

Research Paper



Effectiveness of Neurofeedback With Selected Training Program on Motor Function, Anxiety, and Sleep Habits in Children With Attention Deficit/Hyperactivity Disorder (ADHD)

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ABSTRACT

Background and Aims Today, young children with attention-deficit/hyperactivity disorder (ADHD) have a variety of developmental disorders and problems, including developmental coordination disorder, anxiety, and sleep disorders. The aim of this study was to evaluate the effectiveness of neurofeedback combined with a selected exercise program on motor function, anxiety, and sleep in children with ADHD.

Methods In the current study, 20 children aged 7 to 9 years with ADHD who had normal intelligence were randomly divided into experimental and control groups. The experimental group underwent neurofeedback and physical activity training for 24 sessions of 45 minutes for one session. The experimental group was randomly divided into two groups, of whom five cases started their training sessions with neurofeedback and five cases started with physical activity. The control group performed their normal daily activities during this period. In the pre-test and post-test, the Bruininks-Oseretsky motor proficiency test was used to measure motor performance, the Child Behavior Checklist was used to measure anxiety, and the Child Sleep Habit Questionnaire was used to measure sleep habits. Data obtained from the present study were analyzed using analysis of covariance and SPSS v. 25 statistical software.

Results The results showed that there was a significant difference between the experimental and control groups in the scores of motor function, anxiety, and sleep habits ($P=0.001$).

Conclusion Combined exercises can be useful in improving motor function, anxiety, and sleep habits in children with ADHD.

Keywords Attention-deficit/hyperactivity disorder, Anxiety, Sleep habits, Motor function, Neurofeedback

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Extended Abstract

Introduction

Today, young children with attention deficit/hyperactivity disorder (ADHD) suffer from a variety of developmental disorders and problems, including developmental coordination disorder, anxiety, and sleep disorders. Hyperactivity disorder and attention deficit disorder are commonly used to describe children who repeatedly and repeatedly exhibit age-inappropriate behaviors in the two general areas of inattention and impulsivity-hyperactivity. Although a variety of treatments have been developed in the last three decades to treat ADHD, there is no unique optimal treatment for ADHD. Symptoms, such as hyperactivity, inattention, and impulsive behaviors are reported in response to medications, but medications with side effects alone are not enough to control the patient's problems and non-drug therapies, such as individual and group psychotherapy, behavioral therapy, play therapy, neurofeedback, and parental education should be used. Studies have shown abnormalities in electroencephalogram waves in children with ADHD compared to their normal peers. One of the relatively new methods of treatment to improve the abnormality of brain waves is neurofeedback, which has recently been used in various fields of therapy by psychologists, psychiatrists, and occupational therapists. Neurofeedback is a type of factor conditioning that trains a person to increase or decrease the activity of his brain waves. It is a non-invasive, painless procedure, in which sensors are attached to the patient's head, through which abnormal rhythms and frequencies are changed to normal or relatively normal rhythms and frequencies based on diagnostics based on quantitative brainwaves. Research shows that exercise can cause symptoms of ADHD and symptoms in their actions by stimulating neurobiological processes. There is a very strong relationship between mind and physical function in sports. A wide range of mental powers, such as concentration and attention is needed to improve athletic performance. Also, due to the heterogeneous nature of ADHD and multiple attention deficits, multiple approaches to treatment may lead to increased efficacy and more effective outcomes. The aim of this study was to evaluate the effectiveness of neurofeedback combined with a selected exercise program on motor function, anxiety, and sleep in children with ADHD.

Materials and Methods

In this study, 20 boys and girls aged 7 to 9 years living in Kish with ADHD who had normal intelligence were randomly divided into experimental and control groups. The Connors Parent-Teacher Questionnaire was used to assess ADHD and the Raven Children's Color Intelligence Test was used to assess the subjects' normal intelligence.

The experimental group underwent neurofeedback and physical activity training for 24 sessions of 45 minutes. The experimental group was randomly divided into two groups, five of them started their training sessions with neurofeedback and five cases started with physical activity. The control group performed their normal daily activities during this period.

In the pre-test and post-test, the Bruininks-Ozertsky motor proficiency test was used to measure motor function, the Achenbach questionnaire (child behavior list) was used to measure anxiety, and the Child's Sleep Habits Questionnaire was used to measure sleep habits. The data obtained from the present study were analyzed using analysis of covariance and SPSS software v. 24.

Results

The results showed that there was a significant difference between the experimental and control groups in the scores of motor function, anxiety, and sleep habits ($P=0.001$).

Discussion

It seems that combined exercises can be useful in improving motor function, anxiety, and sleep habits in children with ADHD. ADHD is a neurodevelopmental disorder characterized by electroencephalographic abnormalities. In neurofeedback practice, the skills of concentration and attention to real life are gradually transferred, and as a result, anxiety and performance are affected. Physical activity also increases cerebral blood flow, resulting in increased release of neurotransmitters, such as serotonin, dopamine, and neurotrophic factor in the brain, leading to improved motor function, anxiety, and sleep habits. Improving motor skills also makes children feel more competent in play, school, and daily activities, leading to a reduction in aggression, anxiety, and behavioral problems in general.

Finally, combined neurofeedback/physical activity exercises, in addition to variety and non-fatigue nature, can complement each other in improving the comorbidity of hyperactive children. Overall, due to the heterogeneous nature of ADHD, multiple approaches to treatment may lead to increased efficacy and more effective outcomes, and the most effective treatments for ADHD are those that are used intensively and consistently and use a combination of therapies.

Ethical Considerations

Compliance with ethical guidelines

In this research, ethical considerations were considered in accordance with the instructions of the ethics committee of the Research Institute of Sports Sciences, and the code of ethics was received under the number IR.SSRC.REC.1398.139.

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Authors' contributions

All authors contributed equally in preparing all parts of the research.

Conflict of interest

The authors declared no conflict of interest.

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