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Differences in the effectiveness of adding Bobath Exercise with (task-oriented training) on the balance of children with Cerebral Palsy

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Abstract

This research aims to analyze the addition of bobath exercise with (task-oriented training) on the balance of Cerebral Palsy children. Research use method Quasi experiment with pre test – post test two group design involving 44 (66.67%) boys and 22 (33.33%) girls aged 1-7 years. The research subjects were 66 people divided into two groups randomly. Group I, 33 children with cerebral palsy, were given Pilates exercises and group II, 33 children with cerebral palsy, were given bobath exercises. Treat each child with a dose of 1 time/day, 3 times a week with a treatment time of 45 minutes for each child for 16 weeks. Held from January to May 2024 at the Disabled Children's Education Foundation in Makassar City and the Children's Growth and Development Clinic in Daya Makassar City. Result, in the Bobath group's paired t-test statistical test for balance, the value was obtained at p=0.002 and for standing balance, the value was obtained at p=0.083. The bobath exercises group for sitting balance obtained a value of p = 0.001 and for standing balance obtained a value of p = 0.023. The Independent t-test statistical test obtained a value of p = 0.039 for sitting balance and standing balance obtained a value of p = 0.034. Conclusion, Bobath exercises which add task-oriented training to the sitting balance of children with cerebral palsy are effective in improving the sitting balance of children with cerebral palsy.

Keywords: Bobath Exercises, sitting, standing, Cerebral palsy, Task-Oriented Training

Introduction

The problem of this research is the disturbance of sitting and standing balance in children with cerebral palsy, this occurs due to brain damage during non-progressive growth and development, resulting in limited daily activities and independence (Fatih Tekin, Erdogan Kavlak, 2018) due to poor postural control, decreased range of motion in joints and muscle

contractures (Fatih Tekin, Erdogan Kavlak, 2018) , (Farjoun et al. 2022) , muscle weakness, changes in nervous control and inadequate body position (Monica et al. 2021) .

Postural control in children with cerebral palsy involves controlling and orienting the body to achieve balance stability (Guchan Topcu and Tomac, 2020) . Balance is influenced by the strength of the erector spine and abdominal muscles which uphold and control the trunk (Belizón-Bravo et al. 2021) , (Moura et al. 2017) , if low trunk muscle tone causes balance and mobility problems (Kim, Lee, and Park 2016).) , and if there is limb spasticity in children with cerebral palsy, it will affect limb movement and hinder the development of standing and walking independently (Abd-Elfattah et al. 2022a) .

When the trunk is stable, the upper and lower limbs can be used freely for activities, however children with cerebral palsy show symptoms of hypotonia, weakness of the trunk muscles, increased muscle tone of the upper and lower extremities, loss or delay of postural reflexes and loss of body stability so that the child have difficulty sitting, playing in a sitting position, functional hand movements such as eating and activities of daily living such as sitting in a wheelchair (Shin et al., 2017)

Around 57% of diagnosed cases of child disability are related to cerebral palsy (Horber et al. 2020) and 2 and 3 per 1000 births (Tunde Gbonjubola, Garba Muhammad, and Tobi Elisha 2021) . Approximately 1 in 500 newborns may be affected by cerebral palsy with an estimated prevalence of 17 million people worldwide establishing it as the most common motor disability during childhood (Vinolo-Gil et al. 2021) .

At the Makassar City Disabled Children's Education Foundation, the bobath method is generally used, but the Pilates method has not been implemented. Until now, research analyzing the differences in the effects of Bobath exercises and Pilates exercises interventions in children with cerebral palsy is very lacking and the interventions used generally target the extremities, but trunk disorders are neglected and only a few studies focus on trunk exercises in the cerebral palsy population. Research on this usually uses games and virtual machines to train the trunk (Numanoğlu Akbaş and Kerem Günel 2019) .

Pilates Exercises are effective in improving balance and gross motor function in cerebral palsy diplegia (Abd-Elfattah et al. 2022a) , (Sari, Meidian, and Samekto 2016) and according to AN Dos Santos, SS Serikawa, and NACF Rocha stated that pilates can be Alternative rehabilitation techniques to increase strength and postural control (dos Santos, Serikawa, and Rocha 2016) , improve balance and gross motor function in children with cerebral palsy.

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) , also effective in gross motor learning, improving muscle tone, reflexes and reaction and movement patterns (Trisnowiyanto and Syatibi 2020) .

Task-oriented training is a rehabilitation strategy that emphasizes training on specific task activities that are relevant to the individual's daily life. This approach focuses on restoring patient function and independence by practicing required skills in real-life contexts.

Specific Activities: Involve exercises that are directly related to the activity you want to improve, such as walking, lifting objects, or moving from a chair to bed. Functional Goal: Has the goal of improving the patient's function and independence in carrying out daily tasks. Patients are actively involved in exercise, and training is conducted according to individual abilities and needs. Exercises are performed in a context similar to real-life situations, so that patients can transfer the acquired skills to everyday life.

By understanding the differences in the effectiveness of Bobath and Pilates methods with Bobath Exercise (task-oriented training) on sitting and standing balance in children with cerebral palsy, it can help physiotherapists determine the appropriate treatment modality and which will provide the most effective benefits in a rehabilitation program specifically for cerebral palsy. Therefore, the aim of this study was to analyze the differences in the effects of Bobath exercises and Pilates exercises with Bobath Exercise (task-oriented training) on sitting and standing balance in children with cerebral palsy during the 16 week intervention period.

Research Method

This research is a quasi experiment with a pre test – post test two group design with a period of 16 weeks. All children with cerebral palsy were screened according to the research subject inclusion criteria, resulting in 66 people. Then they were simply randomly divided into Pilates exercises and Bobath exercises groups. The inclusion criteria for research subjects are: a. Cerebral palsy patients aged 1 - 7 years b. Sitting and standing are not balanced and c. Obtain consent from parents to take part in the research

This research was conducted from February to July 2022. A total of 34 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. Research administration preparation, namely research ethics, research permits, research schedule and research materials. This research has received ethical approval from the Makasar Health Polytechnic Health Research Ethics Commission with Recommendation for Ethical Approval No. 111 / KEPK-PTKMS / III /2022 dated March 31 2022.

2. Pre-test

   Sitting balance is measured using the Level sitting scale (Triandari et al. 2018) and standing using the pediatric balance scale (Franjoine et al. 2022) , (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 34 people divided into two groups randomly. Group I, 17 children with cerebral palsy,

were given Pilates exercises and group II, 17 children with cerebral palsy, were given bobath exercises with (task-oriented training). Treatment for each child was dosed: 1 time/day, 3 times a week with treatment time for each child 45 minutes for 12 Sunday.

4. Implementation of Post tests

After treatment on the research subjects, sitting and standing balance measurements were taken which were recorded on the measurement blank in accordance with the physiotherapy examination form used in the Makassar Health Polytechnic Physiotherapy Study Program, Indonesia.

Data analysis

Analysis and statistical tests were carried out using paired t test and independent t test. The level of significance for all statistical tests was set at $p < 0.05$.

Results

1. Characteristics of research subjects

Table 1: Characteristics of research data

Pilates group (mean ± SD)	Bobath group (mean ± SD)	p value
Age (months)	36.5758 ± 15.02504	39.4242 ± 16.94851	0.463*
Gender			
Male	24 (72.73 %)	20 (60.61%)	
Female	9 (27.27 %)	13 (39.39%)	

*Not significant (Paired T Test)

0.463 is obtained, which means there is no difference in age between the Pilates exercises and weight exercises groups in the research subjects and the gender of the two intervention groups is generally male.

2. Sitting and standing balance in the Pilates and Bobath exercises groups

Table 2: Pre-treatment and post-treatment results in the Pilates and Bobath groups

Balance index	before treatment	after treatment	p value
Pilates group			
Sitting balance	3.6970 ± .95147	4.2727 ± 1.15306	0.002*
Standing balance	1.6667 ± .47871	.7576 ± .50189	0.083** Bobath group

Sitting balance	3.4242 ± .79177	3.7273 ± .94448	0.001*
Standing balance	1.4545 ± .50565	1.6061± .60927	0.023*

*Significant **Not significant (Paired T Test)

Table 2 shows that in the Pilates group for sitting balance the value obtained was p=0.002 (p<0.05) which means there was a difference before and after the intervention and for standing balance the value was obtained p=0.083 which means there was no difference in standing balance before and after treatment. . For the bobath exercises group, the sitting balance obtained a value of p = 0.001, which means that there was a difference in sitting balance before and after treatment and for standing balance, the value of p = 0.023 was obtained, which means it was significant.

3. Balance sitting and standing between groups

Table 3: Results between post treatment in the Pilates and Bobath groups

Balance index	Pilates Group	Bobath Group	p value
After Treatment			
Sitting balance	4.2727±1.15306	3.7273±.94448	0.039*
Standing balance	1.7576 ± 1.7576	1.6061 ± .. 60927	0.034*

* Significant (Independent TTest)

Table 3 results of the Independent T-Test statistical test obtained a value of p=0.039 for sitting balance, which means there is a significant difference between the Pilates and Bobath exercises groups in research subjects, while for standing balance, a value of p= 0.034 was obtained, which means there is a significant difference between Pilates exercises and Bobath exercises in children. cerebral palsy.

Discussion

This study aims to compare the effects of the Pilates exercises method and the Bobath exercises method on the sitting and standing balance of children with cerebral palsy. The results of the study showed a significant improvement in sitting balance after being given pilates exercises and bobath exercises (table 2). Standing balance was also significant after being given the bobath, but in Pilates exercises it was not significant for standing balance. The findings of this study corroborate previous findings by various authors who also concluded that it was no significant difference in gross motor skills.

Bo bath exercises in children with cerebral palsy improve motor skills, the level of independence in daily living activities, and balance their abilities, are also effective in gross motor learning, increasing muscle tone, reflexes and reaction and movement patterns. This occurs 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 (Kim, Lee, and Park 2016) .

Kavlak, et al. (2018) stated that improving gross motor skills in children with cerebral palsy affects balance which allows children to walk more comfortably and quickly, using their limbs better in their daily activitie, because balance is needed to explore and interact with the environment, and has been described as fundamental to the functional activity of children with cerebral palsy. In addition bobath can improve motor skills and the development of diplegia cerebral palsy, and more effective than conventional treatment, another study stated that bobath-based rehabilitation improved the lying and rolling, sitting, crawling and kneeling, and standing, walking skills of spastic cerebral palsy children.

The independent T test (Table 3) shows that there is a difference between Pilates and Bobath exercises on the sitting and standing balance of children with cerebral palsy. The results of this research are in accordance with research by Labaf et al. (2015) who concluded that bobath improved the gross motor function of children with cerebral palsy in four dimensions, namely laying, rolling, sitting, crawling, kneeling, and standing, but walking, running, and jumping did not improve significantly. Besios et al. (2018) stated that bobath can significantly increase the excitability of alpha motor neurons in central nervous system disorders. With this increase, the motor learning process can be formed as well as the process of adaptation and plasticity in the nerves which can help restore motor activity in cerebral palsy patients.

Fatih Tekin, Erdogan Kavlak et.al, (2018) study states that doctors and researchers working with diparetic and hemiparetic cerebral palsy should focus more intensively on bobath programs to improve motor development, postural control skills, balance and functional independence of daily activities and 8 weeks of postural control and balance training based on Neurodevelopmental Treatment effectively improved motor function and functional independence in diparetic and hemiparetic cerebral palsy (Tekin et al., 2018)

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

This research shows that Pilates is effective for sitting balance in children with cerebral palsy. These results are similar to the statement of R. Sharma, J. Sharma, and V. Bharadwaj (2018), that Pilates exercises are useful in increasing muscle strength and postural control when standing in children with cerebral palsy and Pilates exercises help stabilize the spinal segments by activating the abdominal muscles, increasing joint stability and increasing neuromuscular efficiency (Panhan et al. 2018) . In addition, Pilates training is more effective in improving balance and gross motor function in children with diplegic cerebral palsy than conventional therapy (Abd-Elfattah et al. 2022) , so it can be used as a rehabilitation technique for children with cerebral palsy who experience mild motor deficits and a low functional level. high,

especially if the goal is to increase muscle strength and postural strength during standing (Dos Santos, Serikawa, and Rocha 2016) .

This improvement in sitting balance is achieved because Pilates provides stimulation of the trunk muscles to maintain the body against gravity by increasing the number of actin and myosin filaments needed for muscle contraction so that muscle strength can increase to maintain body alignment. (dos Santos, Serikawa, and Rocha 2016) .

When giving Pilates exercises, proprioceptive input and muscle stimulation influence trunk muscle strength to maintain balance while sitting upright. Balance is influenced by visuals and head control so that when doing Pilates you must pay attention to correct alignment. H. M. Abd-Elfattah et.al. (2022) stated that Pilates exercises combined with certain physical therapy programs improved gross motor function and balance compared to physical therapy alone (Abd-Elfattah et al. 2022) and were effective on spinal muscles to increase neuromuscular efficiency (Panhan et al. 2018) . Apart from that, Pilates has been proven to increase blood circulation, relax muscles, improve attention, concentration, breathing, sleep quality and body energy, as well as increase individual endurance (Senturk, Kirmizigil, and Tuzun 2021) . Ten weeks of Pilates training was effective in improving sensory interaction, reducing fatigue and balance in multiple sclerosis outpatients (Soysal Tomruk et al. 2016) .

The results of this study were not effective on the standing balance of children with cerebral palsy. Park and Kim (2017) concluded that Bobath exercises in cerebral palsy for 1 year at a dose of 35 minutes per day, 2-3 times per week were significantly effective in reducing spasticity but did not improve gross motor function, and other studies stated that rehabilitation Bobath-based improved lying and rolling, sitting, crawling and kneeling, and standing, walking skills of spastic cerebral palsy children. Therefore, it is recommended that additional research time be added to this research to obtain better results on standing balance.

Conclusion

Pilates exercises are effective in improving sitting balance and not effective in improving standing balance in children with cerebral palsy. Bobath exercises are effective in improving sitting and standing balance in children with cerebral palsy. There is no difference in effectiveness between Pilates exercises and Bobath exercises on sitting and standing balance in children with cerebral palsy.

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Conflict of interest

There is no conflict of interest in this research.

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