

The Effect of Cognitive-Behavioral Play-Therapy on Electroencephalographic Patterns and Behavioral Symptoms in Children with Oppositional Defiant Disorder

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ABSTRACT

Objectives: The purpose of this study was to investigate the effect of cognitive-behavioral play-therapy on EEG pattern and behavioral symptoms of children with oppositional defiant disorder in Shiraz.

Methods: In this study, pre-test and post-test design with control group was used. The statistical population consisted of all 7 to 9 year old male children referring to counseling centers from May to September 2019 in Shiraz. Data were analyzed using available sampling method. 24 children were selected according to CBCL questionnaire criteria and diagnostic interview. Then, they were randomly divided into experimental and control groups. Electroencephalography was recorded for both groups. The experimental group underwent 10 sessions of play-therapy. After the intervention sessions, electroencephalography recording from both experimental and control groups was again performed. Covariance analysis was used for data analysis.

Results: The results of multivariate analysis of covariance showed that after adjusting the post-test scores by eliminating the pre-test effect, there was a significant difference between the experimental and control groups in terms of the severity of oppositional symptoms ($P < 0.001$, $F = 82.325$). Furthermore, the results show that after adjusting the post-test scores by eliminating the pre-test effect, there is a significant difference between the experimental and control groups in terms of oppositional symptoms ($P < 0.001$, $F = 27.231$). In other words, cognitive-behavioral play therapy can reduce the oppositional symptoms in the experimental group.

Conclusion: The results of the statistical analysis of the data showed that cognitive-behavioral play-therapy modulated the pattern of electroencephalography and reduced the behavioral symptoms in children with oppositional defiant disorder.

Keywords

oppositional defiant disorder, Cognitive-Behavioral play-Therapy, Electroencephalography.

Extended Abstract

1.Introduction

One of the most common behavioral disorders that occurs in primary school age is Oppositional Defiant Disorder. ODD is characterized by symptoms such as losing temper, arguing with adults, actively disobeying or not cooperating with adults' rules and requests, intentionally upsetting others, blaming others for mistakes or misbehavior of themselves, being hypersensitive and getting upset quickly; others show resentment and anger as well as resentment and revenge. Basically, they have problems in communicating with parents, teachers and peers and they are at a lower level in terms of social skills and academic abilities in comparison with their peers. Play therapy is an effective and growing intervention method for child disorders and their trauma. In the process of play therapy, children express their accumulated imperfections in an appropriate context through aggression and learn and internalize how to control it with proper reflection. Evidence has shown that play therapy with cognitive-behavioral approach is effective in developing children's problem-solving skills, social skills and other adaptive and cognitive-behavioral strategies. This type of play therapy requires the active interaction of children and their active participation in their treatment; as a result, the advantages of this approach largely eliminate the disadvantages of other approaches. One way to treat children with Oppositional Defiant Disorder is to improve their abnormal EEG patterns. Electroencephalography (EEG) is an extremely sensitive voltmeter with the measurement unit of microvolts or millivolt. EEG recording is completely non-invasive and can be repeatedly used as a valuable tool by patients, adults and children without risk

or limitation in studies. Given that children with Oppositional Defiant Disorder have problems with social skills and academic achievement, this study intends to answer whether play therapy with cognitive-behavioral approach can affect behavioral symptoms and electroencephalographic patterns in children with Oppositional Defiant Disorder?

2.Methods

In this study, pre-test and post-test method with a control group were used. The statistical population included all boys between 7 to 9 years old who referred to counseling and psychological centers in Shiraz from May to September 2017. Available sampling method was used to analyze the research data. According to the criteria in the Child Behavior Checklist (CBCL), parent form and clinical interview, 35 people were identified. 24 of them were randomly selected and randomly divided into experimental and control groups (12 in control group and 12 in experimental group). First, electroencephalography records were performed for both groups. The cognitive-behavioral play therapy intervention consisted of 10 sessions for 5 weeks and each session lasted 45 minutes. The focus of the therapeutic intervention was to increase interpersonal and group communication and to teach verbal and non-verbal communication skills. At the end of the intervention sessions, electroencephalographic records were re-performed for both experimental and control groups. Analysis of covariance was used to analyze the data.

3. Results

The research results indicated that CBCL in the experimental group increased and the electroencephalographic patterns decreased significantly in the post-test. However, these changes in both variables were not observed in the control group. In addition, the results of multivariate analysis of covariance in the control and experimental groups indicated that the groups are significantly different from each other in at least one of the dependent variables.

The results of multivariate analysis of covariance showed that after adjusting the post-test scores by eliminating the pre-test effect, there was a significant difference between the experimental and control groups in terms of the severity of oppositional symptoms ($P < 0.001$, $F = 82.325$). In other words, cognitive-behavioral play therapy can reduce the symptoms of electroencephalographic pattern of Oppositional Defiant Disorder in experimental group. Furthermore, the results show that after adjusting the post-test scores by eliminating the pre-test effect, there is a significant difference between the experimental and control groups in terms of oppositional symptoms ($P < 0.001$, $F = 27.231$). In other words, cognitive-behavioral play therapy can reduce the oppositional symptoms in the experimental group.

4. Discussion and Conclusion

Due to the fact that the educational content of cognitive-behavioral play therapy is widely focused on the symptoms of children's oppositional behavior, they learn necessary skills to communicate with others and apply these skills in the form of role-playing games during play therapy intervention sessions. Finally, this cognitive-behavioral approach leads to acquisition of adaptive and coping skills and the correction of biased cognitive processing, which in turn reduces the child's oppositional behavior. In addition, cognitive-behavioral play therapy has a significant effect on the electroencephalographic pattern associated with Oppositional Defiant Disorder and also the electroencephalographic symptoms associated with this disorder have improved in children, which has shown a significant improvement in these symptoms and behavior. As a result, play therapy approach provides a platform for improving oppositional behaviors and modifying children's electroencephalographic patterns.

5. Ethical Considerations

The importance of implementing the plan was explained to the participants' parents in a briefing session before the start of the treatment program. Sample participants participated in the study consciously with satisfaction and their parents were present during the intervention sessions. In addition, they were assured that they can quit the sessions at any stage of the research. The confidentiality of information was also observed.

Conflicts of interest

The authors of this article state that there is no conflict of interest

Introduction

Every day in Iranian schools, students are observed punished for arguments and aggressive behaviors and face the reaction of school parents. In most cases, parents and school parents are in conflict with them [1]. One of the most common behavioral disorders that occurs in primary school age is the Oppositional Defiant Disorder [2] which has a prevalence of between 2 and 16 percent among preschool or early school children and in the pre-adolescent stage. The disorder is characterized by symptoms such as flowing off the handle, arguing with adults, actively disobeying or not cooperating with adults' rules and requests, intentionally upsetting others, blaming others for their own mistakes or misbehavior and getting upset easily. Others show annoyance, anger, as well as avenge and revenge [3].

Children with Oppositional Defiant Disorder (ODD) often show irritability, mood fluctuations, and anger. Studies show that they have significant problems with emotional fluctuations, especially in negative cases [4]. Children with this disorder mainly have problems in relationships with parents, teachers and peers and are at a lower level in terms of social skills and academic abilities than their peers [5].

Oppositional Defiant Disorder can be a gateway to various psychiatric disorders in adulthood [6]. Apart from the effect that Oppositional Defiant Disorder has on social, educational, and relationship issues of family members, if left untreated, in more than 75% of cases, it turns into adult psychological trauma associated with aggression and violence [7]. Oppositional Defiant Disorder causes internal and external problems for children. It predicts a wide range of adaptation problems. Adaptation is a process in which a person tries to adapt to external and internal pressures [8].

One of the most common methods of treatment which has a wide application in behavioral disorders in children, is play therapy. Playing is the right way to treat a child; Because children often have difficulty expressing their emotions orally, they can reduce their barriers and express their emotions better through playing [9]. Play therapy is an effective and growing method for intervening in child disorders and trauma [10]. Psychoanalysts such as Sigmund Freud, Ana Freud, and Melanie Klein have used play therapy theories as a means of child treatment [11]. Play therapy is a way for children to help themselves. It is based on the fact that playing is a natural mean for children to express themselves [12]. In the process of play therapy, children express their accumulated imperfections in a suitable context through aggression and with proper reflection, learn how to control and internalize it [13].

Many children and their families initially find the play therapy process unsafe and occasionally enter the play therapy process with opposition. Parents' opposition to play therapy and child-related therapies more likely occur at the outset, due to misconceptions about play therapy and the achievement of its goals. This can be done through a careful process of preparing the child and family to understand how emotions are expressed and stated [14].

Evidence has shown that play therapy with a cognitive-behavioral approach is effective in developing children's problem-solving skills and social skills and other adaptive and cognitive-behavioral strategies. This type of play therapy requires the active interaction of the child and his active participation in his treatment, and as a result, the advantages of this approach largely eliminate the disadvantages of other approaches [15]. Also, play therapy is very

useful in relieving pain [16]. Research has also shown that play therapy is an effective way to treat attention deficit/hyperactivity disorder in children [17].

Play therapists believe that in 80% of cases, their treatments are successful. The mechanism of action of this approach is through the correction of maladaptive perceptions and changing beliefs and attitudes related to the symptoms of the disorder and considers the bilateral and complex interaction between cognitions, emotions, behavior and environment [15].

In a study conducted by Janatian [18] on the effect of cognitive-behavioral play therapy on the severity of ADHD symptoms, the results showed that play therapy can be used as an effective treatment for these children.

According to a study conducted by Zare Pour et al. [19] as the effectiveness of group play therapy on the rate of depression in children, the results of research have shown the effectiveness of play therapy on reducing depression in children.

Torabi et al. [20] conducted a study entitled The effect of group play therapy on reducing aggression in preschool children in Shiraz. The results of the study show that identifying children with aggression from an early age, leads to increasing awareness about the frequency of various problems and behavioral disorders associated with it and creating effective treatment strategies. Since group play therapy can reduce aggression in children, the need to develop and present special programs containing group play therapy for prevention and treatment seems necessary.

A recent study of 8 to 9 year old children with ODD found that a Child's Behavioral Check List score was an important predictor of mood disorders between the ages of 14 and 15 [21].

One way to improve children with Oppositional Defiant Disorder is to improve their abnormal EEG patterns. Electroencephalography (EEG) is an extremely sensitive voltmeter which its unit of measurement is microvolts or million millivolts. In rehabilitation applications, non-invasive EEG method is usually used for signal extraction. The advantage of this method is its small size, cheapness and portability of signal recording equipment; At the same time, it does not have the potential dangers of aggressive methods [22]. EEG recording is completely non-invasive and can be repeatedly used by patients, adults and children without risk or limitation in studies as a valuable tool [23].

Alpha amplitude imbalance in the frontal lobes (alpha amplitude at F4 is at least 15% larger than alpha amplitude at F3) is associated with a variety of problems, including oppositional and defiant behaviors. High levels of alpha in the right frontal cortex will be associated with opposition in children, while the same amplitude in the left frontal cortex indicates a depressed mood. We often find this imbalance in children's EEG associated with oppositional and defiant behaviors [24].

Given the fact that children with Oppositional Defiant Disorder have problems with social skills and academic achievement, this study intends to answer the question of whether Play-Therapy based on Cognitive-Behavioral approach can affect Electroencephalographic Patterns and Behavioral Symptoms in Children with Oppositional Defiant Disorder?

Methods

In this study, a pre-test-post-test experimental method was used and the effectiveness of an independent variable (play therapy) on dependent variables (behavioral symptoms and electroencephalographic pattern of Oppositional Defiant Disorder) was investigated. The statistical population included 7 to 9 year old boys referred to counseling and psychology centers in Shiraz from May to September 2019. In this study, the available sampling method was used. The samples were selected from those who referred to the Yekta Counseling and Psychology Center in Shiraz. Then, according to the criteria in the Child Behavior Check List (CBCL), parent form and clinical interview, 35 people were identified. 24 of them were randomly selected and randomly divided into experimental and control groups (12 in the control group and 12 in the experimental group).

Research tools

Clinical interview

In the present study, a diagnostic interview was conducted by a clinical psychologist for parents of children in the counseling center to diagnose the symptoms of Oppositional Defiant Disorder according to DSM-5 criteria.

Child Behavior Check List (CBCL)

Child Behavior Check List (CBCL) is a common way to identify behavioral problems in children. One of the important features of this test is the evaluation of emotions, behavior and social approaches of people in life. This checklist contains 119 questions that are performed in this research by Fars Ravan CBCL software. After entering the answers to the questions, a sample of accurate graphic output, along with z-scores and raw scores with a normalized Iranian profile appropriate to age and gender, is drawn for each subject. The validity coefficients of CBCL forms were reported 0.97 using Cronbach's alpha and 0.94 using test-retest validity. Content validity (choice of question logic and use of class one analysis of questions), criterion validity (using psychiatric interview with child and also correlation with CSI-4 scale) and construct validity (internal relations of scales and group differentiation) of These forms have been reported as desirable [25].

Electroencephalography recording device

Vilistus (4 channel) brand: This device records brain waves and sends brain waves to its software for analysis. Together with Biosees software, this device displays the amplitude of brain waves separately in the standard frequency band. The statistical population included 7 to 9 year old boys referred to counseling and psychology centers in Shiraz from May to September 2019. In the present study, the available sampling method was used. A total number of 24 children were identified based on diagnostic interviews. In the first session, in order to perform the pre-test, the Child Behavior Check List (CBCL) and EEG recording F3 and F4 regions of 10-20 International System were performed and recorded for each subject for two minutes. The cognitive-behavioral play therapy intervention consisted of 10 sessions of 45 minutes for 5 weeks. The focus of this therapeutic intervention is to increase interpersonal and group relationship and to teach verbal and nonverbal communication skills. In the second and fourth sessions, the subjects were taught by pre-determined games including topics such as how to talk properly, skills in communicating with others, empathy, division of labor, group work, etc. In the third and sixth sessions, the subjects were taught the techniques of problem solving, decision making and cooperation skills in the form of games. In the third and sixth sessions, the subjects were taught the techniques of problem solving, decision making and cooperation skills in the form of games. The fifth, seventh and eighth sessions, including increasing the skills to deal with negative emotions, teaching social skills, self-awareness and cognitive restructuring skills, were presented in the form of special games. In the ninth session of the cognitive-behavioral play therapy intervention, all the skills learned and the trainings performed in the previous sessions were reviewed. In the last session, children's changes were assessed and post-test was performed by re-recording electroencephalography and CBCL test from both experimental and control groups. In this study data evaluation was performed by analysis of covariance.

Findings

Descriptive indices of subjects' opposition and defiant scores including the mean and standard deviation of CBCL and EEG opposition and defiant scores in both groups in pre-test and post-test are shown in Table 1.

In order to evaluate the effectiveness of the intervention and to determine the significance of the difference between the experimental and control groups and also to control the effect of the pretest, the results of analysis of covariance are shown in Table 2.

According to the results of Table 1, the CBCL results in the experimental group in post-test increased significantly and the electroencephalographic pattern decreased. However, these changes in both variables were not observed in control group. Before examining the hypotheses, homogeneity of regression slopes and data normality test (Shapiro, Kolmogorov-Smirnov test) were used for CBCL and electroencephalography variables. According to the data obtained from the slope of the regression line and the assumptions of analysis of covariance, the analysis of covariance can be used to analyze the data of the experimental group with the intervention of play therapy.

As shown in Table 2, the results of the multivariate analysis of covariance test in the control and experimental groups show that the groups differ significantly in at least one of the dependent variables.

Based on the results of multivariate analysis of covariance, the overall effect of the experiment was investigated. Then, in order to accurately determine the effect of the experimental variable in which of the dependent variables has a significant difference, the results of univariate analysis of covariance were also examined. The results of this test are reported in Table 3.

Table 1. Descriptive indicators of research variables

	Standard deviation	mean	Standard deviation	mean
	Control group		Experimental group	
Child CBCL at pre-test	4	67.00	3	66.00
Child CBCL at post-test	4	67.08	3	50.00
Percentage of alpha frequency amplitude imbalance between F3 and F4 regions in the pretest	6.00	27.00	7.03	26.00
Percentage of alpha frequency amplitude imbalance between F3 and F4 regions in the post-test	6.06	27.01	2.00	12.00

Table 2. Results of multivariate covariance on post-test scores of variables in control and experimental groups with play therapy intervention

test	value	F	Hypothesis Degree of Freedom	Error Degrees of Freedom	The significance level
Pilay effect	0.933	132.311	2.00	19.00	0.001
Wilks' Lambda	0.67	132.311	2.00	19.00	0.001
Hotelling effect	13.927	132.311	2.00	19.00	0.001
Roy's Largest Root.	13.927	132.311	2.00	19.00	0.001

Table 3. Analysis of covariance of mean scores in the severity of CBCL symptoms and electroencephalographic pattern of Oppositional Defiant Disorder

source	sum of squares	Degree of Freedom	Mean Squares	F	statistical power	The significance level
CBCL symptoms	210.895	1	210.895	27.231*	0.999	0.000

EEG symptoms	346/479	1	346/479	82.325*	1.000	0.000
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Multivariate analysis of covariance was used to determine the effect of cognitive-behavioral play therapy on the severity of electroencephalographic pattern of Oppositional Defiant Disorder in subjects. The results showed that after adjusting the post-test scores by eliminating the pre-test effect, there was a significant difference between the experimental and control groups in terms of the severity of Oppositional Defiant symptoms ($P < 0.001$, $F = 82.325$). In other words, cognitive-behavioral play therapy can reduce the severity of electroencephalographic pattern of Oppositional Defiant Disorder in experimental group. The results also show that after adjusting the post-test scores by eliminating the pre-test effect, there is a significant difference between the experimental and control groups in terms of the severity of Oppositional Defiant Disorder symptoms ($P < 0.001$, $F = 27.231$). In other words, cognitive-behavioral play therapy can reduce the severity of Oppositional Defiant Disorder symptoms in subjects of experimental group.

Discussion

This study was performed to evaluate the effectiveness of cognitive-behavioral play therapy on electroencephalographic patterns and behavioral symptoms in children with Oppositional Defiant Disorder. The results showed that cognitive-behavioral play therapy modulated the pattern of electroencephalography and significantly reduce the symptoms of Oppositional Defiant Disorder in experimental group in comparison to the control group. The results of the study are consistent with the findings of Spence et al. [26], Gainer, Webster and Champion [27], Happer [28], Gallagher, Rabian, and McCloskey [29], Hall, Kaduson and Schaefer [30], Evans, Mullett, Weist and Franz [31]. In explaining the findings of the present study, it should be noted that children with Oppositional Defiant Disorder face many problems in cognitive skills [32]. Cognitive deficits are often seen with impaired executive functions, emotional regulation, language processing, and social information processing. For example, about 55% of children with language disorders also have diagnostic backgrounds Oppositional Defiant Disorder; That is, if the child lacks the language skills needed to name and categorize emotions or communicate with others, he will have difficulty solving problems and tolerance of failure [33]. An important explanation that can be offered is that the educational content of cognitive-behavioral play therapy is widely related to the symptoms of Oppositional Defiant Disorder in children. During play therapy intervention sessions, children learn the necessary skills to communicate with others and apply these skills in the roles during the play sessions. Finally, this cognitive-behavioral approach leads to the acquisition of adaptive and oppositional skills and the correction of biased cognitive processing, which in turn reduces the child's defiant behavior.

Another important explanation here is that cognitive-behavioral play therapy has a significant effect on the electroencephalographic pattern associated with Oppositional Defiant Disorder. Electroencephalographic symptoms associated with the disorder have shown significant improvement in these symptoms and behavior in children. As a result, the play therapy approach provides the basis for improving Oppositional Defiant behaviors and modifying the electroencephalographic pattern of children.

Results

In this study, there are many variables that are beyond the control of the researcher that can affect the results of the intervention (such as background disorders of the child, parental behavior, etc.). Also, the results of the present study can be generalized to boys with Oppositional Defiant Disorder who referred to counseling centers in Shiraz, and if there is a need to generalize the results to other disorders, it is necessary to do it with sufficient knowledge. In addition, this study was performed on boys aged 7 to 9 years; Therefore, it cannot be generalized to the whole society. According to Lochman et al. [34], longer cognitive-behavioral therapy (18-12 sessions) leads to better and more stable results. Simultaneous interventions on parents seem to play a major role in the greater effectiveness of the intervention in children with Oppositional Defiant Disorder.

Finally, it is suggested that future research be conducted with a larger number of samples and longer sessions, interventions be applied to parents at the same time and if possible, interventions should be done with the help of the teacher. It should also be noted that because the children in this study were all boys, the ability to generalize the results of this study to girls is reduced and it is suggested that future research be conducted on girls as well. Researchers should also consider post-treatment follow-up in their study.

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