

Research Paper

Investigating the Use of Rehabilitation Based on Play Therapy to Increase the Attention of Medical Students



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ABSTRACT

Objectives: Attention is one of the cognitive functions that can be enhanced through cognitive rehabilitation. Play therapy is a treatment option for cognitive impairments. This study aims to investigate the use of rehabilitation based on play therapy to increase the attention of medical students.

Methods: The present research is a randomized controlled clinical trial. The statistical population included all 162 third-year students of the College of Medicine in 2022 at the University of Baghdad City, Iraq. Using simple random sampling, the statistical population of 70 people was selected and then divided into intervention (n=35) and control (n=35) groups. Play therapy was provided to individuals in the intervention group, while subjects in the control group did not receive any intervention. We used the IVA-2 CPT software, version 2019.1 to assess visual and auditory attention as well as response control performance. The pre-test and post-test stages were separated by a 15-week interval. The data were analyzed via the multivariate covariance analysis in the SPSS software, version 23. The significance level was set at 0.05.

Results: The results indicated a statistically significant difference between the intervention group's mean pre-test and post-test scores ($P < 0.001$); thus, the rehabilitation based on play therapy significantly enhanced attention in the intervention group. Also, the post-test results revealed a statistically significant difference between both groups ($P < 0.001$).

Discussion: Rehabilitation based on play therapy is an effective way to increase people's attention.

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Highlights

- Under cognitive rehabilitation, play therapy impacted the omitted and commission error variables and could reduce them.
- Play therapy can be an effective method for gaining people's attention.

Plain Language Summary

Non-pharmacological methods, such as play therapy, have received attention in recent years to improve student cognitive rehabilitation. Play therapy interventions can be used to effectively increase people's attention.

Introduction

Attention issues are the first variable associated with executive function disorder. One of the essential factors in teaching and learning is the level of student attention to the lesson subject [1]. According to researchers, the initial stage of any learning begins with attention, and in case attention is insufficient, the individual's learning will be impaired [2]. Attention is an essential task that plays a role in the structure of intelligence, memory, and perception. Failure to hold attention deprives individuals of the opportunity to process, store, and recall information. One of the most common causes of learning disabilities is attention deficit [3]. The researchers discovered a significant difference between subjects who received computerized cognitive training and individuals who did not receive any training in adults with attention deficit disorder and executive function deficits [4].

Attention is one of the cognitive functions that can benefit from cognitive rehabilitation. Attention is a complex mental operation that includes focusing or engaging to hold or endure and listening to the bell for an extended period, decoding the features of the stimulus, and shifting concentration from one aim to another [5]. Identifying attention components is difficult for a variety of reasons. Attention is typically assessed about other activities and is not easy to quantify. Another issue is that processing attention involves multiple parts of the brain [6]. Arousal regulation and selective attention care, sustained attention, attention span or divided attention, dissonance, and manner control are among the theoretical bases of attention components researchers consider [7]. According to neuroscientists, attention is the result of the interaction of diverse zones of the brain, and there is no specialized area of the brain solely accountable for attention performance [8].

In recent years, there has been a surge in interest in using computers to treat cognitive disorders [9]. This has resulted in the growth of computer-based cognitive training software. Cognitive empowerment or training refers to training based on cognitive science findings [10]; however, it takes the form of games (typically computer games) that attempt to improve or enhance cognitive functions (such as attention). According to Kesler et al. [11], the computerized cognitive rehabilitation software improved processing rapidity, cognitive flexibility, verbal and visual memory values, and significantly increased prefrontal cortex activity.

In the past, scientists believed that the brain was hermetically sealed and humans were born with their nature [12]. Recent research has demonstrated that the brain can continue to develop and adapt throughout life. This capability to restructure and form new neural pathways is called neuroplasticity [13]. It is the knowledge behind cognitive instruction, and implementation educators and healthcare professionals can use to complement and raise their remedial interactions with individuals [14]. Studies have demonstrated that systematic brain training in the form of educational interventions with the assistance of brain trainers may improve various cognitive skills [15].

Cognitive training interventions are utilized in treatment programs to help improve a person's brain functioning [16]. Exercises are used to assist in achieving specific treatment goals [17]. Brain training can be utilized in university settings to solve problems associated with learning disabilities [18]. Among its benefits is the ability to learn new strategies and approaches to improving cognitive performance through trial and error [19].

There are numerous reasons to computers as an ideal training partner for mental development [20]. Computers facilitate the instructor's ability to customize instruction and monitor progress. In addition to offering various visual and auditory exercises, the program automatically

becomes more difficult as the client advances [21], continually guiding subjects to develop their cognitive abilities to their fullest potential. Many clinical disorders are characterized by poor attention and self-control. Clinicians should also consider medical and environmental factors (such as a lack of sleep, jet lag, colds, headaches, and so on) that can lead to impaired attention or self-control and affect test performance [22].

Given that executive function deficiencies can persist into old age and cause students to struggle with academic tasks and personal-social affairs, timely diagnosis and intervention are critical. Considering previous studies, the majority of articles proposed using drug therapy methods to treat students' attention disorders, while methods based on increasing talent in specific fields were less discussed. Among non-pharmacological methods, play therapy has received the least attention, indicating the potential for significant advancements in this field. One method of implementing neuropsychological rehabilitation is using software and computer games appropriate for these abilities, thereby increasing the importance of research in this field. Unlike other methods, such as drug therapy, play therapy has no side effects. Accordingly, the present research aims to investigate the use of rehabilitation based on play therapy to increase the attention of medical students. So far, similar research has not been conducted in Baghdad City, Iraq, which is a novel aspect of the current research.

Materials and Methods

The present research is a randomized controlled clinical trial. The statistical population included all 162 third-year students of the College of Medicine in 2022 at the University of Baghdad. Utilizing simple random sampling, the statistical population of 70 people was selected and divided into intervention ($n=35$) and control ($n=35$) groups. Play therapy was provided to subjects in the intervention group. The inclusion criteria were a desire to participate in research, the regular implementation of interventions, and no participation in a similar intervention within the past year. The exclusion criteria were having a history of mental sickness, cognitive disorders, and the current use of psychotropic medication [23, 24]. To comply with ethical standards, the objectives and general procedure of the research were presented to the individuals before the beginning of the research, and they signed a consent form before entering the study. Moreover, the participants were allowed to leave the study at any time. The BrainTrain software packages were used to implement the game-based educational intervention to conduct the current study, and the IVA-2 CPT software was then used to evaluate the participants.

The BrainTrain software products help with decision-making, education, research, and living a healthy lifestyle. It is a mental empowerment tool that combines neuro-feedback with well-known, research-based cognitive training exercises. The main goals are to systematize training and target specific areas that require attention. The engaging SmartMind 4 games help people achieve a positive and relaxed state of mind. SmartMind 4 includes 32 brain games in various add-on packs, allowing for enough customization and variety to keep customers engaged for an extended period. The ability of a person to maintain a state of physical and mental relaxation empowers the games and provides feedback on their success. The level of attention management was targeted in the current study and included various tasks, such as primary auditory processing, letter recognition, color recognition, immediate auditory memory, auditory attention, rapid visual review, tolerance and self-control, faster processing speed, considerable shape recognition, small letters, as well as following simple one-step instructions. The desired training was provided in fifteen 60-min sessions (one session per week). The test was administered in two stages in the current study, one before and one after the test, at a 15-week interval. Accordingly, in the pre-test stage, the test was administered at the start of the first session, and in the post-test stage, it was administered at the end of the last session.

The IVA-2 CPT is clinical decision support software that assists educators in evaluating visual and auditory attention and response control performance. According to research, the IVA-2 CPT is a sensitive and valid measure to identify clinical disorders. The IVA-2 must be administered under the supervision of a licensed healthcare professional who is knowledgeable about the use and interpretation of psychological tests. This test is not intended as a standalone or primary diagnostic tool. Its interpretation requires a clinician to determine whether the IVA-2 CPT has been completed correctly through direct observation. This test does not determine whether or not a specific clinical diagnosis exists. This psychological test aims to provide standardized measures of various aspects of attention and impulse control functioning that examiners can use as part of a comprehensive assessment in clinical diagnosis. This test measures omission error (failing to press the target button in response to the target stimulus) and commission error (pressing the target button against the non-target stimulus). The time to complete this test is approximately 15 min. Villalpando et al. [25] reported a range of 0.66 to 0.75 for the validity of attention scores. In the present study, the reliability and validity of IVA-2 CPT were found to be 0.86 and 0.81, respectively.

The distribution of the variables was examined via the Shapiro-Wilk test. Using descriptive and inferential statistics, the data were analyzed. Intra-group and inter-group comparisons were performed using the multivariate analysis of covariance (MANCOVA) analysis in the SPSS software, version 23. The significance level was set at 0.05.

Results

Table 1 indicates the demographic characteristics of the participants.

Table 1 shows no statistically significant difference between both groups' demographic variables ($P>0.05$). A total of 42(60%) of the participants were women, 55(78.6%) were single, and 40(57.1%) were over the age of 20 years. The mean age of the participants in the intervention and control groups was 20.53 ± 3.19 and 21.06 ± 3.42 years, respectively. Table 2 presents the Mean \pm SD of omission and commission errors singly for the two groups at the pre-test and post-test phases.

According to the results of Table 2 and a comparison of the scores in the pre-test and post-test stages, it is clear that the intervention reduced the mean scores of the variables in the intervention group. Also, the values of the variables in the control group did not change significantly between the pre-test and post-test stages. The analysis of covariance should be utilized to determine the significance level of changes.

The Levene test was used to investigate the variance homogeneity. The findings for both variables in the post-test stage indicated that the variance homogeneity was retained ($P>0.05$). The Box M test was used to evaluate the homogeneity of the matrices and it indicated that the matrices' assumption was determined ($P>0.05$). In addition, the findings of the Shapiro-Wilk test showed that the distribution normality for variables was retained ($P>0.05$). The MANCOVA results are presented in Table 3.

Following the P in Table 3, a significant difference should be observed in at least one of the omission error and commission error variables between both groups. Tables 4 and 5 show the results of the ANCOVA to eval-

Table 1. Demographic variables of the intervention and control group

Variables	Range	No. (%)		P
		Intervention	Control	
Gender	Male	13(37.1)	15(42.9)	0.43
	Female	22(62.9)	20(57.1)	
Age (y)	<20	16(45.7)	14(40)	0.36
	>20	19(54.3)	21(60)	
Marital status	Single	26(74.3)	29(82.9)	0.61
	Married	9(25.7)	6(17.1)	

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Table 2. Mean \pm SD for studied variables in two groups

Variables	Group	Mean \pm SD	
		Pre-test	Post-test
Omission error	Intervention	11.16 \pm 1.52	4.73 \pm 1.08
	Control	11.02 \pm 1.64	10.57 \pm 1.49
Commission error	Intervention	8.31 \pm 2.14	3.59 \pm 1.06
	Control	8.73 \pm 2.45	8.14 \pm 2.11

SD: Standard deviation.

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Table 3. Multivariate analysis of covariance results of both groups in the post-test stage of the attention test

Variables	Values	F	df Hypothesis	df Error	P
Pillai trace	0.71	6.47	5	39	<0.001
Wilks lambda	0.26	7.53	5	39	
Hotelling t-squared	2.14	9.16	5	39	
Roy largest root	1.86	11.81	5	39	

Df: Degree of freedom.

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Table 4. Analysis of covariance findings evaluating the effect of intervention on individuals' omission error

Source of Variation	SS	Df	MS	F	P
Pre-test	37.82	1	37.82	7.14	<0.001
Dependent variable	116.43	1	116.43	21.99	<0.001
Error	84.72	16	20.49		
Total	105.57	19			

Abbreviations: SS: Sum of squares; Df: Degree of freedom; MS: Mean square.

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Table 5. Analysis of covariance findings evaluating the effect of intervention on individuals' commission error

Source of Variations	SS	df	MS	F	P
Pre-test	29.67	1	29.67	6.07	<0.001
Dependent variable	112.38	1	112.38	22.98	<0.001
Error	78.19	16	4.89		
Total	94.12	19			

Abbreviations: SS, sum of squares; df, degree of freedom; MS, mean square.

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uate the impact of the play therapy intervention on the attention of the intervention group participants.

According to Table 4 and Table 5, the play therapy could display a significant difference in the mean score of the of omission error and commission error variables between individuals. The intervention had a 0.71 and 0.64 effect size on the omission error and commission error variables, respectively. According to the results of Table 4 and Table 5, rehabilitation based on play therapy has improved the attention of intervention group individuals.

Discussion

The present research aimed to investigate the use of rehabilitation based on play therapy to increase the at-

tention of medical students. The results showed that play therapy can present a significant difference in omission error and commission error variables between individuals. Therefore, rehabilitation based on play therapy has increased the attention of individuals. The current study's findings are consistent with the findings of numerous other researchers in this field [26-28]. This similarity in results has given researchers hope that cognitive restoration and rehabilitation techniques, such as play therapy can effectively treat cognitive deficiency in individuals with attention deficit hyperactivity disorder. However, some researchers view cognitive rehabilitation interventions with skepticism, believing that their efficacy has not been conclusively demonstrated and changes in the treatment session are not transferred to patients' everyday lives [29].

In the neuropsychological rehabilitation program, the level of difficulty of the assignments is determined by the individual's initial level of preparedness, which gradually increases as the individual improves. In addition, the time required to complete each stage of the game is brief, preventing fatigue and aiding in developing and maintaining a player's attention span. Based on the brain plasticity hypothesis, the possible effects of play therapy can be attributed to cognitive exercises and the repetition of these exercises. The mechanism underlying experience-dependent plasticity is responsible for spontaneous or guided improvements in these disorders. Frequent and supervised cognitive training (such as cognitive rehabilitation through play therapy) induces structural and functional alterations in the neurons responsible for these brain functions. According to the theory of brain plasticity and self-repair, some changes can be stable and long-lasting.

Theoretically, these findings can be interpreted in light of 3 brain mechanisms. Modification of synaptic connection is the first category. Chronic activation of neuronal mechanisms during learning contributes to the enhancement of its performance. Some studies have demonstrated that structural and functional changes can occur in the central nervous system. Lifelong learning allows the brain to process, decode, and implement new knowledge and abilities [30].

Imaging studies of the human brain have demonstrated that cognitive training performances and fundamental ingenuities can modify the amounts of gray issues and synaptic activity [31]. In addition, the modification of synaptic activity by dendrite branching is a constant occurrence in adults. A neuron that has lost input from a damaged neuron can create new dendrites or filaments. This synaptic repair is beneficial for both recovery processes and regular learning and is directly related to and dependent on experience. Without the system's motivating inputs, these connections and new connections cannot form [32].

The second category of brain mechanisms under consideration is neuronal circuit effects. Synaptic reorganization is caused by structured sensory input and structured activity, such as training and rehabilitation. The third category is the relationship between the hemispheres in terms of competition. This relationship is significant as there is evidence that after damage to one hemisphere, the natural inhibitory effect on the other side is lost or diminished [33]. Damage to one hemisphere of the brain alters the equilibrium of functions. The degree of performance enhancement is determined by how much the

impedance of the damaged circuits can be decreased. By activating the circuits in the damaged hemisphere or reducing the activity in the healthy hemisphere, cognitive rehabilitation exercises can explain the improvement of attention deficit symptoms via the underlying mechanisms of neuronal plasticity. García-Redondo et al. [34] investigated the effects of a serious game based on multiple intelligences on attention in people with attention deficit hyperactivity disorder and specific learning disorder in a similar study. Accordingly, performance measures and attention monitoring were employed. The intervention lasted 28 sessions, during which participants practiced 10 games based on multiple intelligences. Following the intervention, there was a significant improvement in the performance measures of attention (visual attention), with a significant difference in the post-test between the experimental and control groups, which was consistent with the findings of the current study.

People are presented with cognitive rehabilitation exercises in a hierarchical structure and with varying degrees of difficulty. Mastery of performing tasks and navigating hierarchies brings difficulty, control, and self-regulation, along with a boost in self-esteem. Researchers have discovered that people's attention can be brought under voluntary control through self-regulation techniques [35]. In addition to its cognitive benefits, this gradual learning process has a substantial motivational impact. In any case, mastering a hierarchy increases a person's self-esteem and sense of control, leading to fulfillment. Yang et al. [36] investigated the effects of different games on students' attention and demonstrated the role of play therapy in increasing attention. Ponce et al. [37] investigated the efficacy of a computer-based educational program designed to provide direct instruction in a set of reading comprehension strategies. Reading comprehension gains from the pre-test to post-test stages were significantly higher for students trained with this program compared to students who received traditional instruction. The findings support the effectiveness of direct instruction in specific learning strategies in a computer-based environment and are consistent with the current study's findings. Rajabi et al. [38] concluded that technological advances offer an intriguing vehicle for international interventions and that combining neurofeedback (NF) with game-based cognitive training can produce positive therapeutic effects on brain waves and attention deficit hyperactivity disorder symptoms.

Among the limitations of the current research is the need for a comparison between the studied treatment method and other treatments for attention deficit disorder. To conduct future research, it is recommended to

compare the efficacy of game therapy to the efficacy of drug therapy, behavioral therapy, or a combination of the two. Also, the impact of play therapy on the various components of executive performance, such as working memory, organization, and planning, was not investigated separately in the present study. One of the study tool's limitations is that it is based on software, which requires the use of a computer. The lack of a follow-up stage to evaluate the constancy of the changes made in the participants, the small sample size, and given that all participants were affiliated with the College of Medicine at the [University of Baghdad](#) are additional limitations of the current research. For future studies, it is suggested that the neuropsychological rehabilitation program be applied to other neurological conditions.

Conclusion

The current study found that play therapy was effective on the variables of omission and commission errors and reduced these variables in the intervention group under cognitive rehabilitation. In the control group, there was no significant difference in the mean scores of the mentioned variables. As a result, it is concluded that cognitive rehabilitation based on play therapy can be utilized as an effective method of increasing people's attention.

Ethical Considerations

Compliance with ethical guidelines

The current study was approved after review and presentation in the Ethics Committee of the College of Medicine, [University of Baghdad](#).

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Authors' contributions

All authors contributed equally to preparing this article.

Conflict of interest

The authors declared no conflict of interest.

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