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Research Paper

The Effect of Early Motivational Program on Mediating Components of Learning: Implications for Education and Mental Health Policy

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Abstract

The significant number of attention deficit hyperactivity disorder (ADHD) children in families and the problems related to their education and medical services creates financial burdens and problems for families, Schools & the government. Finding early intervention programs to promote learning can help reduce those problems associated with ADHD. The present study attempted to investigate the effect of organized motivational program (OMP) on working memory (WM) in ADHD children. The participants (4 girls and 8 boys) were divided into experimental and control groups. They were selected from among 36 subjects after primary tests to be matched. The design of the study was semi-experimental including an independent variable, a pretest and a posttest. After considering the research hypotheses using descriptive statistics and one-way Analysis of Covariance (ANCOVA), the results suggested a significant difference in posttest scores of experimental and control groups after independent variable being applied. The results showed that a motivational program including math assignments that it had coincided with children's motivations can have a positive effect on WM in children with ADHD. Due to the effect of the nature and method of applying the motivational program, an increase was observed in the working memory performance of the experimental group. The findings have critical implications for potential policies adopted for children and adolescents with ADHD.

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Extended Abstract

Introduction

One in four American families has at least one child with special health care needs. These children are exposed to long-term physical, developmental, behavioral and psychological conditions (United States Department of Health and Human Services Health Resources and Services Administration, 2022). Since children with ADHD generally have disorders in several functional areas during their youth (i.e., education, relationship with peers, family conflicts, and misconduct), the effects of this disorder will be extensive. These behaviors contribute to requiring special education services, achieve lower levels of academic achievement, have higher disciplinary cases, and later dropout. Consequently, students with ADHD are a major source of stress for teachers, principals, and classmates (Robb *et al.*, 2011).

Observations of children with ADHD in the classroom show that compared to their classmates, they are more shirk the task, are less precision, less accomplish assignments, interfere with their peers' work, break the rules of the classroom, show less compliance with requests and demands of adults (Robb *et al.*, 2011).

A new study published in the *Journal of Abnormal Child Psychology Congress* states that raising a child with ADHD costs five times more for American families than raising a child without ADHD, and that does not take into account the costs of treatment (Zhao *et al.*, 2019). Another study found that, on average, families of a child with ADHD paid $15,036 per child (treatment costs excluded), while families of child without ADHD spent just $2,848 on child development. That sums to around $1,000 per year of extra fetched, not counting medicine and treatment. Prior thinks about have assessed the normal taken a toll of treatment at $1,574 yearly (Foundation, 2020).

Prevention and intervention strategies are greatly needed to offset the financial impact on the education of children and youth with ADHD (Robb et al., 2011), as well as other negative long-term consequences in lifespan of the children with ADHD. Therefore, any intervention should be applied in the primary ages of these people.

Early intervention (EI) services are critical to improving long-term learning results, because the interventions that exert in the early years improve a child's cognition, language, behavior, and development, particularly through the family. In general, it's confirmed that family involvement is a key element in treatments for people with mental disorders. In this respect, Family Psycho Education (FPE) has been presented, which is a structured family intervention that incorporates continuous sessions with the patient and relatives, accompanied by joint psycho-educational sessions, communication skills exercises, and problem solving sessions (Eberhard and Simonsson, 2016).

The Improving Parents as Communication Teachers (ImPACT) project is also a caregiver-mediated coaching model for families of young children. It is a manualized, caregiver-mediated intervention for naturalistic developmental behavior intervention that comprises of two core components: (1) educational modules to direct caregivers in supporting their child's social communication; and (2) guidelines to assist EI providers who coach caregivers in utilizing intervention strategies (Cidav et al., 2023).

Totally, to address the ADHD public problem, a well-designed policy is needed based on a method and effective tools as its cornerstone which include both EI and ImPACT components. In this study, we aim to design a method and effective tools as a cornerstone for the considered policy and this is in the form of an Early Motivational Program (EMP).

Background

ADHD is commonly has other psychiatric and behavioral clutters, strikingly conduct clutter as well as formative conditions (e.g., dyslexia, autism), tic, sadness and uneasiness (Botbol *et al.*, 2017).

Motivation is a cognitive, individual and intentional phenomenon (Mitchell, 1982), Motivation and learning process have a deep connection. Motivation is the core for human being's aspirations and achievements. Thus, motivation is crucial to succeed in educational matters and without the fighting spirit nothing is possible not only in education but also in real life (Tohidi and Jabbari, 2012; Gopalan *et al.*, 2017). Children with ADHD have little motivation to learn, which makes them less likely to participate in learning-related activities (Sújar *et al.*, 2022).

Working memory, regularly conceived as a "mental work space," can be characterized as a handling asset with restricted capacity included within the capacity of data whereas at the same time controlling data for brief periods of time (Anmarkrud, Andresen and Bråten, 2019). Children with ADHD may suffer from working memory deficits, which can adversely affect their academic performance (Dobrakowski and Łebecka, 2020).

Both external and internal motivation can affect memory and subsequent growth, learning and other skills (Sigelman and Rider, 2014). As well, it is broadly acknowledged that learning and memory are complicated forms that include and enact different brain neurotransmitter frameworks. In expansion, memory plays a significant part within the learning prepare, and everything we learn is interpreted into behavior with the help of memorization (Kourosh-Arami, Komaki and Zarrindast, 2022; Gkintoni, Antonopoulou and Halkiopoulos, 2023).

There are numerous factors which affect motivation and appear to be fundamental. This human psychological factor is affected by social, parents, instruments, teachers, friends, and etc. (Chevallier *et al.*, 2012; Neely *et al.*, 2013; Rogers *et al.*, 2019) .

Koegel et al., (2010) conducted research according to specific motivational variables such as choice, interspersal of maintenance tasks, and natural reinforcers with using intervention conditions for writing and math activities for academic achievements and reducing autism symptoms in autistic children. But they did not investigate the effect of their method on the memory (as the mediator of all skills) and other children with special needs and did not introduce specific tools with a specific using method. We believe that for developing a well-functioning policy to address the ADHD issue, we need an innovative multi-component intervention which serves as a cornerstone in any policy.

Method

This research was done along with another research on autistic children and the method of both was almost the same.

Participants

First, a call was given through social networks, advertising sites and acquaintances, and in this call, it was said that children should not be using any drugs related to nervous system in the last month and do not have vision and hearing problems. We selected 56 families in Tehran, Iran which announced their readiness with using of convenience sampling. Among the children of these 56 families, 40 families whose children were exactly between 7-8 years old and do not have primary sensory, motor, neurological, or psychiatric problems were

selected. In order to identify children with ADHD, the parents were asked to complete the Conners' Parents Rating Scale with ٤٨ items for any child and we used of Clinical Interview, after these stage 36 children were selected for evaluation by Raven IQ Test by senior author.

Then, Raven IQ Test was taken from them, and those who scored above 80 and were more willing to participate in the program were selected as 12 children. Then these 12 children were numbered and Online Numerical Working Memory Test (ONWMT) and Online Corsi Block Tapping Test (OCBTT), were taken from all of them as it was supposed to be taken after applying the independent variable (a day before and a day after apply independent variable). Out of these 12 children (4 girls and 8 boys), 6 children with even numbers were placed in the experimental group and 6 children with odd numbers were placed in the control group with using of systematic sampling.

Instruments

1. Conners' Parent Rating Scale (CPRS): This questionnaire has 48 questions that are completed by parents (Keith Conners *et al.*, 1998).

2.Clinical Interview: In addition to using of the CPRS, in order to more accurately diagnose and identify children with ADHD, a clinical interview was conducted by the researchers based on the clinical criteria taken from DSM-5.

3.Raven IQ Test: The test comprises of a series of abstract images that are skillfully arranged in a coherent manner and are conducted individually.

4.Organized Motivational Program (OMP): This program is designed based on the literature and logic of Koegel et al., (2010) research and is based on the combination of specific motivational variables such as choice, interspersal of maintenance tasks, and natural reinforcers during intervention.

5.Online Numerical Working Memory Test (ONWMT) and Online Corsi Block-Tapping Test (OCBTT): Two online memory tests named, Numerical Working Memory Test (ONWMT) and Corsi Block Tapping Test (OCBTT), which are designed based on the Corsi Block-Tapping Task (Corsi, 1973), and evaluates working, spatial and visual memory (Gmbh, 2016; Mathematics, 2016) .

Design

Given the proposed goals, the research design was of a semi-experimental nature, encompassing a pretest, a posttest, and a control group. Both the experimental and control groups underwent administration of the pretest, subsequent to which the independent variable was introduced solely to the experiment group. A posttest was conducted at the conclusion of the experiment for both groups.

Procedure

First, a math assignments table (sum, subtraction, multiplication and division of numbers under 10) with seven columns from right to left including; Day, Row, Task, Answer, True, False, and Encouragement, which had six math assignments per day and a total of 180 math assignments in a variable method in one month, which became more difficult as it progressed, was designed based on Koegel et al., (2010) motivational program logic. After filling in the consent form of the parents of children with ADHD, the implementation steps of the independent variable were explained to the families of the experimental group. In order to minimize the effect of the same activity in the program, children did not receive the same tasks and encouragements in a 2-hours period before and after the implementation of the

program. First, the families of the experimental group were asked to specify the encouragement column in front of each task based on their children's interest in the desired activities, at least 1 and at most 3 encouragements per day and for a month at least 10 and at most 90 similar or different encouragements, for example going out of the house, pocket money, play with your favorite toys and watch your favorite TV show. Then the parents were asked to guide the child to any part of the house where they feel more relaxed and to ask him to be in whatever position he feels better, such as sitting or lying down, then give him a pencil, pen or marker of the child's choice and before performing the task, tell the child that if they does this task today, they will receive the desired encouragement and ask their to write the answer to each of the math tasks in front of it, if they do not want to write, ask their in the form answer the questions verbally. Then, if the answer is correct or incorrect, mark it in the specified field. Every day, families were required to ask their children to do 6 math tasks, and if they did 4 of the 6 tasks correctly, they were to offer 1 or at most 2 encouragements to the child's choice, and so on, if desired. The child should perform the assignment at most 2 more time to reach a score of at least 4 and if the child does not complete the assignment, do not offer the desired encouragement to the child and they were just doing normal daily activities.

During the implementation of the independent variable, the researchers contacted the families every day by phone and in person to ensure the correct implementation of the daily program. And did they do the homework and were encouraged that all of them had done part of the homework and were encouraged.

After a period of one-month, motivational forms were reviewed for each child and their parents were also asked about the amount of participation and motivation of the children in the program then from both experimental and control groups ONWMT and OCBTT was taken by the researchers. First, the test was set in forward mode, then the speed of the test was set to slow, and the number of displays of numbers and shapes was set to 3 and every time the repetition of the test show was random. The test was conducted at the home of these children's parents in a quiet environment with suitable lighting, in which the children were asked at what angle, distance and surface the laptop, tablet or mobile phone should be placed. Then again, how to perform the tests was explained to the children and they were told that if you solve these tests, you will be encouraged today. Then the child was given the opportunity to complete each test 6 times in a maximum time interval of 5 minutes with a time interval of 10 minutes for each test. Children were given scores from 0 to 6 (one mark for each correct answer). Then the scores of the two tests were added together (e.g., 6+6=12)

Results

The data was analyzed with IBM SPSS statistic version 26.

After assessing the normality of the data through the use of the One-Sample Kolmogorov–Smirnov Test, a one-way Analysis of Covariance (ANCOVA) was employed to analyze the variations in posttest scores between the control and experimental groups. The findings of the One-Sample Kolmogorov-Smirnov Test provide affirmation of the normal distribution of the observed data ($P < 0.05$, pre = 0.135, post = 0.200). Table 1 displays the descriptive statistics for both pretest and posttest groups. The results of the ANCOVA test (as delineated in **Table 2**) demonstrate a statistically significant divergence between the control and experiment groups in their posttest scores, even after accounting for the impact of pretest scores.

The observed significance of the posttest outcomes indicates a statistically significant association between the scores of the independent variables (posttest) and the effect of the

pretest on posttest. This impact has been regulated through the utilization of analysis of covariance. Furthermore, the significance of the group underscores the impact of implementing an independent variable in conjunction with a dependent variable while controlling for pretest conditions. Upon examining **Tables 1 and 2**, it becomes evident that the experimental cohort attained superior ratings in contrast to their pre-intervention phase. Also, η2 (0.49) The present study reveals that the experiment and the manipulation of motivation levels account for 49% of the variance observed in the dependent variable.

Table 1 Mean and Standard Deviation of groups before and after experiment

Group	Time of Measurement			
	Before experiment		After experiment	
	Mean	SD	Mean	SD
Control	3.16	1.72	5.33	2.16
Experiment	3.16	1.16	7.16	1.72

Table 2 Summary of Analysis of Covariance

Source	d.f.	Sum of squares	Mean square	F	Sig.	η2
Pretest	1	27.70	27.70	23.83	0.001*	0.72
Group	1	10.08	10.08	08.67	0.016*	0.49
Error	9	10.46	1.16			

*Significant differences (P <0.05)

Discussion

The comes about of this consider appeared that an OMP can be viable in expanding the WM of ADHD children. This finding has applications to grow information in logical and commonsense areas. In expansion to the reality that the discoveries of this inquire about have logical establishments, they can too be utilized within the fields of educational approaches. We are going look at the reasons and applications of this finding underneath.

Studies have shown that motivation is effective on working memory (Brissenden *et al.*, 2021). But the motivational program is effective when it is designed according to individual characteristics (Koegel, Singh and Koegel, 2010). The reason for the effectiveness of motivational programs is due to various reasons, including cognitive, neurological, social and individual (Au *et al.*, 2015; Ilieva, Hook and Farah, 2015; Stevens *et al.*, 2016; Osborne *et al.*, 2017; Zeitlhofer, Zumbach and Aigner, 2023). If a motivational program is designed to increase WM according to different social groups like children with ADHD, it can be effective in increasing the quality of their learning and education (Cai *et al.*, 2023; Cunha *et al.*, 2023; Mororó *et al.*, 2023; Vernucci, Canet-Juric and Richard's, 2023). This issue has scientific, educational and policy importance. Because not only the findings of this research are scientific, but it can draw the attention of educational managers to the fact that programs of this type can save time for the education of ADHD children and reduce family and government costs for ADHD education.

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Conclusion

The present study proposes a method and effective tools called Early Motivational Program (EMP) that serves as a potential cornerstone for policies targeting children with ADHD. The results of this research showed that the OMP that can be implemented by parents and at home can be effective in increasing WM performance and then learning.

This method confirms that using the EMP program can have a positive effect on a person's memory and learning. EMP implements learning-related programs early in childhood through families, daycare centers, and clinics, and makes these children learn faster in schools and educational centers, as well as they'll have higher performances in academic achievements & peer relations, less family conflict and misconduct, greater utilization of special educational services, and lower rates of disciplinary referrals, retention, and later dropout. Consequently, the government expenditure on this issue will decrease. Because of different concentration of this research, we didn't enter in any calculation of expenses regarding ADHD; so, it is suggested to the researchers to estimate the total changes in government expenses on different areas related to ADHD by using EMP in their future researches.