SJIF Impact Factor (2025): 8.688| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 10 | Issue: 4 | April 2025 - Peer Reviewed Journal

THE IMPACT OF NEUROREHABILITATION ON MOTOR SKILLS OF CHILDREN WITH POST-HYPOXIC ENCEPHALOPATHY

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Article DOI: https://doi.org/10.36713/epra20951
DOI No: 10.36713/epra20951

ABSTRACT

This article focuses on studying the effectiveness of motor dysfunction rehabilitation in children aged 2-6 years suffering from perinatal pathologies and encephalopathies, using neurostimulation and Bobath therapy. The study involved 40 children who underwent rehabilitation interventions combining neurostimulation and Bobath therapy over a 3-month period. The primary objective of the study was to determine the effectiveness of these innovative treatment methods in reducing motor dysfunctions, restoring muscle strength, and accelerating the rehabilitation process. The results demonstrated that the combination of neurostimulation and Bobath therapy significantly improved the children's motor activity and accelerated the overall rehabilitation process. The findings confirm the high effectiveness of these methods in treating perinatal pathologies and emphasize their importance for clinical practice.

KEYWORDS: *Neurostimulation, Bobath Therapy, Motor Dysfunctions, Perinatal Encephalopathy.*

INTRODUCTION

Post-hypoxic encephalopathy (PGE) is a neurological disorder that occurs in neonates as a result of hypoxia, or lack of oxygen, during the birth process, leading to delay and damage to the central nervous system. Hypoxia can occur either before or during birth, when the baby is deprived of oxygen. This condition is often accompanied by significant neurological and cognitive impairment, such as delayed motor skills, problems with balance and coordination, as well as delayed speech development and limited physical activity. Children suffering from PGE experience a variety of physical and neurological difficulties, which significantly affects their overall development and ability to move and function independently. The impairments that children experience as a result of damage to the central nervous system have a long-term impact on their lives and their ability to fully participate in society. Treatment of post-hypoxic encephalopathy includes various methods, such as physical therapy, neurological rehabilitation and neurostimulation. Among these methods, innovative approaches such as neurostimulation and bobotherapy, which are aimed at restoring motor skills, deserve special attention. Unlike traditional treatments, neurostimulation and bobotherapy affect the nervous system to stimulate improved movement, as well as the restoration of cognitive and motor skills in children. These approaches usually give positive results in the rehabilitation of children with hypoxic and ischemic damage to the nervous system, restoring their physical activity and abilities.

Neurostimulation is a technique used to activate and stimulate the central nervous system using electrical and magnetic impulses. Neurostimulation methods include transcranial magnetic stimulation (TMS) and transcranial micropolarization (tMCP). These methods help activate the functions of the central nervous system and promote the restoration of impaired neurological functions. A number of studies have shown that neurostimulation is effective in restoring motor and cognitive skills in children, and also helps improve their balance and coordination. The use of these methods is especially important for children with delayed motor functions due to hypoxic disorders, as they promote the activation of brain neuroplasticity and the restoration of impaired connections between neurons. This, in turn, improves movement and restores normal functionality of the body.

Bobotherapy is a method of physiotherapeutic rehabilitation aimed at developing motor skills in children with various neurological disorders. Bobotherapy includes specially selected exercises aimed at developing movements, improving posture and balance. This method is actively used to improve motor skills, restore functional activity and help children master basic movements such as walking, sitting, going up and down. Bobotherapy not only improves motor skills, but also helps children develop self-control and body regulation abilities, improving overall coordination and the ability to move independently. The combination of neurostimulation and bobotherapy can significantly improve motor functions in children with post-hypoxic encephalopathy. These methods, when used together, provide more noticeable results in rehabilitation, improving not only physical activity, but also cognitive development. The use of neurostimulation allows you to stimulate the central nervous system and activate the areas of the brain that are responsible for motor functions. While bobotherapy helps children develop these functions through practical application of movements and improved coordination.

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Research shows that the combination of these methods promotes faster recovery of motor skills in children with hypoxia-induced disorders. Neurostimulation and bobotherapy used together help activate brain neuroplasticity, restore connections between neurons and improve motor coordination, which significantly accelerates rehablitation.

Thus, this article will examine the effectiveness of neurostimulation and bobotherapy in restoring motor skills in children with post-hypoxic encephalopathy. We will explore how these methods can affect the improvement of motor functions and accelerate the rehabilitation process, which will ultimately lead to better recovery of motor and cognitive abilities of children suffering from hypoxic damage to the central nervous system.

THE OBJECTIVE OF THE STUDY

The objective of this study is to determine the effectiveness of neurostimulation and bobotherapy methods in restoring motor skills in children with post-hypoxic encephalopathy and their role in accelerating the rehabilitation process.

MATERIALS AND METHODS

The study involved 40 patients diagnosed with post-hypoxic encephalopathy. The patients were divided into two groups: the main group (25 people) and the control group (15 people). Patients aged 2 to 6 years underwent neurological and motor assessment using EEG and neuropsychological tests. The study was conducted for 3 months. The main group received a combination of neurostimulation and bobotherapy. Transcranial magnetic stimulation (TMS) was performed for 20 minutes, and transcranial direct current stimulation (tDCS) was performed for 30 minutes. The patients also participated in bobotherapy sessions, the duration of which was 60 minutes.

The control group received standard physiotherapy only, each session lasting 40 minutes, three times a week. During rehabilitation, both groups underwent initial and final assessments using EEG and motor skill tests. Changes in EEG and motor skills were regularly recorded during the study.

RESULTS

EEG (electroencephalography) played an important role in identifying changes in motor skills. EEG was used to monitor brain activity and neural connections in patients. At the initial stage of the study, all participants showed decreased brain activity and hypoxia-related abnormalities. However, after rehabilitation, EEG results improved significantly, especially in the main group.

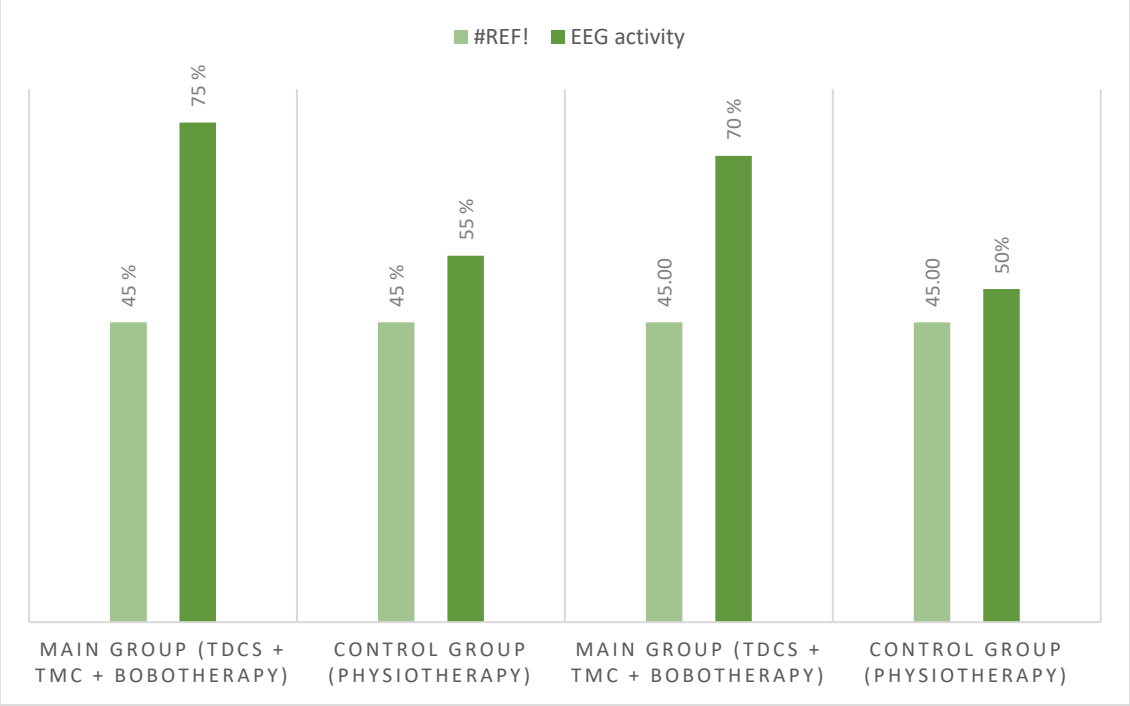


Figure 1. Changes in EEG activity and motor skills

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This chart illustrates the changes in EEG activity and motor skills at the beginning and end of the study. In the main group, where neurostimulation methods (tDCS, TMS) and bobotherapy were used, significant improvements in brain activity and motor skills were observed. In the control group, where only physical therapy was used, improvements were also recorded, but to a lesser extent.

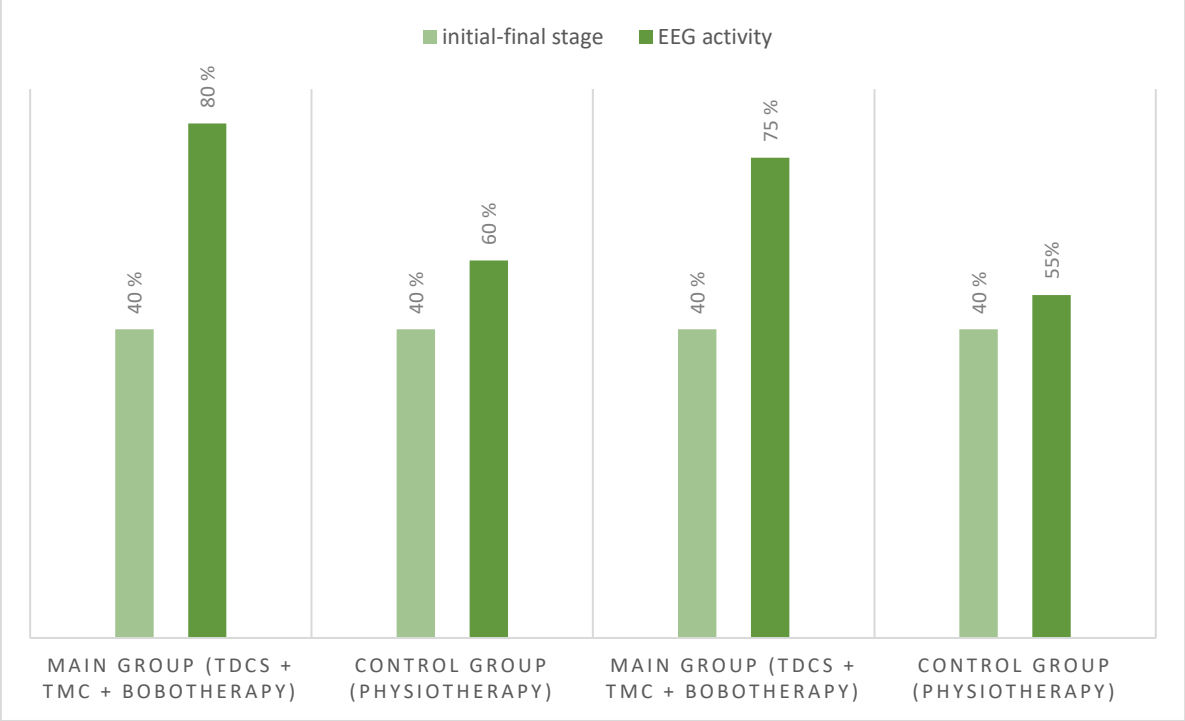


Figure 2. Changes in Motor Skills

The diagram shows the dynamics of motor skill improvement in the main and control groups. The main group demonstrated a significant increase in motor skills, with growth from 30% to 75%. In the control group, the changes were less pronounced, with improvement from 16% to 55%, which confirms the effectiveness of the use of complex therapy with neurostimulation and bobotherapy.

Table 1
Statistical analysis

Group	Improvement in motor skills (%) p-value Analysis result	Improvement in motor skills (%) p-value Analysis result	Improvement in motor skills (%) p-value Analysis result
Main group	От 30% до 75%	p = 0.003	**Significant improvement**
Control group	От 16% до 55%	p = 0.025	**Less improvement**

Statistical analysis was performed using the t-test and p-values to determine the significance of differences between the two groups. The results showed that in the main group, which underwent treatment with neurostimulation (tDCS, TMS) and bobotherapy, the improvements in motor skills were significantly higher (p = 0.003), indicating the high effectiveness of the therapy. In the control group, where only standard physiotherapy was used, the improvements were less pronounced (p = 0.025). These data confirm that the complex therapy with neurostimulation and bobotherapy is more effective than conventional physiotherapy.

CONCLUSION

As a result of the study, it was found that the use of neurostimulation and bobotherapy in the main group led to a significant improvement in motor skills and brain activity compared to the control group, where only standard physiotherapy methods were used. Statistical analysis showed a significant difference in the improvement of motor skills between the two groups, confirming the effectiveness of the complex therapy using tDMS, TMS and bobotherapy.

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