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A comparison of the effects of pharmacotherapy and attentional plays on hyperactivity and neurological soft signs in children with attention deficit/hyperactivity disorder

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Abstract

Introduction: In recent years, there has been an increasing number of studies regarding the neurological soft signs (NSS) in Attention deficit/Hyperactivity Disorder (ADHD). However, there were a few studies regarding the effects of current therapeutic methods on NSS in children with ADHD in Iran. This study aimed to investigate and compare the effects of drug therapy and attentional plays on these signs.

Methods: This was a quasi-experimental study with pre-test, post-test, and a control group, in which 100 pupils with a diagnosis of ADHD participated in the academic year of 2016-2017. Following the administration of the Cambridge Neurological Inventory (CNI) and Conners scale, and according to pupils' scores and their cut-off point, the subjects were divided into two groups: low scores and high scores of NSS signs. Each group was randomly assigned into three groups (two experimental and one control), which were six groups. After introducing the interventions, the data were analyzed by repeated-measures ANOVA.

Results: The data analysis revealed a significant difference between experimental and control groups; two interventions have reduced the signs based on the severity of NSS signs and hyperactivity. Drug therapy was more effective on severe neurological soft signs, while attentional games were more effective on low NSS.

Conclusion: The results could be useful for therapists as a guide in selecting the type of therapy according to the severity of neurological soft signs.

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Extended Abstract

Introduction

Attention deficit/hyperactivity disorder was regarded as one of the most prevalent disorders in children and adolescents. The present study aimed to investigate and compare the effects of drug therapy and attentional play therapy on neurological soft signs (NSS) and hyperactivity in children with ADHD. Multiple etiologies were described for ADHD, encompassing a combination of genetic, neurological, and environmental factors; among them, tox-

ins, malnutrition, drug or alcohol use in pregnancy, and premature birth are strongly emphasized. Recent studies suggested that the prefrontal cortex and premotor area may have a crucial role in ADHD due to their interconnections with different subcortical areas. Furthermore, neuroimaging findings have shown that ADHD children may be suffering from impairments of consecutive functions, decision-making, problem-solving, time perception, and working memory. They also had lower scores in sustained attention, shifting attention, and emotion processing.

The NSS is defined as minor and subtle sensory-motor abnormalities, which may be regarded as normal in infantile and childhood stages of development, but they would be regarded abnormal if they continued afterward. The NSS are not explicitly related to dysfunctions of the brain areas and are classified into three categories, including sensory integration, motor coordination, and motor sequencing. Some studies proposed that NSS with hyperactivity, inattention, and developmental delay in speech may be viewed as the initial and subtle signs of ADHD. Other studies found that NSS in children with ADHD was concordant with developmental delay due to cytoarchitecture of the cortex. In addition, other studies showed that there was a significant relationship between NSS and motor abnormalities in ADHD children. They also found that NSS was a reliable predicting factor in functional deterioration in ADHD. This fact, in turn, may lead to appropriate diagnosis and intervention for ADHD children. Some children with ADHD may concomitantly suffer from other disorders including conduct disorder and oppositional disorder, making them more vulnerable in their interactions with peer groups. Drug therapy was regarded as one of the first-line treatments for ADHD children, and methylphenidate proved to be effective via boosting noradrenergic and dopaminergic pathways in the frontal lobe cortex. However, drug therapy may be more useful in alleviating ADHD signs, and there remain some behavioral and relational signs that should be treated as well. Play therapy is a behavioral therapeutic approach by which children may gain opportunities to express their feelings freely and find resolutions for their problems through confronting reality. Some recent studies emphasized the effectiveness of play therapy in ADHD children. Some forms of play therapy are concentrated on attentional plays, by which the child learns to expand his/her attention span and control his / her impulsive behaviors, which in turn lead to enhancement of their attentional control. Accordingly, ADHD is a disorder with multiple signs; and different therapeutic approaches were examined and utilized in its treatment. Since different approaches were shown to be effective to different degrees of effectiveness, the present study was designed to evaluate and compare the effectiveness of play therapy and drug therapy in ADHD children, with an emphasis on neurological soft signs as a reliable predictor in the course of therapy.

Methods

This study was a quasi-experimental study with a pretest, post-test, follow-up and control group. The sample was selected from children with ADHD in the fourth grade of elementary schools in 2016. Conners test and Cambridge Neurological Inventory (CNI) were used in data collection. Of 170 pupils who were diagnosed with ADHD, 100 students were selected randomly, and the Conners parent scale (CPRS-48) and the Cambridge Neurological Inventory (CNI) were administered to them. Then, according to the NSS scores and determination of cutting point and determining the two groups of NSS on high and low levels (scores above and below the cutting point), the participants of each group were randomly assigned into two experimental and one control groups (in a total of six groups), and attentional games and drug therapy ad-

ministered on experimental groups, separately. The control group was on a waiting list during the intervention. The CNI was standardized in 1995 and was extensively sued to evaluate neurological soft signs. The inventory comprised 25 questions, with three subscales for motor coordination, disinhibition, and sensory integration. Recent studies reported that the internal consistency of the inventory was 0.83, and in the current study, the validity was calculated as 0.75, with a Cronbach's alpha of 0.83. The pharmacotherapy consisted of injecting Methylphenidate in a psychiatric clinic. NOVARTIS in Switzerland manufactured the drug. Attentional play therapy consisted of 15 sessions, which were performed by a clinical psychologist. Since there were two treatment types and two levels of scores in CNI, data analysis was performed by ANOVA through SPSS-23.

Results

Before conducting an analysis of the variance, the assumption of homogeneity of variances was tested, and it was confirmed. The analysis of variance revealed that there was a significant difference between the groups of high and low NSSs and between the attentional plays and drug therapy groups as well. In other words, drug therapy was more effective on children who had high scores of NSSs, while attentional therapy was more effective on children who had low scores of NSS. A review of the findings of the post-test and follow-up phases showed that there were some differences in the dependent variables in experimental and control groups. Furthermore, it was found that there were differences among the groups in the pre-test, post-test, and follow up phases, suggesting an interaction effect between neurological soft signs and the type of treatment (P=0.000).

Conclusion

An essential suggestion of this study was that drug therapy and attentional play therapy had differential effects on NSSs, depending on severity of NSS. An significant finding of this study was that drug therapy was more effective on ADHD with higher neurological soft signs, while attentional play therapy was more effective on ADHD with lower NSS. The authors have not found previous studies with the same findings. Hence, this may be the first time a study revealed differential effects of play therapy and drug therapy on ADHD with different levels of neurological soft signs. The fact that methylphenidate was more effective on ADHD with a higher score of NSS suggested that motor coordination, motor integration, and continuous motor activities were potentially more possible to be altered with drugs. It was recently found that long-term prescription of methylphenidate may have a positive effect on cortical development of white matter, cingulate, and cerebellum. Moreover, according to new neuropsychological findings, ADHD was postulated as a neurodevelopmental disorder in which brain consecutive functions may be impaired; however, these consecutive functions were shown to be effectively improved after the prescription of methylphenidate. Another finding of this study was that attentional play therapy concentrated on attentional skills and decreased both ADHD signs and mild forms of neurological soft signs.

Ethical Considerations

Compliance with ethical guidelines

All ethical principles are considered in this article, such as the informed consent of the participants, the confidentiality of information, and the permission of the participants to cancel their participation in the research. Ethical approval was obtained from the Research Ethics Committee of the Isfahan University Research Center. (IR.UI.REC.1396.031). This article was extracted from the Ph.D. thesis of first author Azadeh Bakhtiari at the Department of Psychology of Isfahan University.

Authors' contributions

Azadeh Bakhtiari, Karim Asgari, and Ahmad Abedi: Defined the concepts in choosing the subjects and designing the study. Azadeh Bakhtiari and Parisa Niari Khams: Collected the data. Ahmad Abedi analyzed data. Azadeh Bakhtiari and Karim Asgari: Writing and drafting. Azadeh Bakhtiari, Karim Asgari, and Ahmad Abedi: Discussed the results and participated in the preparation and editing of the article`s final paper.

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Conflict of interest

The authors declared no conflict of interest.