

# Combination of Trunk Mobilization and Neuro Development Treatment against Spasticity Reduction of Spastic Type Cerebral Palsy

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**Abstract:** Spastic cerebral palsy is a type of brain damage that occurs in the extreme part of the pyramids that results in an increase in reflexes that make muscle tone higher than normal. This study aims to look at the effect of a combination of Trunk Mobilization and Neuro Development Treatment on reducing spasticity in spastic type cerebral palsy children. The research design used was one group pre and post test design. Test Results for the results of reducing spasticity in cerebral palsy children before and after the intervention of Trunk Mobilization and Neuro Development Treatment, it can be seen that the value of  $p = 0.157$  which means greater than 0.05 ( $p > 0.05$ ) so that the null hypothesis ( $H_0$ ) accepted and the alternative hypothesis ( $H_a$ ) was rejected. So the conclusion with the acceptance of  $H_0$  means there is no effect of a combination of Trunk Mobilization and Neuro Development Treatment to reduce spasticity in children with cerebral palsy after intervention.

## 1 INTRODUCTION

Cerebral palsy or abbreviated (CP) is a disability that was first raised by William Little in the 1840s. This condition is a diagnostic and therapeutic challenge which is quite large (Bajraszewski, 2014). There are mild degrees with minimal disabilities up to severe degrees. Disability that occurs for a lifetime, will generally be the cause of autism and mental retardation which causes difficulties for the impact on their individuals and families (Myoung and MPH, 2017).

Cerebral palsy is a disorder of motion and attitude. This is defined as a non progressive disorder of posture, motor disturbances and secondary disorders that occur due to lesions or anomalies that occur in the brain that arise in the early stages of development. Primary lesions or static injuries will affect the growth and development of plasticity and maturity of the central nervous system (Myoung and MPH, 2017). Cerebral palsy occurs worldwide 2-2.5/1000 births. One cause is trauma at birth, and the progress of neonatal management has not been able to show a decrease in the incidence of CP patients (Ryan and Sandra, 2011).

The neurologic impairment is nonprogressive, although secondary disability can occur. Characteristics of cerebral palsy change with developmental stages, especially in the first few years of life. This impairment and resultant disability are both permanent (Bosanquet, 2013).

The prevalence of people with Cerebral Palsy at birth is based on research data from health care centers in the United States from mild to severe ranging from 1.5 to 2.5 per 1000 live births. Research data on school-age children, the prevalence of cerebral palsy found 1.2 - 2.5 children per 1,000 population. At least 5,000 new cases of cerebral palsy occur each year. From these cases 10% to 15% of cerebral palsy found a brain disorder that is usually caused by infection or trauma after the first month of life (Surakarta, 2013).

The incidence of cerebral palsy patients in Indonesia based on data from the Ministry of Health in 2011 is estimated to be around 1 - 5 per 1,000 live births and the number of people with disabilities is around 7-10% of Indonesia's population. More men than women. Generally found in the first child. The incidence rate is higher in babies born prematurely, twin births and mothers who are over 40 years old. Almost half this disability is experienced in children

born prematurely and children born normal (Depkes, 2011).

Pathogenesis of CP occurs from the first gestational age to 24 weeks. Cortical neurogenesis occurs characterized by proliferation, migration, and neuronal processes of neuron precursor cells (Dutt, 2015). Genetic deficits or disorders such as viruses or toxicity result in malformations such as isencephaly or agyria-pachyria, nodular heterotopias, polymicrogyria, schizencephaly, and cortical dysplasia. Growth and differentiation events (axonal and dendritic growth, synapse formation and myelination) as well as the process of neural apoptosis, neuron regression, redundant synapse elimination. Environmental factors also affect such as hypoxia ischemia. In addition, the process of forming an immature brain structure will change a series of developmental events, therefore CP is the result of destructive and developmental mechanisms (Stephanie, 2013).

The etiology of CP is very diverse and multifactorial the causes are congenital, genetic, inflammatory, contagious, anoxic, traumatic and metabolic. Injury to the brain can occur in the prenatal, or postnatal period of CP is more common in children born very premature or full term. Even though term babies have a relatively low absolute risk, the term birth represents the majority of all births, like as well as about half of all child births with cerebral palsy. Prenatal risk factors include intrauterine infection, teratogenic exposure, placental complications, multiple birth, and motherly conditions like mentality retardation, seizures, or hyperthyroidism. The incident CP is higher among twins and triplets than singles bleeding, seizures, hypoglycemia, hyperbilirubinemia, and significant birth asphyxia. Perinatal arterial ischemia stroke has been identified as another possible cause which causes CP hemiplegia in many babies (Sankar, 2005).

To aid in confirming the diagnosis and ruling out neoplastic or progressive causes for motor disability such as metabolic and neurodegenerative disorders, magnetic resonance imaging (MRI) is usually indicated. The imaging can usually wait until a child can undergo the study without sedation or done in conjunction with another procedure. Other diagnostic testing may include cultures, immune status, metabolic screening, karyotyping, genetic probes or confirmatory tests for other specific disorders (Bosanquet, 2013).

Impaired oxygen supply to the fetus and brain Asphyxia is classically considered as the main cause of explaining CP later. But clinically defined birth injury or birth asphyxia accounts for a small

proportion of CP cases (Ferluga, 2013). CP is rarely due to brain malformations due to a unique genetic deficit or perinatal damage that is obtained due to a unique acute asphyxic event. Generally CP, the causative factors do not act separately, but in synergy to create interference (Stephanie, 2013).

CP is classified into topographic-based subtypes, diplegia, hemiplegia, or extrapyramidal disorders. This classification arises in various areas of the nervous system that develop during the process of fetal development in the womb, during labor and after birth during the first 2 years of life. Gestational age also influences the development of brain structure and the type of disability associated with CP (Ryan and Sandra, 2011). Topographic of Cerebral Palsy can be seen in the picture below in Figure 1.

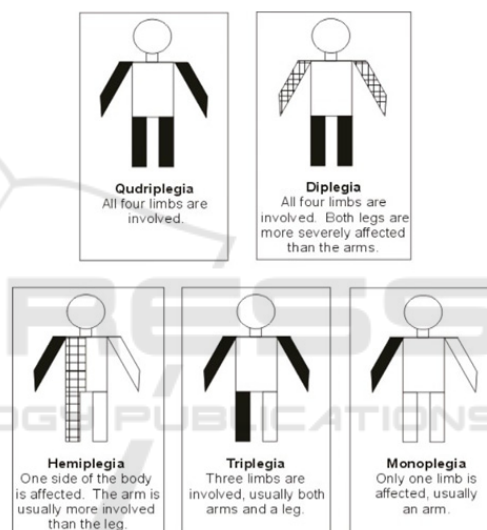


Figure 1: Topographic of Cerebral Palsy.

There are three types of cerebral palsy that can be distinguished by their symptoms and management approaches. The types of CP are Spastic, Ataxic and Athetoid brain paralysis (Hartono, 2004). Spastic CP type is CP that has spasms characterized by unique muscle tightness the patient has muscle flexibility. This type of CP occurs in at least 70% of all CP cases in the world. In the case of CP seizures, this disorder can be more easily managed compared to other types since treatment through treatment can be taken in a number of neurological and orthopedic approaches. Muscle spasticity causes other symptoms of muscle stress that may include tendinitis and arthritis in individuals aged 20-30 years. This type of CP can be managed using occupational and physical therapy where it can strengthen, stretch, exercise and the other. Physical activity is used to manage daily

disruptions. The disorder can also be overcome using drugs that eliminate flexibility by killing the nerves that cause the disorder (Kumar and Parveen, 2018).

Pain is a common problem in the brains of children of all ages. Many children are very patient and don't need to ask about pain. That pain most often felt due to musculoskeletal disorders, spasms and spasticity or digestive problems like as reflux and constipation. It is important for children with cerebral palsy to look for and eliminate the causes of pain and to treat pain passionately without complaining. Muscle cramps due to fatigue (Bosanquet, 2013). Type of Cerebral Palsy can be seen in the picture below in Figure 2.

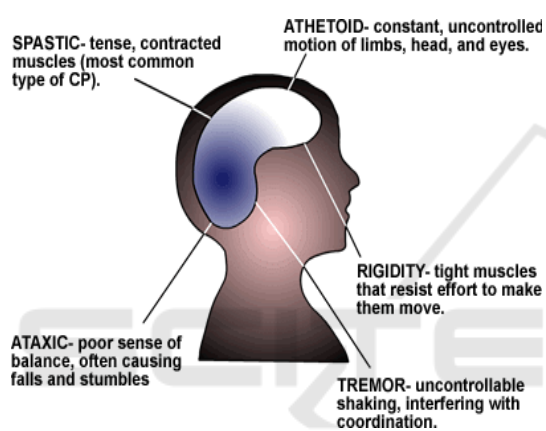


Figure 2: Type of Cerebral Palsy

Spasticity is an increase in stretch reflexes and tendon reflexes that originate from excessive excitability of stretch reflexes in limb abnormalities. Postural tone abnormalities will result in impaired coordination and poor balance. So that spasticity becomes a problem solving that must be considered. Rhines and Magoun said the emergence of spasticity is a result of an imbalance between alpha and gamma motor neurons which is a consequence of the imbalance between the facilitation center and the inhibition center (Susanto, 2014).

The physiotherapy approach that is commonly used for handling disorders in Cerebral Palsy children such as Neurostructure, Brain gym, (Neuro Development Treatment) NDT, Trunk mobilization. In this study the methods used are two of the above interventions and then combined to reduce spasticity in children with Cerebral Palsy.

Trunk mobilization is a passive stretching technique that extends soft tissue. Passive stretching is expected to provide a relaxing effect on spastic

muscle groups, increase postural mobility and control abnormal movements that arise, thereby reducing stiffness or spasticity in the trunk region towards lower extremity (Kisner, 2013).

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NDT (Neuro Development Treatment) or Bobath Method. The concept of this method is to affect muscle tone and increase postural balance. This method is able to treat motor control disorders of cerebral palsy spectrum (Kavlak et al., 2018). NDT is a training method to stimulate the response of neuromuscular mechanisms through proprioceptor stimulation. NDT (Neuro Development Treatment) techniques include: inhibition of spasticity, facilitation and stimulation to improve abnormal movement patterns, normalizing tone and optimizing postural control functions. Before implementing the NDT (Neuro Development Treatment) method, it is first performed proper examination, determination of physiotherapy diagnoses and plan of therapeutic program for sufferers of spastic type cerebral palsy (Surakarta,2013).

In a state of normal activity needed background movement which is normal and functional skills. Normal Postural Reflexology Mechanisms are dynamic response in every answer activity changes. The reactions are Encourage NPRM: Righting reaction Consists of: labyrinthine righting, neck righting, body on body righting reaction, body on head righting reaction and optical righting reaction. Equilibrium reaction and Protective reaction.

The nature of the Trunk Mobilization method and NDT (Neuro Development Treatment) is suppressing pathological abnormal / postural reflexes which causes normal movements to be inhibited and stimulation in the form of touch, exercises shown to stimulate neurons in children in normal growth and development. But the process requires quite a long time. Early and intensive treatment will provide optimal results, because it will continuously improve abnormal patterns in children (Surakarta,2013).

Ashworth scale is a degree or scale used to measure the level of muscle spasticity / tone. The Ashworth scale is one of the physiotherapy measuring devices, part of the Bobath concept. Initially used to see the reaction of antispastic drugs in multiplesclerosis. In 1987 developed by Bohannon and Smith, so this measurement was used to measure

the spastic value of the problem of the central nervous system (Surakarta,2013).

## 2 RESEARCH METHOD

The research was carried out in the Physiotherapy room at Deli Serdang Lubuk Pakam Distric Hospital right on Thamrin street number 1 Lubuk Pakam for 1 month starting on june 6, 2016 until june 30, 2016. The sample of study consisted of 12 people obtained from the calculation of the Pocock formula (Pocock, 2014).

Spasticity measurements are carried out using the Asworth scale. The Asworth scale has been widely used in the population of children with cerebral palsy. Asworth scale is an instrument used to assess the intensity of spasticity. Asworth scale value:

- Value 0: There is no increase in tone.
- Value 1: An increase in muscle tone is marked by the feeling of minimal resistance at the end of ROM when the joint is moved flexion and extension.
- Value 2: There is a slight increase in tone marked by the cessation of movement and the appearance of a minimum resistance along the rest of the ROM.
- Value 3: There is an increase in muscle tone more pronounced along most of the ROM. Explain to sufferers that right angle means no pain, middle means moderate pain and left angle means very painful (front VAS).
- Value 4: Increased tone is very real, passive motion is difficult to move.
- Value 5: Stiff joints and extremities for flexion and extension

Research flow can be seen in the picture below in Figure 3.

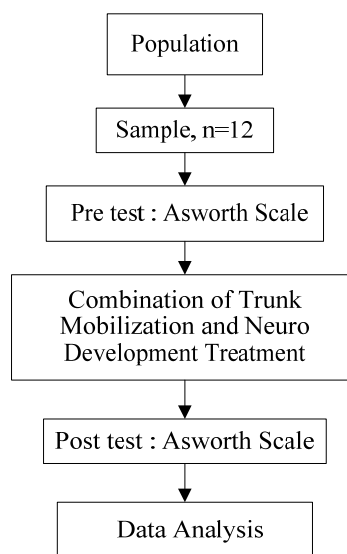


Figure 3: Research flow.

Trunk mobilization is a passive stretching technique that extends soft tissue. Passive stretching is expected to provide a relaxing effect on spastic muscle groups, increase postural mobility and control abnormal movements that arise, thereby reducing stiffness or spasticity in the trunk region towards lower extremity (Kisner and Colby,2007).

The mechanism of exercise in trunk mobilization is to improve the co-contraction of trunk muscles and to gain flexibility from the trunk. At the end of the passive movement can be accompanied by stretching (stretching soft tissue) and elongation (trunk lengthening towards the top) (Humaira, 2014). Extending carried out passively will be able to lengthen the soft tissue so that it decreases stiffness or spasticity. Passive stretching is expected to provide a relaxing effect on spastic muscle groups.

Neuro Development Treatment was developed by Dr. Kr Bobath and Mrs. Berta 1997. This method is specifically used to deal with central nervous disorders in infants and children. The main principle that underlies this method is the normalization of muscle tone, facilitating normal movement patterns in daily activities.

The mechanism of neuro development treatment (NDT) is the inhibition of abnormal reflex activity patterns and the facilitation of normal motor patterns. Physiologically spasticity results from excess abnormal tonic reflexes due to UMN lesions (Richard, 2008). The provision of continuous therapy provides direct inhibition of spastic muscles. By doing the inhibition technique, it will stretch both the extrafusal muscle and the muscle spindle of the

muscle. Then the muscle spindle responds by sending a series of spindle impulses to the spinal cord.

Afferent fibers in the dorsal radix that carry impulses form synapses with motoneuron which are then excited and cause muscle contraction. This occurs when afferent fibers from the spindle muscle give a collateral branch to a group of intermediary neurons in the grisea substrate (Koman, 2014). These neurons are inhibitors and send their axons to the motor neurons that innervate the antagonistic muscles. Explanation of the example above illustrates the muscle spindle by means of afferent impulses monosympathetically activating motoneuron which invests extrafusal muscle causing contraction of the muscle and causes relaxation of the antagonist, which means reduced spasticity (Pariera,2011).

### 3 RESULT AND DISCUSSION

#### 3.1 Characteristics of Respondents

The study was conducted on subjects, namely children with a diagnosis of Cerebral palsy in Lubuk Pakam District Hospital and from those selected as a whole (total sampling) aged between 1-6 years. From the results of the study can be described as the following analysis.

The gender of men is 6 people or 50%, women are 6 people or 50%. While the respondents based on gender the majority of women are 9 people or 75% of the total 12 respondents from the two intervention groups. Characteristics of Respondents by sex can be seen the below in able 1.

Table 1: Characteristics of Respondents by sex.

Sex	n	Persentation (%)
Male	6	50 %
Female	6	50 %

Based on the table below it appears that the majority of research subjects at the RSUD are ages 1-2, as many as 4 people with 33.3 presentations, then at the age of 3-4 years, as many as 7 people with a percentage of 58.3 and children aged 5-6 years, as many as 1 person with a percentage of 8.3, the mean results obtained are 1.75 and SD are 0,622. Characteristics of Respondents by age can be seen the below in Table 2.

Table 2: Characteristics of Respondents by age

Age	n	Persentation (%)
1-2 th	4	30 %
3-4 th	7	50 %
5-6 th	1	7 %

Based on the table above, it appears that most of the research subjects at the Lubuk Pakam Regional Hospital based on body weight, namely 10 kg body weight by 3 people with a percentage of 25.0 and then followed by each different body weight ie 8 kg body weight by 1 person with a percentage of 8, 3%, 9 kg body weight 2 people with a percentage of 16.7%, 12 kg body weight 2 people with a percentage of 16.7, body weight 16 kg 2 people with a percentage of 16.7%, body weight 20 kg 1 person with a percentage of 8.3%, 14 kg body weight of 1 person with a percentage of 8.3 with a mean of 12.17 and an elementary school of 3.639. Characteristics of Respondents based on body weight can be seen in Table 3.

Table 3: Characteristics of Respondents based on body weight.

Body Weight	n	Persentation (%)
8	1	8 %
9	2	16 %
10	3	25 %
12	2	16 %
14	1	8 %
16	2	16 %
20	1	8 %

#### 3.2 Spasticity Measurement Results

Based on the table above, it appears that the research subjects at Deli Serdang Lubuk Pakam Hospital with their severity based on the Asworth scale obtained the results that with a spasticity (pre test) the maximum value is 5 while the minimum value is 2 with a Mean of 2.58 and a Standard Deviation (SD) 0.996, while after the intervention (post test) it is known that the value of spasticity in cerebral palsy children with a maximum value of 4 while the minimum value of 2 with a mean of 2.42 and a standard deviation (SD) 0,793. Spasticity measurement results can be seen in Table 4.

Table 4: Asworth scale values before and after the intervention

Asworth scale		
n	Before	After
1	4	4
2	2	5
3	2	3
4	3	4
5	2	2
6	2	2
7	2	2
8	5	3
9	2	2
10	3	3
11	2	3
12	2	3
Mean	2,58	2,42

### 3.3 The Effect of Trunk Mobilization and Neuro Development Treatment on Decreasing Spasticity

The results of data processing using paired t- test, before and after the administration of the intervention, the results of data analysis found that there was no effect of the intervention so that the intervention did not affect the reduction of spasticity in children with cerebral palsy with indicated p value = 0.157 which means p value greater than 0,05 (p>0,05). Results can be seen in the Table 5.

Table 5: Pre test and Post Test

Group	n	$\bar{x} \pm SD$	p*
Pre-test	12	2,58 ± 0,28	0,15
Post-test	12	2,42 ± 0,22	

This shows that the results obtained are not in accordance with the theory and purpose of the combination method of Trunk Mobilization and NDT which have a role to reduce Spasticity. In this study, researchers have not yet gotten the results from providing a combination of Trunk Mobilization and NDT in reducing spasticity in spastic-type Cerebral palsy children, for their spasticity the patient did not change due to the nature of the Trunk Mobilization and NDT (Neuro Development Treatment) methods.

The mechanism of intervention is suppressing pathological abnormal / postural reflexes which causes normal movements to be inhibited and stimulation in the form of touch, exercises shown to stimulate neurons in children in normal growth and development (Kisner, 2013). But the process requires

quite a long time. Early and intensive treatment will provide optimal results, because it will continuously improve abnormal patterns in children (Pickles, Altun and Yurdalan, 2016).

In a study by Tri Sarjono Waluyo, statistical tests showed that there was an effect of trunk mobilization on decreasing spasticity in spastic cerebral palsy in sample 12 according to the largest age group between ages 3-4 years with results (p = 0.046)) (Waluyo, 2010). Research by Bar-Haim et al., 2006 with the title "comparison of efficacy of adeli suit and neurodevelopment mental treatment in children with cerebral palsy" influence on reducing spasticity in Spastic type Cerebral Palsy children, with a sample of 12 cerebral palsy children (9 boys and 3 girls) with an age range of 5-13 years, for brackets of 4 weeks or 1 month (2 hours per day, 5 days a week, in 20 sessions) with significant results p <0.05. The researchers' assumption that the giving of an intervention needs to be given attention to the accuracy of the intervention (Stevness,2009).

## 4 CONCLUSION

Based on the results of the statistical tests and the discussion above, it can be concluded that there is no effect of reducing spasticity onspastic-type Cerebral Palsy children in the administration of a combination method of the combination of Trunk Mobilization and NDT.

## 5 SUGGESTION

To find out whether the therapy is successful or not, as a physiotherapist should use a measuring tool to measure the results before and after being given an intervention so that it always gets an evaluation. Adjusting the patient's exact position when doing activities or at rest against the spasticity pattern so that the spastic muscles can elongate and can prevent contractures. The length of time given.

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