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The role of executive functions in anxiety management of children with ADHD

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Abstract. Anxiety is a particular form of emotional distress which is frequently experienced by students with LD. Research has indicated that high levels of anxiety have negative effects on performance on cognitive and academic tasks. Also, findings suggest that children with LD and ADHD present cognitive and neuropsychological deficits. Cognitive behavioral therapy combined with martial arts training is an effective intervention for youth with ADHD symptoms as well as youth with high levels of anxiety.
Keywords: executive functions, ADHD, anxiety management, test anxiety, cognitive behavioral therapy, mindfulness practices, martial arts

Contextualization and analysis

The executive functions' (EFs) include planning, cognitive flexibility, inhibition, attention control, verbal and visuo-spatial working memory. Both ADHD and learning disorders have been found to be associated with executive dysfunctions (Wafa, Ghobashy & Hamza, 2020). According to the World Health Organization, stress is the "health epidemic" of our century. In the last years, mindfulness is one of the most popular topics in psychology, psychiatry, medicine and neuroscience (Matko & Sedlmeier, 2019). Mindfulness practices constitute key factor in personal and professional development. In many schools of general and special education, mindfulness-based programs are valuable tools for bodily, cognitive, emotional and social improvement (Drigas & Karyotaki, 2018). In the current study, we analyze the immediate role of executive functions in stress management of children with ADHD.

The role of executive deficits in ADHD learning disabled children

Learning disabilities are comorbid with other diagnoses including attention-deficit/hyperactivity disorder (ADHD), anxiety, and depression (Martinez & Semrud-Clikeman, 2004). ADHD has been found to co-occur in approximately 20% to 50% of children with reading difficulties (Semrud-Clikeman et al., 1992). ADHD has also been found to co-occur with difficulties in mathematics, written language and social–emotional learning disabilities (Semrud-Clikeman, 2003).

In particular, the BDEFS-CA scale was used in order to examine executive functions among a sample of 340 children from 6 to 13 years old. The inhibition control dysfunction was the most commonly affected executive function in group while time management, self-regulation and problem-solving were the most commonly affected in the group of the learning-disabled children. What is more, problem solving was the most significantly affected EF in learning disorder group before and after the exclusion of children with other psychiatric comorbidities. Self-restraint was significantly affected in children with ADHD before and after exclusion of children with other comorbid psychiatric disorders (Wafa, Ghobashy, & Hamza, 2020).

Moreover, the Neuropsychology Center of Louisiana (NCLA) designed a Build-A-Brain program for tween boys from 10 to 14 years old with learning disabilities in combination with hypoactivity, impulsivity, distractibility, difficulty falling asleep, and

heightened sensitivity. Consequently, after this 8-week/14-session program, using playful, interactive experiential learning techniques, executive/frontal functioning skills were developed. As a result, the boys began thinking before acting, and impulsivity and anxiety were reduced (Pastrana et al., 2020).

Executive dysfunction is common symptom among children with attention deficit hyperactivity disorder (ADHD) and/ or Mathematical Learning disability (MLD). More specifically, a study examined the levels of anxiety and its impact on executive functions, especially verbal and visuospatial working memory through comparing executive functioning in children 8 - 12 years old with ADHD/MLD, who presented high and low levels of anxiety. According to the results, children with high anxiety had poorer verbal working memory (Nazarboland, Abedivzadeh & Ghanbari, 2019).

In addition, 70 child psychiatric outpatients were examined based on the presence or absence of attention-deficit hyperactivity disorder (ADHD) and/or reading disability (RD). The results revealed no significant differences on a CPT measure of inattention. Moreover, deficits in motor decision/response organization were observed in the ADHD-only subgroup, but not in the comorbid ADHD+RD subgroup (Hall, Halperin, Schwartz, & Newcorn, 1997).

Another study evaluated the impact of a 20week mindfulness martial training program (Integra Mindfulness Martial Arts - MMA) on executive function (EF), internalizing and externalizing behavior and social skills in a clinical sample of adolescent boys 12- 18 years old with learning disabilities (LD) and co-occurring attention deficit/hyperactivity disorder (ADHD) or anxiety. Consequently, cognitive behavioral therapy combined with martial arts training is an effective intervention for youth with ADHD symptoms as well as youth with high levels of anxiety (Haydicky et al., 2012).

In a study, 327 children from 6 to 14 years old were taken randomly from two regular schools at Warangal, India. Children with learning disabilities exhibited significant behavioral problems than children without learning disabilities in the form of hyperactivity and aggression. The externalizing behaviors presented as defiance, impulsivity, hyperactivity, aggression and antisocial features. The internalizing behaviors characterized by withdrawal, dysphoria and anxiety (Sridevi, Sriveni, & Rangaswamy, 2015).

Also, three diagnosed groups of children, aged between 7 and 12 years were tested on tasks related to five major domains of executive functioning (EF): inhibition, visual working memory, planning, cognitive flexibility, and verbal fluency. ADHD children showed deficits on visual working memory, planning, cognitive flexibility and phonetic fluency (Marzocchi et al., 2008).

Executive functions and test anxiety in students with ADHD

Scientific evidence indicates that both academic and social difficulties presented by students with LD and ADHD arise from the deficiencies in self-regulation processes. Research has demonstrated significant and meaningful improvements following SRSD in students' development of planning and revising strategies, including brainstorming, self-monitoring, reading for information and semantic webbing, generating and organizing content, advanced planning and dictation, revising with peers, and revising for both substance and mechanics (Harris, Reid, & Graham, 2004).

Children who had both ADHD and LD were significantly more impaired on both executive and nonexecutive functions than ADHD children without LD. Neuropsychological performance was most impaired in ADHD with combined arithmetic and reading disability. These data indicate that comorbid LD, especially arithmetic disability, significantly increases the severity of executive function impairment in ADHD (Seidman et al., 2001).

Moreover, eighty-three children with ADHD and 29 age-matched controls (age 7–13) participated in a study. Findings indicated that children with ADHD have slower verbal responses and sustained attention deficit. Deficits in selective attention and attentional capacity observed were largely related to the presence of LD. These results revealed that ADHD is related to a specific deficit in regulation for attentional resources. Results also emphasized the importance of isolating the effect of lower level of abilities (e.g., speed of processing) and the utilization of specific definition for the examination of executive functions (Wu, Anderson, & Castiello, 2010).

It is a fact that test anxiety has a dramatic impact on students with ADHD. Therefore, school personnel may find intervention strategies such as attentional training, memory enhancers, self-monitoring, and study skills and test-taking skills training in combination with cognitive behavior therapy to be effective in addressing cognitive obstruction/ inattention symptoms (Whitaker, Lowe, & Lee, 2007).

Conclusion

The next generation of educators, students, therapists, and parents are required to develop new skills as well as adopting daily sustainable habits. An increasing number of studies show the positive effects of mindfulness practices in emotional, mental and spiritual level of human existence (Drigas & Mitsea, 2020). Based on the above research:

1. Learning disabled children with comorbid diagnoses have at least partially distinct underlying cognitive and neuropsychological deficits (Hall, Halperin, Schwartz, & Newcorn, 1997).

2. Test anxiety causes deficits on executive functions of ADHD children (Marzocchi et al., 2008).
3. A cognitive-behavioral intervention using relaxation training, guided imagery, self-instructional training, and study skills training reduces levels of test anxiety (Wachelka & Katz, 1999).
4. Especially, a cognitive-behavioral intervention using relaxation training, guided imagery, self-instructional training, and study skills training reduces test anxiety levels (Wachelka & Katz, 1999).

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