

ICASH-A022

THE EFFECT OF GROSS MOTOR AND FINE MOTOR STIMULATIONS ON THE DEVELOPMENT OF BABIES AGED 3-6 MONTHS

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ABSTRACT

Background: Toddler is a crucial phase as the child's brain is developing rapidly during this period. In this stage, it is important to assess the child's stimulation to detect any abnormality as early as possible. The earlier the growth and development retardation are detected, the treatment or stimulation intervention can produce more effective results.

Aims: The objective of this study is to determine the effect of the gross stimulation and the fine motor stimulation on the development of babies aged 3-6 months.

Methods: This research used the quasi experimental method with one group pre- and post-test design. The research was conducted at Community Health Center of Ngoresan. The samples were 20 respondents (babies with dubious development), chosen by using the quota sampling technique. The data of the research were analyzed statistically by using Wilcoxon test.

Results: There is a difference in the baby development mean value prior to and after following the gross stimulation and the fine motor stimulation, that is 7.85 and 9.5 respectively with the value of $p = 0.000$.

Conclusion: Gross and fine motor stimulations affect the development of babies.

Keywords: gross motor stimulation, fine motor stimulation, and development

INTRODUCTION

In the first three years of life, children's brain develop very fast, so stimulation and early detection of children development needs to be done [1] The earlier a developmental delay is detected, the earlier stimulation interventions can be done, so it can give effective results [2]. Stimulation is the basic needs of children. Children who get stimulation in accordance with the stage of their development will grow develop faster than children who get less one. Less stimulation can cause develop deviation growth, even it can become persisted disruptions [3, 4]

Fortunately in our health facilities, There was limited implementation of developmental detection so indirectly it caused less information in the incidence of developmental disorders in children [5] This resulted in not a lot of data that can be obtained on the incidence of developmental disorders in infants, either from the database issued by Ngoresan Health Center, Health Department Surakarta, Central Java Health Office, and/or the Department of Health of Republic Indonesia.

Study by Ashar (2009) in West Java mentioned, from 978 children under five, as many as 7% of children were late in their development.[6] A preliminary studies using Pre-Screening Questionnaire development in infants aged 3-6 months at Ngoresan Health Center found that from five infants with dubious developments, four babies (80%) delay in gross motor aspects and one (20%) delays in fine motor aspects. Stimulation is required at an early age for child's development, therefore we are interested in studying the effect of stimulation development of gross motor and fine motor skills to the development of infants aged 3-6 months.

METHODS

This research used the quasi experimental method with one group pre and post test design. The research was done at Community Health Center of Ngoresan-Surakarta and implemented in March 2014-June 2014. The population was babies with dubious developments at Community Health Center of Ngoresan-Surakarta, detected by the early detection of developmental screening. The samples were 20 respondents, chosen by using the quota sampling technique. Sample selection was done based on inclusion criteria: infants aged 3 months and 6 months with dubious progression (with an obtained score of 7 or 8 through screening using Pre-Screening Questionnaire Development), and as the exclusion criteria are babies with physical or mental limitations.

The intervention of this research is the stimulation of the gross motor and fine motor development. Stimulation is given to babies who have dubious development at first examination. It is stimulation for the age group younger than the baby's age and in accordance with any problems were found. Stimulation is done by parents who are taught how to do intervened stimulation. Stimulation is given daily for 14 days. Stimulation of gross motor was done with babies in the prone position, then shocked a toy rattle so the baby will be trying to lift its head. Fine motor stimulation was done by showing bright colored small toys to the baby, then the baby will be trying to reach out, to the objects for easy grip.[7]

For the assessment, the used instrument was pre-screening questionnaire development which consists of a 10-choice questions of Yes and No. Analysis of data was done using the non-parametric the Wilcoxon test because the data distribution is not normal. We didn't use a control group because of ethical consideration that researchers should still provide treatment to all children with dubious developments. We used a minimum sample size of experimental research because of our limitations. In health services in Indonesia, developmental screening has never been done, and testing was commonly done only for growth screening. So in finding a baby with dubious developments researchers should screen for all babies' development throughout the working area of Community Health Center of Ngoresan. Therefore we used a qualitative approach to discuss the results.

RESULTS

Respondents' characteristics

The characteristics of respondents are presented in table 1. Table 1 shows that the majority of respondents at the first screening developments were 3 months, which numbered as 16 respondents (80%). The majority of respondent were born mature, which numbered at 19 respondents (95%). The majority of respondents have a full-time mother, as many as 11 respondents (55%), is the first child or second child, as many as 15 respondents (75%), is stimulated in a category often, as many as 11 respondents (55%). Based on Growth Chart's babies, all respondents (100%) are not below the red line.

Table 1. Characteristics of participants

Variables	N	Percentage (%)
Age of baby (month)		
3	16	80
6	4	20

Table 1. Characteristics of participants

Variables	N	Percentage (%)
Birth		
Premature	1	5
Mature	19	95
Baby weight		
Not below the red line	20	100
Below the red line	0	0
Mother's occupation		
Working mom	9	45
Full time mom	11	55
Number of children		
≤ 2	15	75
> 2	5	25
Stimulation		
Frequently	11	55
Not Frequently	9	45

Table 2. Baby development before and after received developmental stimulation

Variables	N	Baby development's score			p value
		Median	Average	Range	
Before stimulation	20	8	8.5	7-8	0.000
After stimulation stimulated	20	10	9.5	(8-10)	

Table 2 shows that there is a significant difference in the baby's-developmental mean value prior to and after following the gross stimulation and the fine motor stimulation, that is 7.85 and 9.5 respectively with the value of $p = 0.000$

DISCUSSIONS

The analysis shows that there are differences in the average value of a baby's development before and after given stimulation for gross motor development and fine motor skills (7.85 and 9.5). Differences in development influenced by several factors, including the age, gender, environmental care, nutrition, and stimulation. Table 1 shows that the majority of respondents at the first developmental screening were 3 months, which numbered as 16 respondents (80%). The earlier a child with a developmental delay is detected, the earlier a stimulation intervention can be done, with less cost and more effective results.[2] The majority of baby were born mature (95%). Mature children show better development than premature one This is caused by the lack of neurological development which causes sensory and motor problems in premature children.[8]

The data shows that all the 20 respondents (100%) were not below the red line. Based on Growth Chart's baby. The weight written looks in accordance with the existing color bands of green, yellow, and red. The weight on the green band is good nutrition, the yellow brand is warning, and the band is malnourished. Nutritional status is a factor affecting children's gross motor development. Children who have good nutritional status have good development.[9].

The interaction between mother and child affects the development of the child. Table 1 shows that the majority of respondents have a full-time mother, found in 11 respondents (55%). Working mothers have

little time to educate their children and have less time to give stimulation. Difficulties in parenting will affect the development of children.[10] According to Waldfogel, mothers who are working and have children aged less than 1 year will affect the development of their children. This is because the mother does not provide breastfeeding and optimal care, where breast milk and nurture greatly affect the development.[11]

Table 1 shows that the majority of respondents were the first child or second child, found in approximately 15 respondents (75%). Too many children and the very close among them cause the insufficient attention from parents. Too many children will lead to less of attention and affection received by each child.[12] Table 1 shows the frequency of the stimulation provided by parents for 2 weeks. The categorized are frequent and not frequent. Frequent stimulation is defined when stimulation frequency \geq mean (≥ 41), and not frequent stimulation is defined when the frequency of stimulation $<$ mean (< 41). Table 1 shows that the majority of respondents stimulated in a category often, as many as 11 respondents (55%). Children who are targeted stimulation will grow faster than children who get less stimulation.[3]

Before given stimulation, all respondents had a dubious development. After 2 weeks stimulation was given, we found significant developmental differences. After treatment, 95% of respondents were re-classified in the category of normal development, while others remain on the category of dubious development. Respondents who still remain in the category of dubious developments thought to be linked to the working mother status and the condition where they and did not get frequent stimulation. The interaction of mother and child affects child development.[7] The role as a mother challenged if the mother had to work, that the time dedicated by the mother for child care is reduced. Difficulties in parenting will affect the development of children.[10] The stimulation is also important in improving a child's development. Children who obtained targeted stimulation will grow faster than children who get less stimulation.[3]

Screening results showed that prior to stimulation treatment, all respondents have dubious developments; 80% of respondents have developmental delays in gross motor aspects and 20% on fine motor. Motor development is divided into gross motor and fine motor. Motor movements are associated with the development of the brain motor center. The exercises of right, rough and smooth movement can improve flexibility and deliberations, so that the child's skill will grow.[12]

The result showed a significant effect of developmental stimulation for gross motor and fine motor skills to the development of infants aged 3-6 months. The function of stimulation is to help improve sensory and motor development.[13] Early detection of child development is still rare. The efforts of the government in improving the early detection of child development are through many designs of developmental programs. One of the innovations in early detection of child growth and development in Indonesia is the design of the learning system (ISD), the ADDIE model. The ISD process consists of five steps: analysis, development, design, implementation, and evaluation. The system designed based on information technology will facilitate the health personnels to achieve the desired outcome. It was effective in terms of competeness, ease, timeliness, accuracy, and conformity. [14]

Intervened stimulation provided in this research is stimulation of gross motor and fine motor skills, because these two aspects are common problems found during screening. Stimulation of gross motor was done with babies in the prone position, then shooked a toy rattles so the baby will be trying to lift its head. It is best to exercise his neck muscles so that his neck muscles get stronger.[15] Fine motor stimulation was done by showing bright colored small toys to the baby, so the baby will be trying to reach out and easily grasped the objects. It is useful to train her to be more skilled at holding things. Hand controls are starting from the shoulders to produce the arm's rough movement, gradually becomes a good elbow motion and eventually wrist and fingers' motions so that the movement becomes smooth and accurate.[16]

There are several mechanisms underlying the effect of developmental stimulation. Motor development is influenced by the organs and the brain. The central nervous system plays a role in motor skills and

coordinates any movement of the child. The more mature the developing nervous system of the brain that regulates muscle will allow the development of competence or ability of the child's motor.[17]

Stimulation affects the brain as a command center in the motor movement. An infant's brain has plasticity characteristics, include changes in brain anatomy because of the ability of nerves to regenerate. If It is used it will grow, if it not used it will degenerate. Development of brain function is not purely by biological processes, but is also affected by the quality of experience of interaction with the environment or parenting. The more synapses, the more complex the ability to receive, store, process and respond to stimulation. Synapses that do not receive the stimulus will degenerate.[18]

Motor development is also affected by the working muscles. Skeletal muscles are innervated by motor neurons that build the somatic nervous system. Stimulation will affect muscle strength. Stimulation produce patterns of different charge to the muscles. Adaptive changes occur in the muscle fibers, and the muscle will respond more effectively in accordance with instructions. The stimulation also causes metabolic changes in oxidative fibers, that use O₂ muscles efficiently, and the amount of capillaries that supply blood to the muscle fibers will also increase. The stimulation also causes muscle fibers to thicken as a result of increased synthesis of actin and myosin filaments that allow increased opportunity to interact across the bridge that will increase muscle strength.[19]

Another theory states that the stimulation is given through gestures to be responded by body movements. It is useful to develop the potential of children's intelligence. The response of children is a movement of the body's muscles as a result of the orders from the central nervous cells. When the stimulus is given to children by involving movement of the body, the brain cells will be more stimulated.[20]

Our result is in line with the research conducted by Kosegaran, et al (2013) that only connected the degree of parental knowledge about stimulation without providing stimulation intervention. The result showed a significant relationship between the degrees of the knowledge of parents about early stimulation to the child's development. Good knowledge of parents about early stimulation affects the stimulation of the development for children, so that children achieve optimal development according to age.[21]

This result also is in line with a study conducted by Ahsan, et al (2012). The research showed a significant relationship between knowledge, attitudes and practices of mothers in the stimulation of the development for children's language development. The better behavior of the mothers (knowledge, attitude and practice), the better language development of the children.[22] Hastuti (2007) in her research mentions that the mother's knowledge about nutrition and child development and psychosocial stimulation showed a positive and significant relationship with the child's cognitive development.[23]

CONCLUSION

The result showed a difference in mean values before and after the baby's development given the stimulation of development of gross motor and fine motor skills (7.85 and 9.5) with a significant value (p) = 0.000. The data suggests that the parents should provide developmental stimulation as early as possible and in accordance with the stage of development. Health workers should provide counseling regarding the stimulation of development, raise awareness of mothers in the delivery of developmental stimulation and participation in the development of early detection. Further studies on this should increase the number of samples and be conducted on all aspects of development.

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