to represent such rules. The ability for these children to learn is related intimately and neuroanatomically to EF. Therefore, the presence of EF weakness is one likely explanation for the persistence of academic difficulties.

Castel et al. (2010) discovered that “children with ADHD-C exhibit impairments in the strategic and efficient coding and recall of high-value items” (p. 179). These findings have implications linking theories of memory dysfunction in childhood ADHD. Additional impairments of poor memory performance or self-regulatory processes may be implicated in the memory of children with ADHD, making memory recall difficult in school settings.

A recent meta-analysis shows that children with this disorder have specific deficits in working memory (WM), which has shown to be more pronounced in spatial WM tasks than in verbal WM tasks (Martinussen et al., 2005). Further, research by Halperin et al. (2008) found neuropsychological deficits, including problems with WM, partially mediates the persistence of ADHD over time, as well as the degree of impairment associated with ADHD.

Pre-school years are a key time of the child’s development, where the building blocks for later success are laid, and where social, academic and behavioral skills are necessary for academic and social development. However, a majority of pre-school children’s readiness are compromised. Some children encounter difficulties with impulse control, attentional capacity and hyperactivity. These difficulties hinder their ability to
acquire crucial skills such as focusing on teachers, interacting with peers and authority figures, and learning emergent literacy, mathematics, and language (Daley & Birchwood, 2009).

ADHD has been identified in 2% of pre-school age children (Lavigne, Gibbons, Christoffel, Arend, Rosenbaum, Binns, Dawsons, Sobel, & Issacs, 1996). Research regarding pre-schoolers has looked at ADHD’s impact on school readiness. In studies comparing individuals with ADHD and control groups, ADHD pre-schoolers have been shown to experience problems with memory, reasoning, academic skills, cognitive ability, conceptual development, and difficulty acquiring basic pre-reading and mathematic skills (Mariani & Barkley, 1997).

In a longitudinal study by McGee, Partridge, Williams, & Silva (1991) followed a group of pre-schoolers with hyperactivity through adolescence. Findings reveal children with hyperactivity had poorer reading abilities than controls at age 7 and 9. By the age of 15 the hyperactive children continued to be behind the control groups in reading performance. Rabiner & Cole, (2000) studied ADHD symptoms and reading achievement in 387 pre-school children. Findings indicate that intentional and hyperactivity was negatively associated with reading achievement, with the strongest correlation with inattention. Moreover, findings suggest that pre-school inattention was associated with poor long-term reading achievement. This was studied up to 5 years after baseline, where 34% of inattentive pre-schoolers were reading-impaired.

However, not all children with ADHD who showed early signs of ADHD go on to express the full disorder and experience academic impairments. Sonuga-Barke, Auerbach, Campbell, Daley, & Thompson (2005) purposed that pre-school aged children
who display significant early signs of ADHD, but are exposed to proactive, firm limit-setting as home and an appropriately structured classroom might be able to limit the downward spiral into long-term expressions of the disorder, and poor school achievement.

For adolescence, less empirical studies regarding academic performance have been completed, in comparison to their younger counterparts. However, research reveals that adolescents with ADHD are also likely to struggle at school (Barkley, Anastopoulos, Guevermont & Fletcher, 1991). Evidence for adolescent academic impairment has also come from longitudinal studies that follow ADHD individuals from pre-school and into adolescents. McGee, Prior, Williams, Smart, & Sanson (1991) found that 15-year-old adolescents who were diagnosed as hyperactive as pre-schoolers displayed less reading ability than controls, and were more likely to be reading disabled than the controls.

Childhood hyperactivity has been shown to predict adolescent behavioral problems such as conduct disorder, juvenile delinquency and substance abuse, which tend to culminate leaving school with no qualifications for the future (McGee et al., 2000). Therefore, university prospects seem unreachable. However, a small amount of literature suggests that a few individuals with ADHD manage to cope with their symptoms and continue to the university level. Some research does suggest that these individuals have not found themselves at an academic disadvantage when attending a university (Sparks, Thompson, Abikoff, Kline, & Brotman, 2006).

However, due to their unique learning style, neurological deficits, and various difficulties in learning can make academic life challenging. Their deficits fall into a range
of mild to severe in intensity. Many of these children will need additional help for improved academics.

Brokaw (2004) describes the following classroom problems children with ADHD face:

- Difficulty Paying Attention
- Very Disorganized
- Forgetful…Does Not Remember All Instructions
- Easily Frustrated and Overwhelmed
- Difficulty With Problem Solving…Gives Up And Doesn’t seek help
- Impulsive…Verbally And/Or Physically
- Slow Getting Started On Assignments Or Projects…Can Not Break Down The Task
- Does Not Listen To Instruction, Read Directions Or Follow Them
- Inability To Plan Out Work In A Timely Fashion, Resulting In Work That Is Incomplete, Messy, Or Not Turned In
- Poor Short Term Memory
- Takes Twice As Long To Complete Work
- Loses Things A Lot
- Easily Bored
- Underachiever…Does not Work Up To Ability
- May Have Difficulty With Self-Control And/Or Social Problems
- Has Good Days And Bad Days
- May Act Immature For Age
- Overactive Or Daydreamer/Spaces Out (p. 10)
However, children with ADHD who do have support, encouragement or help from parents, teachers, and clinicians are likely to experience more severe and frequent feelings of negative symptoms. More important, are the children who do not receive an early behavioral intervention become more likely to continue to have negative symptoms into adolescence and later into adulthood ultimately leading to negative outcomes such as low self-esteem.

Therefore, for better academic success, interventions for children with ADHD should focus on EF deficits such as working memory, planning and response inhibition, and inattentive symptoms. Recent research has found that training the ADHD child’s working memory skills improved response inhibition, reasoning and parent-rated inattentive symptoms (Daily et al., 2009).

With all of the complications of this disorder, can children with ADHD be helped in the area of academics? According to a literature review by Daley & Birchwood, (2009) there are academic interventions that may help move these children toward greater academic success.

For children with ADHD being placed in large classes, with a lack of one-on-one instruction are likely to increase ADHD academic difficulties. Peer tutoring is a strategy where an ADHD individual is paired with another non-ADHD peer to work in specific areas of academics. This provides one-on-one instruction and assistance for the ADHD child’s own individual pace. Research has shown that peer tutoring improves classroom behavior and academic performance (DuPaul, Ervin, Hook, & McGoey, 1998).

Research into peer tutoring has also been extended to parent tutors (Hook & DuPaul, 1999). Parents were asked to tutor their child with ADHD on oral reading tasks,
with one-on-one instruction, feedback, and active responding. It was concluded that reading performance increased at home and in school. While research into peer tutoring and ADHD has been limited, the results have been encouraging.

Another academic intervention is task/instructional modification. This involves manipulations including reducing task length, dividing tasks into smaller sub-units, explicit instructions, and modifying the delivery of instruction according to the child’s learning style (Raggi & Chronis, 2006). Unfortunately, research has focused only on single cases. Therefore, external validity comes into question. However, the results so far have been promising. Studies evaluating Computer Assisted Instruction (CAI) have demonstrated an improvement in mathematics performance is both special education setting and general education classrooms (Dailey et al., 2009).

Classroom functional assessment procedures is an intervention that is specific to the child based on the identification and manipulation of environmental variables that initiate, maintain and/or increase the child’s problematic behavior in a particular setting (Daily, et al., 2009). This approach is used to increase on-task behaviors and reduce disruptive behaviors in the ADHD child. One example is having the ADHD child use a specific area in the classroom which he/she can study without distractions from the environment, peers, and classroom activity. As of yet this procedure has not been studied in terms of academic productivity.

Self-monitoring is another intervention. This involves setting goals for classroom completion and accuracy, monitoring goals, and administering rewards based on successful completion. Research suggests that these strategies help improve academic performance for ADHD children, especial older children and adolescents. It is important
for parents and teachers to be actively involved setting and evaluating goals. Findings were especially promising when used in combination with stimulant medication (Raggi et al., 2006).

The next intervention involves strategy training. This teaches children a specific skill they can implement in an academic situation to improve performance (Evans, Pelham, & Grudberg, 1995). This method has received little attention. However, research suggests that it could be a useful tool for ADHD individuals, where children and adolescents learn useful skills to improve academic performance, while taking responsibility off parents and teachers (Raggi, 2006). For example, using a weekly planner to keep track of assignments and projects is a skill parents and teachers can implement to help keep the ADHD child organized. Parents need to learn these skills in order to teach their child (Brokaw, 2000).

Homework-focused problem solving technique is another intervention. Time spent on homework is the best predictor of student grades and achievement (Cooper, Lindsay, Nye, & Greathouse, 1998). Children and adolescents with ADHD experience problems with planning, prioritizing, focusing on individual tasks, filtering out distraction, forgetfulness and a lack of organization. Therefore, teaching parents homework strategies based on these problems may be beneficial to ADHD individuals (Raggi et al., 2006).

However, research suggests that parent-based strategies should not be the only method used (Daley, et al., 2009). A significant minority of children with ADHD will have a parent with ADHD or presenting with ADHD symptoms (Faraone & Biederman,
1997). These high levels of maternal ADHD can reduce the effectiveness of parent training intervention.

A dual-pathway model of ADHD could also prove useful. This intervention is designed to improve ADHD individual’s in-class focus, therefore improving academic performance (Sonuga-Barke, 2002). For example, ADHD children with delay-aversion could be given distractor object, such as a stress ball to fidget with during class. This can distract them from the passing of time and reduce delay aversion.

In addition to the interventions listed, Brokaw (2000) suggests a six step method to problem solving skills for children with ADHD. The first step is to define the problem. “Think about whether this is the real problem or whether there is another problem that resulted in this problem, write down exactly what the problem is, as you see it” (p. 34).

The second step is to list all the possible solutions. Brokaw (2000) suggests that “there should to be a minimum of three, and often eight or more solutions to a problem” (p. 34). Some solutions can have combinations of various solutions. It is important to brainstorm creatively without limitations.

Steps three and four consist of evaluating each possible solution and deciding on the best solution. Brokaw (2000) recommends crossing off the solution that seems least effective and ask if the solution will be possible to carry out, and whether it will be fair when evaluating the solutions. After that, other possible solutions often are discovered. These solutions might need to be modified or changed.

In step five, use the solution. Brokaw (2000) recommends “thinking about how you will implement this solution and how will you accomplish it” (p. 34). Other
questions to ask are how the solution will be carried out, and will you do it if you do not have the cooperation of others?

The final step consists of evaluating the solution. Solutions might not always work as expected. It could be necessary to reconsider and take more time to problem solve. According to Brokaw (2000) “You may wish to return to the list of possible solutions again or you may decide that this solution is working and continue to use it” (p. 34). Some modifications might also be decided to make solutions more effective.

As parents, it is important to help the ADHD child implement these new strategies. It is possible to experience some setbacks or failures. However, parents need to realize that this is just a normal part of the change process. Parents are encouraged to reflect upon the positive changes being made, even when the changes happen over time.

Children with ADHD who do have support, encouragement or help from parents, teachers, and clinicians are likely to experience more severe and frequent feelings of negative symptoms. More important, are the children who do not receive an early behavioral intervention become more likely to continue to have negative symptoms into adolescence and later into adulthood ultimately leading to negative outcomes such as low self-esteem.

Children with ADHD need accommodations in the classroom for better academic success, beginning with encouragement which builds self-esteem. According to Brokaw (2004) “They can go on to be very successful in their talent areas,” (p. 1). To achieve this, it becomes crucial for parents and teachers alike to help the child discover areas of strengths and improve on weaknesses.
Barkley (2000) describes needed changes to the classroom structure and to curriculum that may help build academic success.

1. All academic tasks should be well matched to the ability of the child. Increasing the novelty and interest level of the task through use of increased stimulation such as color, shape, texture, seems to reduce negative behavior, enhance attention, and improve overall performance.

2. Teachers should change-up styles of lecture and task material, to help maintain the interest and motivation of the child. If interest is low or passive tasks are assigned, they must be interspersed with high-interest or active tasks to optimize attention and concentration. Certain task requiring and active as opposed to a passive response may allow children with ADHD a way to better channel their disruptive behaviors into constructive responses. Giving the ADHD child something to do as part of the class lecture, work assignment, or activity, the child’s behavior becomes less of a problem.

3. Assignments should be brief to fit with a child’s attention span. A good rule of thumb is to assign the amount of work that would be appropriate for a child 30% younger. Feedback regarding accuracy of assignments should be given immediately, and time limits for getting work done should be short. This can be aided by the use of timers.

4. A child’s attention during group lessons may be enhanced by delivering the lesson in an enthusiastic yet task-focused style, keeping it brief and allowing frequent and active child participation. A teacher who pretends to be more like an actor-
who is vibrant, enthused, and emotionally charged—will get much more attention than one who drones on about some dry subject.

5. Mixing classroom lectures up with brief moments of physical exercise may also be helpful. This reduces the sense of fatigue and monotony that children with ADHD may experience during extended academic work periods. The teacher can try jumping jacks by the desk, a quick trip outside the classroom for a brisk two-minute run or walk, or other brief physical activities. These can rejuvenate the attention span not only of a child with ADHD, but other children too.

6. The teacher should schedule difficult academic subjects in the morning, and leave the more active, nonacademic subjects and lunch to the afternoon periods.

7. Whenever possible, classroom lecture should be augmented with direct-instruction materials, drills of important academic skills with computers that have software doing the same thing (pp. 236-237).

The last intervention addresses the academic performance of ADHD children, and teachers’ beliefs and attitudes towards the child’s behaviors and treatments. Teachers’ patience, knowledge of intervention techniques, ability to collaborate with interdisciplinary teams, use of gestures when communicating with students, and positive attitudes towards ADHD children, are key factors for achieving academic success (Sherman, Rasmussen, & Baydala, 2008). Continuing to stress these points could generate positive classroom environments, which may prove valuable to both the ADHD student, as well as the non-ADHD student. Children with ADHD who have supportive and encouraging parents and family members stand a greater chance at success.
Social Interest

Another holistic piece of the treatment play could be instilling a sense of social interest. Children with ADHD often lack a sense of social interest, since creating and maintaining friendships can be difficult. According to Ansbacher & Ansbacher (1956) “Social interest is the true and inevitable compensation for all the natural weaknesses of individual human beings” (p. 154). The human need for everyone is a need of dependence upon each other. As long as a child’s inferiority is not too impacting, a child will strive to attain the useful side of life. Therefore, social feeling and social adjustments are a normal part of compensation.

When the child has a feeling of social interest, he feels his existence is worthwhile, as long as he is useful (Ansbacher & Ansbacher, 1954). This usefulness becomes part of the striving for superiority, verses inferiority. Feeling at home is an important part of social interest. “Thus, a certain evaluative attitude emerges in which we do not regard the adversities of life as a personal injustice” (p. 155). This type of attitude is found in other lines of strength that helps people overcome the adversities of life.

As parents, their role is to help their ADHD child feel nurtured and gain a sense of belonging. Since children with ADHD have difficulty with peers, it becomes critical for parents to introduce their child into society (Biederman et al., 1991). Many parents have the ability to motivate their ADHD child by creating a family atmosphere where contributing to the welfare of others is expected, as well as in society.

Therefore, it becomes important for parents to choose family activities that children enjoy. If the child is not interested or unable to participate, the activity does not support the development of the relationship. Children become friends with people they
“have fun with” (Popkin, 2007, p. 43). Fun activities can also strengthen the parent-child relationship. The development of positive routines can lead to changes in values and thinking.

**Conclusion**

In summary, complex disorders like ADHD with or without co-morbid ODD or CD are almost invariably a product of genes and environmental factors. Empirical findings support that variables are influential, interactive interdependent and interconnect with each other. Ignoring, or failing to diagnose ADHD further complicates future treatment options and leads to unhealthy relationships with family, peers, and teachers.

Empirical data presented suggests the importance medication as all, or part of a treatment plan for children with ADHD. A combined treatment plan of medication and complementary and alternative options can be beneficial.

Research reveals that academics can be extremely challenging for children with ADHD due to deficits in the pre-frontal-cortex of the brain where executive function take place. There are many accommodations and intervention that can be implemented for greater academic success. Parents and teachers play a significant role in the adaptation and accommodation for children with ADHD.
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