

Original Research

Study the Relationship between Executive Function and Emotional Regulation in Children with ADHD

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Abstract

Background: Living with ADHD children in the family creates the special issues and problems for families. Regardless of the positive and negative effects of having a child with ADHD, the question is raised, how is the executive function and emotional regulation in ADHD children? Therefore, the purpose of this study is to investigate the relationship between executive function and emotional regulation in children with ADHD.

Method: The findings of the research showed that a deficiency in executive functions that can be the cause of failure in expressing the emotional regulation in children with symptoms of attention deficit/hyperactivity disorder. Executive functions as a theoretical structure has been able to create a strong relationship between brain structures (especially the frontal and prefrontal regions) and psychological functions such as problem solving, abstract thinking and group change, and in this way can be help to better understanding the psychopathology.

Results: Based on the findings of this research, people with ADHD have deficiencies in most of the abilities related to executive functions. Defects in executive functions can be the cause of failure in expressing the emotional regulation in children with symptoms of attention deficit/hyperactivity disorder.

Conclusion: Therefore, it can be concluded that in order to increase the emotional regulation in ADHD children, programs should be used to strengthen executive functions.

Keywords: Executive Function, Emotional Regulation, Children with ADHD.

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Introduction

One of the most common childhood disorders that has attracted the attention of psychologists and psychiatrists is attention deficit or hyperactivity disorder. This disorder begins from the ages of 2 to 4 years. This disorder is among the most common neurobehavioral disorders of childhood, which affects most of the world's population, 3 to 7% of children [1]. Attention Deficit/Hyperactivity Disorder (ADHD) is defined as a persistent pattern of inattention or hyperactivity and impulsivity that is repeatedly displayed and the severity of these behaviors is far greater than that of their peers. This disorder is one of the most common psychiatric disorders in children and adolescents, so that 3 to 7% of school-age children suffer from it [2]. It is also one of the most common neuro-developmental disorders of childhood, which is caused by weakness in behavioral inhibition and it is characterized by three characteristics: attention deficit, hyperactivity, and impulsivity [3]. In fact, this disorder is usually diagnosed in childhood, but in many cases it continues until adulthood. About six million children and ten million adults in the United States suffer from this disorder. Attention Deficit Hyperactivity Disorder or ADHD occurs along with three types of behavioral disorders: attention deficit, hyperactivity and acting without thinking. The symptoms of this disorder are classified into three groups: lack of attention, which includes being distracted easily, leaving one activity unfinished and moving quickly to another activity, quickly getting tired of doing an action and getting bored, having difficulty in focusing on an activity or finishing it and having some troubles for finishing the schoolwork, losing personal belongings and other objects, not listening or paying attention to what others are saying when talking to them, daydreaming or wandering without attention. Having the motivation to do a specific activity is having difficulty in carrying out orders and requests [4]. Among the psychiatric diagnoses in childhood, the diagnosis attention

deficit/hyperactivity disorder is controversial. Placing separate symptoms for this disorder is difficult due to issues such as the lack of difference between these symptoms and other behavioral and learning disorders, low agreement among different measurement tools, and the lack of a single etiology and consistent response to treatment [2]. Although attention deficit/hyperactivity disorder is currently a behavioral diagnosis but research has begun to provide evidence for the use of neurometric tools in the diagnosis of this disorder. One of these tools that has been used in many researches is electroencephalography (EEG) [5]. The distinguishing features of ADHD include short attention spans and high levels of distraction that are inconsistent with the child's chronological age and developmental stage. At school, children with attention deficit/hyperactivity disorder usually have problems in following the instructions and need special (individualized) attention from teachers. At home, affected children frequently disobey parental instructions and require multiple reminders to complete relatively simple tasks. Children with ADHD usually act impulsively, are emotionally unstable, have outbursts of anger and lose their temper quickly, lack concentration and are irritable [6]. Tension in the family format, especially when it is chronic and exists in early development, has harmful effects on the health of parents, children, and parent-child relationships [7]. One of the factors related to the internal characteristics of the family that can cause tension is the behavioral and emotional problems of children. Research shows that the severity of a child's behavioral disorder is an important feature of a stressful situation, and one of the most common disorders is attention deficit/hyperactivity [8]. Hyperactivity is a disorder characterized by constant irritability, impulsivity and problems in concentration [9]. In most cases, hyperactivity is associated with other problems such as stubbornness, disobedience to parents, behavioral problems and lack of academic success [10]. The maladaptive behaviors of

hyperactive children (such as impulsivity, disobeying parental orders, destructive behaviors, stubbornness, disobedience, and irritability) cause bad feelings in parents (such as anger, anger, helplessness, fatigue, and reduced tolerance) [11]. These reactions eventually lead to the acuteness of the child's problems. In this way, a vicious cycle is created, in such a way that the precise diagnosis of cause and effect gradually becomes very unlikely [12]. The reaction of family members to the child's problems can be a range of complete rejection or acceptance, neglect or complete care [8]. The need for special facilities to take care of a hyperactive child, tolerating the words of others, the deterioration of the relationship between the child and the parents due to separation from peers, problems that arise in relation to his siblings, educational issues, are the problems that parents In the care and upbringing of hyperactive children, they face it more or less and all of them cause pressure and stress on the parents, especially the mother, and probably disturb the peace of the family [11]. Since hyperactivity and the behaviors that result from it are constant and stable, it affects the interactions that the child has with his siblings and parents. Meanwhile, the health of mothers who usually have to take care of their children at home is more vulnerable [13]. When thinking about changing children's behavior, it is possible to focus on three areas: the child, the school, and the family. The occurrence of any change in the family puts the family in a new stage and similar to the stages of individual growth, it requires changes, adaptations and developmental tasks that must be overcome; Therefore, the entry of children into the family puts spouses in a new position in terms of their roles and tasks [4]. In this situation, one of the most effective interventions in the field of children's behavioral and emotional problems is teaching parents skills that control the child's behavior and create effective parenting styles [14]. Executive function is a high cognitive and metacognitive function that includes a set of high abilities, inhibition, self-initiation, strategic planning, cognitive flexibility and impulse control

[15]. Based on the studies, evidence of executive actions in people with ADHD has been presented. Executive actions are skills that help a person in reaching a goal in the form of decision-making activities, sustained attention, organization, planning, self-initiation, self-reflection and flexibility. According to the presented materials, the main purpose of this review research is to examine the relationship between executive function and emotional and emotional regulation in children with ADHD.

Method

The current research is descriptive and a systematic review. In this method, a systematic review of the scientific findings of the studies conducted in Iran in the field of "Study the relationship between executive function and emotional regulation in children with ADHD" has been done. The results of research published in Springer, PubMed, Google Scholar, Science direct, ProQuest, Google Scopus, Magiran, Sid, Normex, Irandak, ensani.ir and Civilica databases which were analyzed in 2021 and 2022. The keywords of executive function, emotional regulation and children with ADHD were searched in the mentioned databases. After the review, the articles that met the criteria for entering the research were used for the final review. Researches that had the searched keywords and were related to the relationship between executive function and emotional regulation in children with ADHD were included in the research. These articles had full text and were published in 2021 and 2022 in reputable journals. After that, 45 cases were initially found. Of these, 34 cases related to executive function and emotional regulation in children with ADHD were selected. Next, articles that were part of books, newspapers and magazines were removed from the review, which brought the number of cases to 26. In the continuation of the review, articles with repeated topics and articles of internal conferences of organizations were excluded from the research. Finally, 19 articles were included in the research and analyzed.

Discussion

Learners with ADHD disorder are faced with problems in the speed of information processing, information retrieval from memory, visual-spatial memory, concentration of attention and selective attention, which due to these functional defects in cognitive abilities, academic problems are created for these children. In order to carry out purposeful actions and behaviors, executive actions are helpful; Because they provide the use of specific intellectual skills to choose and achieve goals or solve problems, which include planning, working memory, organization, and metacognition. These skills include: response inhibition, emotional self-regulation, task initiation, flexibility and persistence to achieve the goal. The concept of executive functions as a theoretical structure has been able to create a strong relationship between brain structures (especially the frontal and prefrontal regions) and psychological functions such as problem solving, abstract thinking and group change, and in this way it can be help to better understand the psychopathology . Numerous studies show that children with attention deficit/hyperactivity disorder have defects in regulating emotional emotions and executive functions [16, 17, 18].

However, very few studies have been conducted in the field of study the relationship between executive function and emotional regulation in children with ADHD . This research was written with the purpose of study the relationship between executive function and emotional regulation in children with ADHD. Based on the mentioned materials of this research, it was found that people with ADHD have defects in most abilities related to executive functions. By researching and reviewing research related to the executive functions of ADHD children, the researchers came to the conclusion that 15 to 18 studies have shown that people with ADHD and healthy people have a significant difference in one or more measures of executive functions. The main cognitive model that links deficits in executive functions to behavioral symptoms of ADHD is that the three

main categories of ADHD symptoms (hyperactivity, attention deficit, and impulsivity) are all subsets of deficits in inhibition (which itself is one of the types of executive functions). . There is also some degree of dysfunction of the frontal lobe in these children. One of the executive functions that seems to be impaired in the mentioned children is planning and organization. Sometimes , the main complaints of a hyperactive child, teenager or adult are related to emotional problems, which include: inability to control emotions, problems related to anger control, anger outbursts, strong emotional reactions, too much sensitivity to emotions, Inability to cope with emotions, intense emotions. In the middle of the 19th century, it was found that instead of the diagnosis of attention deficit disorder and hyperactivity, the diagnosis of mild brain malfunction "minimal brain dysfunction" was used, the symptoms of inability to control emotions were included in the diagnostic criteria. But now not even a single sign of inability to manage emotions plays a role in diagnosing this disorder. In fact, emotional regulation refers to all the processes that are related to different aspects of emotions, that is, the emotions that people experience, the intensity of emotions and how these emotions are experienced and expressed. The main function of emotion regulation is shaping emotional states to facilitate adaptive and purposeful behavior in a specific situationIt is probably since hyperactivity is associated with many other disorders. For example: anxiety disorders, neurodevelopmental disorders or behavioral disorders. But the fact is that even when a hyperactive person does not have another disorder, they still experience problems in regulating their emotions. In fact, the main problem in attention deficit hyperactivity disorder is the problem in self-regulation, which manifests itself both in behavior management, emotional regulation, and cognitive function regulation which can affect behavior and emotions and vice versa. Based on studies, it can be said that cognitive emotional regulation is predictable

through response inhibition, in other words, children who perform better in response inhibition also perform better in cognitive emotional emotion regulation, and vice versa if they have a deficit in response inhibition, in cognitive emotional regulation will also fail. In expressing these findings, it can be stated that the lack of behavioral skills (inhibition) in children with ADHD reduces their ability in various social and cognitive fields. These children show less emotional regulation and their ability to take a point of view is defective, and this defect has a neurocognitive basis and is caused by their inability to control inhibition. The skill of self-monitoring is a prerequisite for emotional regulation and perspective-taking; Because children need to inhibit responses (inhibition) in order to separate another person's point of view from themselves and understand another person's emotional experience. During the process of emotional regulation, response inhibition by reducing impulse and inhibiting automatic responses to other people's emotions can help to give appropriate responses to the situation [19]. Also, the results show that cognitive and emotional regulation can be predicted through sustained attention, in other words, children who perform better in sustained attention also perform better in cognitive and emotional emotion regulation, and vice versa if they have deficits in sustained attention. are, they will also suffer from cognitive and emotional empathy deficiency. According to the findings of this research, a defect in executive functions can be the cause of failure in expressing emotional regulation in children with symptoms of attention deficit/hyperactivity disorder. It is suggested to use programs to strengthen executive functions in order to increase emotional regulation in these children.

Conclusion

Therefore, it can be concluded that in order to increase the emotional regulation in ADHD children, programs should be used to strengthen executive functions.

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All authors contributed toward data analysis, drafting and revising the paper and agreed to be responsible for all the aspects of this work.

References

- [1]. Seyed Mohammadi, Seyed Hamidreza; Ehtshamzadeh, Parvin; Hafizi, Fariba; Pasha, Reza; Makundi, Behnam. The effectiveness of cognitive rehabilitation after drug therapy on brain executive functions and behavioral symptoms of children with ADHD in Ahvaz city. *Journal of Cognitive Psychology and Psychiatry*, 2018; 6(3), 102-117.
- [2]. Tarihi, Samia; Vahedi, Shahram; Tabatabai, Seyyed Mahmoud; Hadighi, Ramtin. Examining the role of brain waves in differentiating children with intestinal parasitic diseases and children with attention deficit/hyperactivity disorder in Karaj city. *New Journal of Cognitive Sciences*, 2021; 23(2), 59-71.
- [3]. Chang YK, Hung CL, Huang CJ, Hatfield BD & et al. Effects of an aquatic exercise program on inhibitory control in children with ADHD: A preliminary study. *Archives of Clinical Neuropsychology*. 2014; 29(3), 217-223.
- [4]. Abbaslu, Farzaneh. The effect of parent-child relationship-based play therapy training (CPRT) to mothers on reducing the behavioral problems of children with ADHD. *Scientific journal of researchers*, 2019; 18(4), 21-38.
- [5]. Besharat MA, Hamidi S, Rostami R, Farahani H. The effectiveness of neurofeedback training on EEG among children with attention deficit/hyperactivity disorder. *Contemporary Psychology, Biannual Journal of the Iranian Psychological Association*. 2012;7(1):3-16. (Persian)
- [6]. Sadock BJ, Sadock VA, Ruiz P. Kaplan and Sadock's *Synopsis of Psychiatry: Behavioral Sciences/Clinical Psychiatry*. 11th ed. New York:Wolters Kluwer. 2014.

- [7]. Alevriadou, A., & Pavlidou, K. Teachers interpersonal style and its relationship to emotions, causal attributions, and type of challenging behaviors displayed by students with intellectual disabilities. *Journal of Intellectual Disabilities*. 2016; 20 (3), 213-227.
- [8]. Hallahan, D. P., Kauffman, J. M., & Pullen, P. C. *Exceptional learners. Introduction to special education* (15th ed). Boston: ALLYN & Bacon. 2014.
- [9]. Robinson, M., & Neece, C. L. Marital satisfaction, parental stress, and child behavior problems among parents of young children with developmental delays. *Journal of Mental Health Research in Intellectual Disabilities*. 2015; 8(1), 23-46.
- [10]. Masten, A. S., & Monn, A. R. Child and family resilience: A call for integrated science, practice, and professional training: *Interdisciplinary Journal of Applied Family Studies*. 2015; 64(1), 5-21.
- [11]. Amiri Moghadam, Ali; Sudani, Mansour; Khojaste Mehr, Reza; Mehrabizadeh the artist, Mahnaz. Identifying resilience factors in mothers of children with attention deficit hyperactivity disorder (ADHD): a qualitative study. 2019.
- [12]. Green, S. A., Berkovits, L. D., & Baker, B. L. Symptoms and development of anxiety in children with or without intellectual disability. *Journal of Clinical Child & Adolescent Psychology*. 2015; 44(1), 137-144.
- [13]. Jansen, S. L., van der putten, A. A. & Vlaskamp, C. Parents experiences of collaborating with professionals in the support of their child with profound intellectual and multiple disabilities: A multiple case study. *Journal of Intellectual Disabilities*. 2017; 21(1), 53-67.
- [14]. Goldberg I, Goldberg H. *Family Therapy; Translators: Hossein Shahi Boravati, Hamid Reza et al., Tehran: Psychological Publishing. Landreth, G.L. (2nd edn). Play therapy: The Art of Relationship. Philadelphia: Brunner-Routledge. 2006.*
- [15]. Alizadeh H. The relationship between cognitive neural executive functions and developmental disorders. *Journal of new cognitive sciences*. 2006; 4: 40-57. (Persian)
- [16]. Maoz, H., Gvirts, H. Z., Sheffer, M., & Bloch, Y. Theory of Mind and empathy in children with ADHD. *Journal of attention disorders*, 2019; 23(11), 1331-1338.
- [17]. Dvorsky, M. R., & Langberg, J. M. Predicting impairment in college students with ADHD: the role of executive functions. *Journal of Attention Disorders*, 2019; 23(13), 1624-1636.
- [18]. Tenenbaum, R. B., Musser, E. D., Morris, S., Ward, A. R., Raiker, J. S., Coles, E. K., & Pelham, W. E. Response inhibition, response execution, and emotion regulation among children with attention-deficit/hyperactivity disorder. *Journal of abnormal child psychology*, 2019; 47(4), 589-603.
- [19]. Yan, Z., Hong, S., Liu, F., & Su, Y. A meta-analysis of the relationship between empathy and executive function. *PsyCh Journal*, 2020; 9(1), 34-43.