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Relationship between primitive reflex values and gross motor abilities in children with spastic cerebral palsy

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Abstract. Primitive reflexes are basically present in normal growth and these reflexes are background of gross motor development in the children. However, Cerebral palsy in the children had motor activity disruption. This study aims to determine the relationship between primitive reflex value and gross motor ability level in the children with spastic cerebral palsy. The study was used correlative research method with cross sectional design. The study population were children had spastic cerebral palsy type who undergone therapy. The samples were 30 children who met the inclusion criteria such as children with spastic cerebral palsy type who undergone therapy at Physiotherapy clinic, aged below than 8 years and willing to be respondents. The primitive reflex assessment used reflex value scale and gross motor skills is assessed based on Gross Motor Functional Classification System (GMFCS) level. The result found there was significant relationship between primitive reflexes and gross motor skills in 6 times of primitive reflexes such as ATNR ($p=0.015$), STNR ($p=0.028$), Moro ($p=0.035$), Neck righting ($p=0.001$), parachute ($p=0.019$) and foot placement reaction ($p=0.015$). Meanwhile, there was not significant relationship between extensor thrust and gross motor skills, $p=0.164$.

1. Introduction

Cerebral palsy is most common cause of permanent motor disabilities in the children especially in the infant brain which affected development of movement and posture [1-3]. CP is more common in undeveloped and developing countries than developed countries [5]. The cerebral palsy prevalence is 2-3.5 cases per 1000 live births [6]. In the United States, school aged children is diagnosed with CP for 3-4 per 1000 people [7]. Most cases are diagnosed before 4 years and 80% of cases due to prenatal brain injury and 10% due to adverse events peripartum [8].

In Indonesia, the prevalence of cerebral palsy is 0.09% among the children aged between 24 months and 59 months. The physiotherapy plays role in preventing or reducing neurological symptoms. The goal of physiotherapy for cerebral palsy patients is to help patients and their families to improve motor function and prevent deformity and emotional adjustment so that patients are able to improve their functional activities and minimize help from others in performing daily activities.

The primitive reflex are basic in the normal growth and these reflexes motivated children motor development such as rolling, sitting, crawling and standing. In normal development, the primitive spinal reflex and brain stem are gradually reduced as higher patterns and balance reactions developed. This study aims to determine the relationship between primitive reflex value and gross motor ability level in the children with spastic cerebral palsy.



2. Methodology

The study was conducted and SLB Pembina Tingkat South Sulawesi on 3rs April 2017 until 5th May 2017 since both places had physiotherapy clinic. This study used correlational research method with cross sectional design.

The study population was all spastic cerebral palsy patients who undergone therapy in physiotherapy clinic. The samples were 30 children with spastic cerebral palsy who met the inclusion criteria such as children with spastic cerebral palsy who undergone the physiotherapy treatment, aged below 8 years old and willing to be respondents.

The data was collected with primitive reflex value scale and assessment of gross motor skill with on Gross Motor Functional Classification System (GMFCS) level. The data was analysed using Spearman's Rho test with SPSS program to determine relationship of primitive reflex values and gross motor skills in children with spastic cerebral palsy.

3. Result and Discussion

3.1. Result

Table 1 shows that there were 18 female respondents (60%) and 12 male respondents (40%) had involved in this study. There were 16 respondents (53.3%) were aged between 6 years and 12 years and 3 respondents (10.0%) were aged between 12 years and 18 years old. Meanwhile, there were 8 respondents were aged 7 months (26.7%) and 15 months (26.7%). In additions, 20 respondents (66.7%) suffered diplegia spastic and 10 respondents (33.3%) suffered quadriplegia spastic.

Table 1. Respondent characteristic distribution.

Respondent characteristic	n	Percentage (%)
Gender		
Male	12	40.0
Female	18	60.0
Age		
2-4 years old	7	23.3
4-6 years old	4	13.3
6-12 years old	16	53.3
12-18 years old	3	10.0
Growth age		
5 months	3	10.0
6 months	4	13.3
7 months	8	26.7
8 months	2	6.7
10 months	2	6.7
11 months	2	6.7
15 months	8	26.7
24 months	1	3.3
Spastic type		
Diplegia	20	66.7
Quadriplegia	10	33.3
Total	30	100

There were 10 respondents had reflex values of 0 with good of gross motor abilities and 3 respondents had reflex values of 0 with medium and very poor in gross motor abilities. The statistical test showed there was significant relationship between ATNR and gross motor abilities, $p=0.015<0.05$. In STNR, 8 respondents had reflex value of 0 with good gross motor abilities and 4 respondents had

reflex values of 0 with medium and poor in gross motor abilities. There was significant relationship between STNR and gross motor abilities, $p=0.028$. In Moro, 10 respondents had scored 0 in Moro and good in gross motor abilities and 5 respondents had scored 1+ in STNR had poor in gross motor abilities. There was 3 respondents had scored 2+ and very good and good in gross motor abilities for neck righting. In statistical test, there was significant relationship between neck righting and gross motor abilities. In parachute, 7 respondents had scored 2+ and good in gross motor abilities, while 1 respondent had scored 1+ with poor and very poor in gross motor abilities. There was significant relationship between parachute and gross motor abilities. Furthermore, 6 respondents had scored 0 and good in gross motor abilities and 4 respondents had 0 and very good in gross motor abilities for extensor thrust. In the statistical test, there was no significant relationship between extensor thrust and gross motor abilities. There was 8 respondents had scored 2+ with good in gross motor abilities and 2 respondents had scored 0 with very good in gross motor abilities for foot placement. There was significant relationship between foot placement and gross motor abilities.

Table 2. Relationship between primitive reflex values with gross motor ability in children with spastic cerebral palsy.

Reflex values		Gross motor abilities					p-value	r
		Very good	Good	Medium	Poor	Very poor		
ATNR	0	5	10	3	4	3	0.015	-0.439
	1+	-	-	1	2	2		
	2+	-	-	-	-	-		
STNR	0	5	8	4	4	2	0.028	-0.402
	1+	-	2	-	2	3		
	2+	-	-	-	-	-		
Moro	0	5	10	3	-	5	0.035	-0.386
	1+	-	-	1	5	-		
	2+	-	-	-	1	-		
Neck righting	0	-	4	3	4	4	0.001	0.584
	1+	2	1	1	2	1		
	2+	3	3	-	-	-		
Parachute	0	-	-	1	3	1	0.019	0.426
	1+	3	3	3	2	3		
	2+	2	7	-	1	1		
Extensor thrust	0	4	6	2	2	3	0.164	-0.261
	1+	1	4	1	3	1		
	2+	-	-	1	1	1		
Foot placement	0	2	1	1	4	4	0.015	0.438
	1+	3	1	1	2	1		
	2+	-	8	2	-	-		
Total		5	10	4	6	5		

3.2. Discussion

ATNR reflex is primitive reflex found in new born and usually persisted until aged 6 months. ATNR appeared in the uterus around 18 weeks after conception and identified and observed in first 3 months after births. In additions, ATNR had stimulated muscle development and vestibular system while during pregnancy. ATNR also helped eye hand coordination and served as precursor to these skills. ATNR can have significant impact on the children physical, cognitive, social and emotional development which affected their ability in school.

ATNR can prevent babies from developing certain physical cross patterns such as rolling and crawling. As older, the children had unusual movement patterns such as clapping hands down or left-handed in doing activities. Besides, strong ATNR caused physical problems in the bone development which affected joints and skeletal structures. ATNR is correlated with non-ambulatory.

SNTR reflex helped the babies in sitting which caused prevention in other skills and difficulty in maintaining certain position because upper and lower body extremities conflict with each other if this reflex is held for too long. The head position was very important in terms of body posture which affected walking, standing and poor posture also affected skeletal muscles in the children development. The children with cerebral palsy had difficulty with posture, transition movement and functional mobility.

The Moro reflex had functioned helped in protect the infant from dangerous through sensory system. Moro reflex persisted in the children caused allergies and adrenal stress due to the constant cortisol secretion effects. The hypersensitivity toward children environment also affected anxiety occurrence and difficulty ignoring irrelevant stimuli. In children with cerebral palsy was hypersensitivity or increased in the stiffness.

Neck righting is triggered by neck muscle stretching during cervical movement in the womb. Late appearance of neck righting in the children caused lack of visual skills for reading and vestibular problems. The neck righting had significant relationship with gross motor abilities especially in the children growth.

The parachute was normal part of upright and postural reaction involved the labyrinth and vision. However, the reactions is triggered by visual stimulus because balance is maintained through complex physiological mechanism. The cerebral palsy patients who are hypertonic and neuromuscular abnormalities in form of decreased mobility derived from upper motor neuron lesions in the brain and motor cortex which lead damage to some nerve receptors.

The foot placement reaction is postural equilibrium reaction that occurs in response to visual and vestibular stimuli. The postural stabilization reactions began by proximal and developed distally. The gait analysis in the children has many advantages for the neuromuscular defects treatment especially in the children with cerebral palsy.

4. Conclusion

In conclusion, there was significant relationship between ATNR, STNR, Moro, Neck righting, parachute and foot placement toward gross motor skill in the children with spastic cerebral palsy. Meanwhile, extensor thrust had insignificant relationship with gross motor skill in the children with spastic cerebral palsy.

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