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## **Different of Influence of Trunk Control Facilitation and Ball Exercise on the Improvement of Balance Control in Palsy Cerebral Patients**

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### **Abstract**

Cerebral Palsy is characterized by motor abnormalities accompanied by physical dysfunction and mental disorders. This study aimed to examine different of influence of Trunk Control Facilitation with Ball Exercise against improving Cerebral Palsy patient control. This research was an experimental research with pretest design - posttest two group control, aimed to know the difference of influence facilitation of trunk control intervention with ball exercise to increase balance control in the cerebral palsy patient. This study was conducted in Dr.Wahidin Sudirohusodo General Hospital, with a sample size of 30 people divided randomized into 2 groups: treatment group 1, which provided 15 trunk control facilitators and 2 treatment groups who received ball exercise intervention as many as 15 people and measured with Trunk Control Measurement Scale (TCMS). Wilcoxon test showed that trunk control facilitation can produce significant balance control change with the average increase of 4,027 and p value <0,05 i.e p = 0,002, while ball exercise also yields significant balance control change with the mean increase of equal to 3,000 and p value <0,05 i.e p = 0,007. The conclusion of this study is that both the trunk control and ball exercise facilitate improved balance control in cerebral palsy patients.

**Keywords:** Facilitation of Trunk Control; Ball Exercise; Balancing Control; Cerebral Palsy.

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## **1. Introduction**

Cerebral Palsy is characterized by motor abnormalities accompanied by physical dysfunction and mental disorders. In 2001, 764,000 children and adults in the United States were diagnosed with Cerebral Palsy. In addition, an estimated 8,000 infants and children suffer from Cerebral Palsy, and 1,200 to 1,500 pre-school children suffered from Cerebral Palsy every year [1]. In Indonesia, the incidence of Cerebral Palsy cannot be assessed with certainty.

There are several factors that influence the incidence of this disease population is taken, how to diagnosis and accuracy. For example, the incidence of cerebral palsy in Europe (1950) was 2.5 per 1000 live births, whereas in Scandinavia 1.2 to 1.5 per 1000 live births. Gilroy obtained 5 out of 1000 children who showed a motor deficit associated with cerebral palsy; 50% of cases include mild (self-contained) while 10% includes weight (requires special care). The relative incidence of cerebral palsy classified according to motor complaints is as follows: spastic 65%, 25% atetosis, and stiff, tremor, ataktik 10%.

Cerebral Palsy spastic type with the stiffness experienced in his hands to make children with cerebral palsy experience obstacles in the smooth motor development. In addition, the key to the development of normal movement is the child's postural tone. Children learn to use the same patterns for useful activities and are influenced by the force of gravity. The posture of the child's cerebral palsy may change, and without the basic readiness of the muscles to react can cause difficulties for the child to develop good functional skills without assistance [2].

Based on observations made at Dr.Wahidin Sudirohusodo Hospital, it was found that 75% of patients visiting were patients with pure cerebral palsy and 25% were pediatric patients with motor problems. Population data obtained were 75 patients who visited the Mother and Child Physiotherapy Poly.

Postural control (posture control) is the necessary corrective movement necessary to keep the center of gravity in a support base. What is needed to achieve this goal is the coordination of the frame, the sensory muscles, and the central nervous uscul. Trunk control in CP children results the basis of postural control and is known to be a major factor in predicting the outpatient status of children with CP. It is suggest that the selective control of trunk movements in the lateral and transverse planes may be most important in trunk control during walking [3].

Posture controls include control of body position and dual functioning for stability (balance) and orientation (maintaining proper relationships between body segments and between body and environment). The loss of trunk control in patients should be targeted as specific disorders obtained from descending cortical-fugal pathways that conserve muscle stem [4]. The posture control system consists of a complex process that includes both sensory and motor components and produces an integrated combination of visuals, these sensors are vestibular and proprioceptive afferent inputs. Combined with the effort of the basic tools for dynamic equilibrium (stability). If one of these tools is damaged, the stability of the posture will be impaired.

The complex picture shown in patients with neurologic conditions almost always involves damage to a system that controls posture and voluntary movements. When a descending impulse drive to the spinal cord is

disrupted, it causes organizing problems according to the activity-oriented pattern of interest in the background of the postural control. The human body is essentially unstable because of the evolvement of the bipedal attitude to free the upper limbs for function. Maintaining stability requires a complex process of information to maintain proper postural stability in many of the posture variations that are necessary for us for daily activities. Postural responses occur in anticipation of movement, and during unexpected / reflexes, and are commonly known as feed-forward and feedback.

Neuron Development Treatment is a holistic approach that deals with the quality of balance-coordination patterns and not only with the problem of individual muscle function but also involves the whole person, not only sensory-motor problems but also development problems, decreased perceptions, emotional, social, and functional from daily life as well [5].

Handling Balance training can improve balance control in children with cerebral palsy by means of close kinematic can maintain position in one style, which repeatedly done will get results that improve postural control and balance. This study aimed to examine Different of Influence of Trunk Control Facilitation with Ball Exercise Against Improving Cerebral Palsy Patient Control at Dr. Wahidin Sudirohusodo Hospital.

## **2. Methods and Materials**

### ***2.1 Research design***

The research design used were a quasi experiment with pre test-post test two group design.

### ***2.2 Population and sample***

The study population was all patients with cerebral palsy who visited the Mother and Child Physiotherapy Poly of Dr.Wahidin Sudirohusodo Hospital. The sample of the study were 30 patients who visited the Mother and Child Physiotherapy Poly according to the inclusion and exclusion criteria in the sampling, divided into 2 groups (each group of 15 patients).

### ***2.3 Collecting Data and Procedure Intervention***

Data collection was done by measuring to obtain pre test and post test data. Measurements using the Trunk Control Measurement Scale (TCMS) tool by measuring the child's balance control, with the following procedures: 1) measure the child's willingness control before the action (pre test), then record the results. 2) give equal treatment to each group of respondents. In group 1, the intervention was facilitated by trunk control and group 2 was given Ball exercise intervention.

### ***2.4 Data analysis***

The Wilcoxon test was used to test the different effects of facilitating Trunk Control and Ball Exercise on improving balance control in Cerebral Palsy patients.

### 3. Result

**Table 1:** Average and Percentage of Samples based on Sample Characteristics

Characteristic Sample	Group 1		Group 2	
	Average	SD	Average	SD
Age (Year)	2,73	1,280	3,20	1,014
	n	%	n	%
Sex :				
Man	5	33,3	9	60,0
Woman	10	66,7	6	40,0

Table 1 showed the mean and sample percentages based on the sample characteristics. Viewed from the ages, the value of  $2.73 \pm 1.280$  years for group 1 (Ball Exercise = BE) and the value of  $1.014 \pm 3.20$  years for the group (Facilitation trunk control = FTC). Then, seen from the gender, there were 5 men (33,3%) and female sample were 10 people (66,7%) for group 1, and got male sample as many as 9 people (60,0% ) and female sample of 6 people (40,0%) for group 2.

**Table 2:** Average Trunk Control Measurement Scale based on pre test, post test, and difference

Group	Average and Standart Deviation		
	Pre test	Post test	Difference
Group 1	$8,600 \pm 6,0004$	$12,627 \pm 8,9223$	$4,027 \pm 3,9380$
Group 2	$10,453 \pm 6,6267$	$13,453 \pm 8,1568$	$3,000 \pm 3,6557$

Based on table 1, the average value of Trunk Control Measurement Scale (TCMS) in group 1 is pretest of  $8,600 \pm 6,0004$  and posttest of  $12,627 \pm 8,9223$  with an average difference of  $4,027 \pm 3,9380$ . In group 2, we get the mean pretest value of  $10,453 \pm 6,6267$  and posttest equal to  $13,453 \pm 8,1568$  with an average difference of  $3,000 \pm 3,6557$ . This indicates an increase in TCMS average after the intervention.

### 4. Discussions

Epidemiological studies show that cerebral palsy disease tends to occur at the age of 2 years and below. If attributed to a newborn child, then the cause is birth trauma. Recent advances in neonatal management and obstetric care have not shown a decrease in the incidence of Cerebral Palsy [6]. In addition, it is estimated that

8,000 infants and children suffering from Cerebral Palsy, and 1,200 to 1,500 pre-school children suffering from Cerebral Palsy every year [1].

Based on hypothesis test by using statistical test of Wilcoxon obtained p value  $<0,05$ , which means that giving of balance training can give significant influence to change of balance control in the cerebral palsy patient.

Cerebral palsy is a group of disorders that are permanent which has an effect on the development of movement and posture, leads to activity limitations, which are associated with non-progressive disorders that occur in the developing fetus or infant brain [7]. Several studies have shown that Ball Exercise is an important intervention program for cerebral palsy patients, whose close-loop kinematic-chain exercises with repeated frequencies can demonstrate great benefits for improving balance control in children with cerebral palsy [8]. The close kinematic chain exercise is part of the balance training program, performed by way of the distal joint position in a closed state. Training balance training by means of the close kinematic chain can improve postural stability which will also affect the power of controlling the balance of trunk in children with cerebral palsy [9].

The close kinematic chain is a movement that uses more than one joint that moves on the body weight to impose on more than one muscle group that works in the same time either agonist or antagonist and increases activation of lower limb proprioception [10, 11]. Children with cerebral palsy often exhibit somatosensory problems as joint positions and kinesthesia deficits. Children with CP tend to depend disproportionately on visual input to maintain posture and position of their limbs, indicating that they are very deficient in proprioception. Individuals with hemiplegic and cerebral palsy spasticity have deficits in proprioception in terms of the ability to determine whether the movement of the index finger has occurred and in what direction [12].

Ball training can produce significant improvements in muscle and joint stability because stability and orientation are two important things in terms of postural control improvements. The neuromuscular control relies heavily on sensory feedback that affects the response to changes in external demands, in which the normal response to movement and muscle activation patterns is to adapt to repeated disorders. Patients with cerebral palsy have complaints of muscle weakness, joint stiffness and neuromuscular control disorders that may affect external disorders. The effect of balance training can stimulate the improvement of proprioception or neuromuscular adaptation optimally in joints during exercise [13].

Based on pretest and post test data of TCMS on static sitting balance component, dynamic sitting balance, and dynamic reaction showed the difference of static sitting balance component, pretest data showed that the average sample has the most points because most samples still have the ability to sitting even though still using the support of the hand and only survive in a few seconds (under 10 seconds). Then, post test data indicated that the change as much as 9 children with CP and 6 children with CP did not change.

For the dynamic sitting balance component, the values of pretest and posttest indicate that there were more unchanged samples of 10 children with and only 5 children with CP who changed after the intervention.

For the component of the dynamic reaction, seen from data of pretest and posttest indicated that there were 7 children with CP that experienced change and 8 children with CP do not change after the intervention. The

existing of non-changeable samples after the intervention, it is expected that high spastic tone among samples and intervention programs should require long duration (6 months and above).

This is in accordance with research conducted by Bayrakci [14] with the title of research The effects of two different closed kinetic chain exercises on muscle strength and proprioception in patients with patella femoral pain syndrome which in the study showed that Closed Kinetic Chain provides increased muscle strength, proprioceptive and functional capabilities. In principle Closed Kinetic Chain training can train the muscles on eccentric and eccentric controls performed systematically by utilizing biomechanical phenomena and functional physiology that are not dependent on gravity.

Based on hypothesis test by using statistic test of Wilcoxon obtained p value  $<0,05$ , which means that giving of trunk control inhibition can give significant influence to change of balance control in the cerebral palsy patient. Cerebral palsy disorders have implications for impaired motion and posture resulting from injury or developmental malformations in the central nervous system. Malformations of the central nervous system will cause problems in the limb muscles, such as high spasticity [13].

Based on hypothesis testing by using Mann Whitney test obtained p value  $> 0,05$ , which means that trunk control inhibition is not more effective significantly compared to balance training to change control of balance in patient of cerebral palsy but seen from mean value indicate that trunk control inhibition more provides an effect of changes on balance control in patients with cerebral palsy. Balanced training is not very effective in patients with high or low spasticity. Better balance training is used in a state of muscle that is almost normal or without spastic [2]. This is evident from the results of this study, where the inhibitory intervention of trunk control results in a greater change in balance control compared with balance training for cerebral palsy patients. However, statistical tests showed no significant difference so that it can be said that trunk control inhibition is not significantly more effective than balance training on changes in patient balance control of cerebral palsy.

## **5. Conclusion**

Ball exercise interventions and Trunk Control Facilitation can have a significant effect on in balance control changes in patients with cerebral palsy. Trunk Control Facilitation interventions were not significantly more effective than Ball Exercise on improving balance control in patients with cerebral palsy.

## **Conflict Interest**

The author declares there is no conflict interest.

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