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Tactile-kinesthetic stimulation to gain weight and reduce the length of stay care for premature baby at public hospitals of Semarang, Indonesia

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ABSTRACT

Background: Premature babies are susceptible to a variety of health problems in early of their lives, thus, management of premature care should be designed to optimize the growth and development, with no more cost extension. The management of premature care by non-pharmacological treatments becomes popular nowadays, and applied in the hospital unit care, including the Tactile-Kinesthetic Stimulation (TKS) and Kangaroo Mother Care (KMC).
Aims: This study is to present the effect of Tactile-Kinesthetic Stimulation (TKS) on weight gain and reduction length of stay care for premature babies, and to compare the results with the standard Kangaroo Mother Care (KMC) given at the hospital care unit.
Methods: The study used a quasi-experimental design with pretest-posttest with a control group. A total of 32 premature babies was equally divided to a control group given a standard KMC procedure and an intervention group receiving the TKS. Sampling was done using a consecutive sampling method where the low birth weight infants were selected from two public hospitals in Semarang of Indonesia, with consent from the parents. Data was then analyzed by a repeated measure ANOVA, general linear model and Mann-Whitney test to find the significant mean difference at *p* value less than 0.05.
Results: The data shows that the babies' weight significantly increased day by day only if the premature neonates received Tactile-Kinesthetic Stimulation, gained 148.75 gram only 3 days after the initial measurement. However, from this study we noted that the premature babies' weight at the control group provided only with Kangaroo Mother Care slightly decreased at 35.69 gram at the third day of observation. In average, premature babies receiving TKS need only 3 days before return home, while if receiving the standard KMC the preterm babies required 5 days in the hospital care.
Conclusion: Not only effective to gain the weight, giving Tactile-Kinesthetic Stimulation to the low birth weight baby shorter the length of stay in the hospital unit care. It suggests that the TKS intervention will provide good result in maintaining the weight of the low birth weight baby and will reduce the costs of staying in the hospital unit care.

INTRODUCTION

The conditions in the premature babies often lead to the occurrence of mortality and pain in babies [1]. The 2017 World Health Organization's report noted, of 4.5 million premature babies died over the globe, there are 675,700 cases found in Indonesia, or at the 5th rank after India, China, Nigeria and Pakistan [2]. A recent report from the perinatology room of KRMT Wongsonegoro Hospital recorded that, of 1,608 babies were born premature and

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low birth weight (LBW) in Semarang in 2017, there were 335 cases found in this study site [3].

Premature babies have been indicated with non-mature rudimentary organ function and others conditions led to experience adverse effects three times greater than those born at term [4]. As results, the preterm neonates face difficulty to adjust to their life outside the uterus which causes the baby having many disorders [5]. For example, the premature infant oral motor intervention on feeding progression led the premature babies to barely gain weight, and it will affect the premature babies will stay longer in the hospital [6, 7]. Thus, it is a need to provide properly care to the premature babies including the more efficient good handling and optimal management which can improve the growth and development of premature babies.

Kangaroo Mother Care (KMC) is a standard operation procedure provided by the hospital for the premature birth and it is found to effectively improve the babies' growth and development and the physiology and welfare of premature babies; however, the care is less efficient in the process of reducing the length of stay in the hospital [8]. This study proposes Tactile-Kinesthetic Stimulation (TKS) as a non-pharmacological treatment alternative that can help in the process of adaptation of preterm to the extrauterine environment [9], and known to shorter the length of hospital stay and lower the cost of hospital care [10].

Tactile-Kinesthetic Stimulation (TKS) presents benefits to brain development, reduces stress reflected in lower serum cortisol levels, increases weight, decreases pain response, improves digestion, lower energy expenditure, increases temperature in preventing hypothermia, stables the neonates' rate breathing, improves the preterm' behavior related to their physical health, and increases the maturation of electroencephalographic activity, visual function, neurological development, and motor [8]. This typical massage is a healing method using energy transferred from providers' hand, generating warmth to the recipient's body and has a fairly specific effect in maturation and activity of the premature babies' sympathetic nervous system. A recent literature review orchestrates advantages of massage in improving the behavior and physiological state of the premature infants [11]. This stimulation therapy is in the form of additional care that functions not to replace pharmacological treatment but must be carried out together with a hospital care treatment plan [12, 13]. This study will define how effective the Tactile-Kinesthetic Stimulation (TKS) on weight gain and reduction length of stay care for premature baby, compares to Kangaroo Mother Care (KMC).

METHODS

This study employed a quasi-experiment pretest-posttest with a control group. The focused population consisted of all stable premature babies and allowed to return home, and met the inclusion criteria; born at age <37 weeks with weight 1,500-2,500 grams and body temperature 36.5 - 37.5 ^{0}C, and based on medical records babies who did not have congenital abnormalities, complications such as anemia, RDS, intracranial hemorrhage, apnea marked by blue baby skin, and pulling of the chest wall. Those who receiving oxygen therapy or indicated with dehydration are excluded from the group. There were 32 premature neonates selected using a consecutive sampling method in May to June 2018, from two public hospitals in Semarang; KRMT Wongsonegoro Regional Hospital and Ungaran District Hospital. The babies were then equally divided into two groups, a control group receiving the standard procedure of Kangaroo Mother Care (KMC) and the intervention group acquiring with Tactile-Kinesthetic Stimulation (TKS). The procedures and the research design used in this study have been approved by the Health Research Ethics Commission on May 03, 2018, with number 128/KEPK/Poltekkes-Smg/EC/2018.

The trained health providers accompanied with hospital nurses deliver the Tactile-Kinesthetic Stimulation (TKS) twice a day for 3 days, at morning and evening, for 15 minutes. In the first 5 minutes Tactile stimulation was given with the supine baby positioned, 2 x 5 times with 6 repetitions, starting from the head, shoulders, back, legs and arms. For the next 5 minutes, the Kinesthetic stimulation was given with the position of the baby prone, 2 x 5 times with 6 repetitions of each movement, both hands and feet. The last 5 minutes, the baby in supine position and received tactile stimulation, as like given at the first 5 minutes.

Kangaroo Mother Care (KMC) was given for 1 hour a day for 3 days, by placing the baby, skin-by-skin contact, directly to the mother's chest. After that the baby is held directly by the mother for 1 hour in one action. KMC is applied to the control group because KMC treatment has been included in the standard routine care for the premature babies who are already allowed to return home.

Measurements on weight gain were carried out before and after treatment. Measurements on the first morning were carried out by measuring body weight before being given TKS action, then after the measurement the baby was given TKS action which lasted for 15 minutes. Then in the afternoon TKS care was given and continued measurement of body weight afterwards. On the second day, the TKS action will continue to be given as the first day and the measurements will be carried out in the afternoon after the TKS is given. And on the third day, the

TKS action is still given like the first or second day and the measurement of body weight is still done in the afternoon after giving TKS. Whereas, the measurement on the variable length of stay is to assess the duration of treatment of premature babies measured when babies are given treatment until premature babies are allowed to go home or until hospital care is completed.

Baby's weight was measured before TKS and KMC given to the neonates as the Pre Day, and the day after (Post) observed from the Day 1, Day 2, and Day 3. The study also recorded the time of baby be allowed to return home after the birth, indicated as length of stay care. The data was then analyzed using the Repeated Measure ANOVA test and General Linear Model after be noted the data was normally distributed. A Mann-Whitney test was performed to indicate the significant mean difference of body weight and length of stay care between the control and intervention group.

Table 1. Overview of premature babies weight gain and length of stay (N=32)

Variables	Intervention (N=16)		Control (N=16)	
	Mean	SD	Mean	SD
Weight gain (gram)				
Pre	2125.63	221.42	2150.31	205.75
Post Day 1	2125.63	221.42	2150.00	205.51
Post Day 2	2179.56	231.61	2135.25	207.06
Post Day 3	2274.38	238.58	2114.62	205.34
Delta	148.75	20.58	- 35.69	11.56
Length of stay care (day)				
Post	3.00	1.18	5.00	1.21

RESULTS

Overeview of premature babies weight gain and length of stay

Table 1 orchestrates the weight and length of stay in hospital unit care of the premature babies receiving the Kangaroo Mother Care (Control group) and Tactile-Kinesthetic Stimulation (Intervention group). The data shows that the babies' weight increased gradually day by day only if the premature neonates received TKS, gained 148.75 gram only 3 days after the initial measurement. However, from this study we noted that the premature babies' weight at the control group provided only with KMC slightly decreased at 35.69 gram at the third day of observation. No wonder why the preterm babies at control group need more time to stay at the hospital unit care compared to those who received the TKS intervention. In average, premature babies receiving TKS need only 3 days before return home, while if receiving the standard KMC the preterm babies required 5 days in the hospital care. The result shows that the average length of stay care in the intervention group, where the preterm received the TKS, was shorter than the control group. The average length of stay care in the intervention group was 3 days with a minimum of 3 days and a maximum of 6 days. Meanwhile, the average length of stay care in the control group is 5 days with a minimum duration of 3 days and a maximum of 7 days.

Will the Tactile-kinesthetic stimulation present significant difference to the weight gain?

Table 2 presents the mean difference and indicates the parametric statistical tests of premature neonates' body weight in the intervention and control group between two indicated time using Mann-Whitney test, and overall group (repeated measure ANOVA). Interestingly, we found that the TKS increases the weight, however, the standard KMC provided at the hospital presents the negative result to the weight gain. We noticed that almost no difference observed from Pre and Post Day 1 while the highest difference found if compared the Pre and Post Day 3. The statistical analysis indicates the mean difference between the weight gain between the control and intervention group was significant (p value = 0.001). From the results, we noticed that a least one group generates significant weight gain.

Table 2. The difference in the average weight of a premature babies

Observation Time	Weight gain (gram)		*p* value Mann-Whitney test
	Intervention	Control	
	Delta	Delta	
Pre- Post Day 2	53.93	- 15.06	0.001
Pre- Post Day 3	148.75	- 35.68	0.001
Post Day 1- Post Day 2	53.93	- 14.75	0.001
Post Day 1- Post Day 3	148.75	- 35.37	0.001
Post Day 2-Post Day 3	94.81	20.62	0.001
p* value *Repeated measure ANOVA		0.001	

By a Post Hoc Bonferroni test, we found that if compared to the result from Pretest before TKS was applied, the highest mean difference was observed at the Post Day 3, and the difference was significant (p value = 0.046), as shown in Table 3.

Table 3. Effect of giving premature babies tactile kinesthetic stimulation to weight gain

Observation Time	*p value*
Post day 1	0.749
Post day 2	0.573
Post day 3	0.046

General Linear Model Pos Hoc Bonferroni

Table 4. Effect of giving premature babies tactile kinesthetic stimulation to the length of stay care

Variables	Group		Delta	*p* value
	Intervention	Control		
Length of stay	3 days	5 days	2 days	0.033

Mann-whitney test

Table 4 shows that the length of stay care of the premature babies in control and intervention group is significantly different (*p* value = 0.033). In average, the premature babies received TKS required 2 days shorter to stay at hospital care unit compared to those provided with a standard KMC.

DISCUSSION

The process of increasing body weight observed in the intervention group is more optimal than in the control group. The body weight of premature babies who received the TKC (intervention group) increased 53.93 grams at the first day, 94.82 grams at the second day, and 148.75 at the third day. The results of the study are in accordance with the existing theory that the weight gain of premature babies per day ranges from 15-30 grams so that when viewed in a period of 3 days to 90 grams so that in this study the weight gain of premature babies was 58.75 grams [14].

Meanwhile, in the control group on the first day decreased by 15.06 grams, 20.62 grams at the second, and 35.68 grams at the third day. This is in line with the theory that the weight of a premature baby will experience a normal decline on the first day to the third day of 6-8% of body weight at birth while a full-term baby has a decrease of 5% [15]. The baby's weight loss is caused by insufficient breastfeeding, lack of calorie intake, decreasing fluid volume due to dehydration, declining the gastrointestinal motility, and the fluid loss when evaporation of the skin, through respiration, kidney and gastrointestinal, and experienced to urine and faecal fluid loss about 3-10% [16, 17].

Weight gain occurs due to the provision of kinesthetic tactile stimulation (TKS). This process is a touch action given to the baby as an effort to care for premature babies using certain techniques that provide great benefit to the process of growth and development of the baby, both physically and emotionally [18]. The growth process affects the weight gain while in the progression process it stimulates the effective sucking and swallowing reflexes, thus, it can affect the development process of the baby's intelligence more optimally. Consequently, the coverage of breast milk received by the baby is more and more effective [19].

The kinesthetic-tactile stimulation (TKS) given to the baby is in the form of sensory touches that will be processed in the brain's hypothalamus and mediated by the skin to produce positive brain waves in the form of beta endoprin release which can improve the process of growth and development of the baby so that the mechanism of food absorption is better in the digestive system baby [20, 21]. Babies given tactile kinesthetic stimulation will experience an increasing of vagus nerve tone (brain nerve 10) which will lead to an increase in the level of absorption enzyme gastrin, insulin or IGF-1 (insulin - like growth factor 1) which results in better food absorption, thus, the breast milk production of mother increased and the baby will feel hungry quickly and will breastfeed more often. With this condition, the baby's body weight increases more than babies who do not get kinesthetic tactile stimulation [22].

From the result, we acknowledge that tactile kinesthetic stimulation is effective in increasing the weight of premature babies compared to the treatment of kangaroo mother care (KMC), however, the KMC is also effective in anticipating excessive baby weight loss. This KMC is one method in the management of premature and low birth weight (LBW) baby care. Thus, all hospitals may require to implemente this method. The two public hospitals in this study have implemented this method and met the Standard Operating Procedure (SOP), however, not all babies received this application.

The analysis on the length of stay care variable is based on the length of treatment given to the two groups. The duration of treatment both in the intervention group and in the control group was not determined, so that the treatments have been given according to the condition of each premature baby or it can be seen from the achievement of the premature baby health during hospitalization from the condition of weight gain or the condition of the signs vital baby in a stable limit. From the present study, the average length of stay care of premature babies in the intervention group was 3 days while in the control group reached 5 days. It can be concluded that there was a difference in the duration of treatment between the intervention group and the control group.

Based on the observations made during the research, the long stay of treatment between premature babies with one another is significantly different. This can be caused by differences in the acceptance of the condition of each baby's body [23]. In general, premature babies are allowed to go home or finish their treatment period when they meet several indicators of the improvement of baby's condition, such as strong suction power, the ability to swallow, heavy body increases more than body weight at birth and stable vital signs [24]. The attainment of premature baby health affects the cost of hospitalization funds, if the stay care is longer, it will need higher cost

[25]. In addition, TKS can improve premature baby's growth and development to be more optimal and reduce hospital stay [26].

Looking at the result, it was found in this study that the intervention group given tactile-kinesthetic stimulation had shorter treatment period than the control group where kangaroo mother care (KMC) has been provided. This research is in accordance with the theory developed by Mendes *et. al*. in 2008, which states that TKS in low birth weight babies can reduce the length of stay in hospital [23]. This finding is also inforced by a theory by Abdallah (2013) that explains that TKS has a large positive effect on premature babies including gaining the body weight, decreasing the pain response, improving the baby's digestion, and decreasing the energy expenditure, temperature rise, positive effect on heart rate variability [8]. Thus, this study encourages hospitals to provide tactile kinesthetic stimulation for the premature babies with a purposes to the better baby condition and a decrease of cost by shorter the length of stay in the hospital unit care.

CONCLUSION

Giving premature babies tactile-kinesthetic stimulation (TKS) is effective in increasing weight of the low birth weight baby and decreasing the length of stay care in the perinatology room of the hospital. The study acknowledges that the kinesthetic-tactile stimulation given to the premature babies was more effective in shortening the treatment period about 2 days faster than those received kangaroo mother care (KMC). This finding can be recommended, among others for health workers, which TKS can be used as treatment care as SOP (Standard Operating Procedures) in treating premature babies in a hospital catalog and can be used as routine daily care in addition to KMC because it can optimize growth and development, especially in the process of weight gain. This TKS study was not carried out in conjunction with KMC, but was carried out separately in each treatment group so that the researcher had not been able to measure the advantages obtained if done together.

CONFLICT OF INTERESTS

No conflict of interests declared in the study.

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