



An Intensive Combination of Bobath Therapy and Core Stability Exercises Is More Effective In Improving the Sitting Balance of Cerebral Palsy Children

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Abstract

This research is an experimental study with a pretest – post one group design which aims to analyze the effectiveness of intensive bobath therapy and core stability exercises on sitting balance in children with Cerebral Palsy. A total of 17 Cerebral Palsy children were given bobath therapy and core stability exercises for 10 weeks, with a dose: 1 time/day, 4 times a week with a treatment time of 60 minutes for each child. The research subjects were children suffering from Cerebral Palsy with the age criteria of 1 year sitting unbalanced. Carried out from February to July 2023. Sitting balance is measured using a sitting flat scale. The research subjects consisted of 13 men (76.47%) and 4 women (23.53%) with GMFCS categories III and IV. Average age of research subjects: 36.5758 ± 15.02504 . The results of the statistical test using Wilcoxon obtained a p value = 0.001. Conclusion: Bobath therapy and core stability exercises are more effective in increasing sitting level scale scores in Cerebral Palsy children.

Keywords: Bobath therapy, core stability exercises, sitting, Cerebral Palsy

Introduction

Cerebral Palsy is the most common neurological disorder in children that affects movement and posture due to damage to certain parts of the brain that control motor activity (Sari, Meidian, and Samekto 2016) dan (Abd-Elfattah et al. 2022a). This balance is affected by the strength of the erector spine and abdominal muscles that straighten and control the trunk (Belizón-Bravo et al. 2021). If low trunk muscle tone causes balance and mobility problems (Moura et al. 2017) and if there is leg spasticity in children with cerebral palsy it

will affect body mobility the lower part and inhibits motor development to stand and walk independently (Kim, Lee, and Park 2016)

Cerebral palsy children have poor postural control, decreased joint range of motion and muscle contractures that affect children's motor development significantly (Abd-Elfattah et al. 2022a) dan (Tekin et al. 2018) due to weak muscle strength, changes in nerve control and inadequate body position (Farjoun et al. 2022) Postural control of children with cerebral palsy involves control and orientation of the body to achieve balance stability (Monica et al. 2021). Children with cerebral palsy show hypotonic symptoms, weakness of the trunk muscles, increased muscle tone of the upper and lower extremities so that the child has difficulty sitting, playing in a sitting position, functional hand movements such as eating and activities of daily living (Guçhan Topcu and Tomaç 2020).

About 57% of diagnosed cases of childhood disability are related to cerebral palsy (Shin, Song, and Ko 2017) and occur 2 and 3 per 1000 deliveries (Horber et al. 2020). Approximately 1 in 500 newborns may be affected by cerebral palsy with an estimated prevalence of 17 million people worldwide which establishes it as the most common motor disability during childhood (Tunde Gbonjubola, Garba Muhammad, and Tobi Elisha 2021).

To date, there is still very little research examining the combined effects of Bobath exercises and core stability exercises in children with Cerebral Palsy and the interventions used in clinics for Cerebral Palsy generally focus on the extremities, but trunk abnormalities are neglected and only a few studies focus on them trunk exercises in the Cerebral Palsy population. . Research on this usually uses games and virtual exercises to train the trunk (Vinolo-Gil et al. 2021)

Two widely used therapy methods are Bobath exercises and core stability exercises. Core Stability exercises help strengthen the core muscles, including the abdomen, lower back and can increase body stability in children with CP and these exercises focus on balance, which is an important aspect in the development of children with CP.

Literature Review

Bobath exercises improve motor function abilities, the level of independence in daily living activities, and also balance abilities in children with cerebral palsy (Kavlak Et Al. 2018) (Besios et al. 2018) are also effective in gross motor learning, improve muscle tone, reflexes and reaction patterns and movement. Both methods have shown potential to help improve the balance of children with cerebral palsy, but a direct comparison of their effectiveness still needs further research.

Although these therapeutic methods have been known and used for some time, their combination has become increasingly relevant and received more attention in research and clinical practice in recent years. The combination of these two therapies is considered promising because they can complement each other to achieve better results in improving balance, mobility and motor function in children with Cerebral Palsy. Therefore, this study

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aims to evaluate the effectiveness of intensive core stability training and Bobath therapy in improving sitting balance in children with Cerebral Palsy.

Research Method

The type of research was a pre-experiment with a pre-post test one group design by providing Bobath therapy with Pilates to children with cerebral palsy. A total of 17 children with cerebral palsy aged 1 - 7 years who met the inclusion criteria, namely not being able to sit and stand, being able to understand commands and included in levels III - IV of the GFMCS classification. This research was carried out from February to June 2023 at the Daya Makassar and YPAC Makassar children's clinics.

Research procedure

This research was conducted from February to February to July 2023. A total of 17 children with diplegia were at the Disabled Children's Education Foundation in Makassar City and the Child Growth and Development Clinic in Daya Makassar City. During this study, no children from the two research groups dropped out.

Research procedures are carried out starting from:

1. This research has received ethical approval from the Makassar Health Polytechnic Health Research Ethics Commission
2. Pre-test
Sitting balance is measured using the Level sitting scale (Triandari et al. 2018), (Sharma, Sharma, and Bharadwaj 2018) which is recorded on the measurement blank
3. Implementation of Research
Before applying Pilates exercises and bobath exercises, passive movements of the arms and legs and trunk mobilization are first given as preliminary exercises. The research subjects were 17 children with cerebral palsy who were given a combination of Bobath and Pilates exercises. Treat each child with the dosage: 1 time/day, 3 times a week with a treatment time for each child of 45 minutes for 16 weeks.
4. Implementation of Post tests
After treatment on the research subjects, their sitting balance was measured which was recorded on the measurement blank in accordance with the physiotherapy examination form used in the Makassar Health Polytechnic Physiotherapy Study Program, Indonesia.

Data analysis

Data analysis and statistical tests were performed using Wilcoxon with the significance level for all statistical tests set at $p < 0.05$.

Results

Table 1: Characteristics of research data

Characteristics	Bobath and Pilates (mean \pm SD)
Age (Years)	36.5758 \pm 15.02504
GMFCS level III	10 (58.82 %)
GMFCS level IV	7 (41,18 %)
Gender	
Male	13 (76,47 %)
Female	4 (23,53 %)
Total	100 %

Tabel.2. Results of the Wilcoxon bobath therapy test and core stability exercises

On sitting balance in children with cerebral palsy

		N	Mean Rank	Sum of Ranks	Z	P
Level sitting of scale	Negative Ranks	0 ^a	.00	.00		
	Positive Ranks	12 ^b	6.50	78.00	-- 3.217	0.001
	Ties	5 ^c				
	Total	17				

Discussion

Cerebral palsy children experience problems due to damage to certain parts of the brain. After being given bobath therapy combined with Pilates exercises, our findings showed that there was a significant change in the sitting balance of children with cerebral palsy (Table 2).

These findings are of interest because both methods have been used widely in the rehabilitation of children with cerebral palsy, but there has not been much evidence combining their effectiveness directly. The combination of Pilates and Bobath is successful because the two methods target different aspects of the balance problems of children with cerebral palsy because pilates focuses on improving postural control, core muscles, and flexibility, while Bobath emphasizes the use of normal movement patterns and better motor coordination. The combination of the two can provide positive synergy and complement each other, thus creating a more holistic rehabilitation approach.

The research results of Fatih Tekin, Erdogan Kavlak, et.all (2018) show that posture and balance training based on Neurodevelopmental Treatment for 8 weeks is an effective approach to increase functional motor level and functional independence by improving postural control and balance in diparetic and hemiparetic cerebral palsy.

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Bobath therapy was applied to 30 Spastic Cerebral Palsy children between 18 months – 8 years for 6 months divided into two groups (treatment and control groups), and according to Bower E, McLellan D (Fatih Tekin, Erdogan Kavlak, 2018) there were significant differences in gross motor skills. This can occur because bobath increases proprioceptive input and reduces spasticity, facilitating normal motor development and improving activities of daily living, improving posture and movements performed with abnormal muscle tone (Moura et al. 2017)

In table 2 bobath exercises have an effect on improving sitting balance function in children with cerebral palsy. Bobath therapy focuses on increasing the child's body awareness or proprioception by providing appropriate stimulation to the muscles and joints. By understanding and feeling their body position, children with cerebral palsy can more easily regulate muscles to maintain balance when moving or being in certain positions with asymmetrical movements can help improve postural control, as it allows children to overcome imbalances and balance their bodies in a variety of ways situation.

Butler and Darrah stated that Bobath therapy develops postural control, balance and improves motor function, a level of independence in activities of daily living, and a balance of abilities in children with cerebral palsy (Kavlak et al. 2018) because balance is needed to explore and interact with the environment, and has been described as an anchor for purposeful movement and functional activity in children with cerebral palsy.

Improvements were also seen in motor skills and physical development. Therefore, Bobath therapy can be recommended for spastic diplegia cerebral palsy (Abd-Elfattah et al. 2022b). Bobath technique is effective in motor development and bobath is more effective than conventional treatment (K. Lee 2021).

The results of this study are in accordance with the research of Labaf et al. (2015) who concluded that the bobath approach improves gross motor function in children with cerebral palsy in four dimensions, namely laying, rolling, sitting, crawling, kneeling, and standing, but walking, running and jumping did not improve significantly (Panhan et al. 2018).

Besios et al. (2018) stated that bobath can significantly increase the excitability of alpha motor neurons in central nervous system disorders. With this increase, motor learning processes can be formed as well as adaptation processes and plasticity in the nerves which can help restore movement activities in cerebral palsy patients (dos Santos, Serikawa, and Rocha 2016)

In maintaining balance, it requires information about the position of the body to the surrounding environmental conditions obtained from peripheral sensory receptors found in the visual, vestibular and proprioceptive systems. Vestibular has the greatest contribution in maintaining balance, followed by visual and proprioceptive. In neurodevelopmental treatment with a trunk stability approach, there are proprioceptives and extrareceptors. Proprioceptive input stimulates the muscles, stimulation is carried to the spinal cord through two neurons, namely the spinal ganglion and dorsal (homolateral) Arcuatus fibers, one of which is the cerebellum and the other is forwarded to the thalamus, then afferents are delivered through two branches, namely to the motor cortex and sensory cortex. In the motor cortex, afferents are brought to the brainstem, while afferents that go to the sensory cortex continue their

journey to the cortical association area. Efferents continue stimulation to the basal ganglia and return to the thalamus until they return to the muscles.

According to research results, the trunk muscle core stability program is highly recommended as a treatment for children with spastic cerebral palsy to improve balance. In addition, pelvic symmetry must be considered as an important component in improving trunk control in children with spastic diplegia, so that evaluation of the trunk capabilities of children with spastic cerebral palsy must be carried out accurately (Kallem Seyyar, Aras, and Aras 2019)

The use of visual trunk stabilization can improve gross motor function and trunk balance in a sitting position (K. Lee 2021) concluded that the core muscle program improves feedback mechanisms as a component of stability control, because trunk stability relies on muscle strength and accurate sensory signals from body interactions sent to the central nervous system to establish continuous feedback and refinement of movement. Activation of core muscles such as the diaphragm, internal obliques, and transversus abdominalis will improve the ability to stand, walk, and jump in participants with spastic diplegia cerebral palsy (K. H. Lee et al. 2017)

In addition to getting proprioceptive (joint position) and exteroceptive (press and touch stimulation), patients get stimulation from awareness of the position of body parts obtained from visuals. Where the impulses come from slowly adapting nerve endings in the synovia and ligaments. When awareness of joint position arises, it is hoped that the muscles will be stimulated to contract, causing a muscle response and system adaptation in maintaining sitting balance.

According to Fatih Tekin, Erdogan Kavlak (2018) states that doctors and researchers who work with diparetic and hemiparetic Cerebral Palsy should focus more intensively on the bobath program to increase the level of motor development, postural control skills, balance and functional independence in activities of daily life (K. Lee 2021).

In the treatment of children with cerebral palsy, the bobath method provides direct improvements in equilibrium and righting reactions which will affect normal postural reflex mechanisms which will be the main support for normal movements in normal functional abilities (Park and Kim 2017). Based on the research of Arı and Kerem Günel (2017) concluded that the addition of trunk exercises with the bobath approach in children with cerebral palsy affects motor function positively [8], so it is recommended that bobath treatment in people with cerebral palsy be carried out according to the right duration and as early as possible for better recovery (Park and Kim 2017)

Previous research reported that information coming from the body and the environment can be conveyed simultaneously to the neck and trunk to enable coordination between head and limb movements, including neck muscle movements. One of the functions of the neck muscles is to coordinate the position of the body and head relative to the surrounding environment and provide stable support for the visual and vestibular systems during postural control (G. Arı and M. Kerem Günel, 2017)

When giving Pilates, the input obtained from proprioception and muscle stimulation influences muscle strength to maintain body alignment in an upright sitting position. This happens because Pilates stimulates the trunk muscles in defending the body against gravity, resulting in an increase in the number of sarcomeres and muscle fibers (actin and myosin

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filaments needed for muscle contraction), with the formation of new muscle fibers, muscle strength can increase which affects the trunk to maintain body alignment, in addition to visual and auditory stimulation which provides impulses to the cerebellum and cerebral cortex.

Activation of agonist and antagonist muscles synergistically, especially the trunk stabilization muscles which provide a response to the vestibular which becomes activated by the muscles to contract, causing a muscle response and system adaptation in maintaining sitting balance. Balance is influenced by visuals and head control, so when doing Pilates you must pay attention to correct alignment.

The combination of Bobath and core stability exercises can stimulate brain plasticity, namely the brain's ability to undergo structural and functional changes in response to exercise and stimulation. Thus, this combination can help improve brain connectivity and stimulate better motor development. This includes strengthening muscles, improving balance, developing motor control, and improving the overall quality of body movement.

Conclusion

Bobath therapy and core stability exercises are more effective in increasing sitting level scale scores in Cerebral Palsy children.

Declaration of conflicting interest

The author declares that there is no conflict of interest in this research article.

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