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ORIGINAL RESEARCH

ISSN: 2477-4073

## THE EFFECTIVENESS OF COMBINATION OF KANGAROO MOTHER CARE METHOD AND LULLABY MUSIC THERAPY ON VITAL SIGN CHANGE IN INFANTS WITH LOW BIRTH WEIGHT

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### ABSTRACT

**Background:** Kangaroo mother care (KMC) and lullaby music methods have been considered as the alternative treatment for vital sign changes in low birth weight infants. However, little is known about the combination of the two methods.

**Objective:** To identify effectiveness of combinations of Kangaroo mother care and Lullaby music methods on changes in vital signs in low birth weight infants.

**Methods:** A quasi experiment with non-equivalent control group design. This study was conducted on October–December 2016 at the General Hospital of Ambarawa and General Hospital of Ungaran, Semarang, Indonesia. There were 36 samples selected using consecutive sampling divided into three groups, namely: 1) a group of low birth weight infants with the combination of KMC and lullaby music, 2) an low birth weight infant group with the lullaby music intervention, and 3) a control group given standard care in low birth weight infants by KMC method. Paired t-test and MANOVA test were used to analyzed the data.

**Results:** Findings revealed that there were significant differences between the combination group, lullaby music group, and control group in temperature ( $p=0.003$ ), pulse ( $p=0.001$ ), respiration ( $p=0.001$ ), and oxygen saturation ( $p=0.014$ ) with significant value of  $<0.05$ , which indicated that there was a statistically significant difference in vital sign changes among the three groups.

**Conclusion:** The combination of KMC method and lullaby music intervention was effective on vital sign changes (temperature, pulse, respiration, and oxygen saturation) compared with the lullaby music group alone and control group with KMC method in low birth weight infants. It is suggested that the combination of KMC and lullaby music methods can be used as an alternative to improve low birth weight care for mothers in the NICU and at home and to reach the stability of the baby's vital signs.

**Keywords:** kangaroo mother care, lullaby music, low birth weight, vital signs change

## INTRODUCTION

Low Birth Weight (LBW), especially in preterm birth, is due to the immaturity of the infant's organ system.<sup>1</sup> Infant with low birth weight has a tendency toward increased infection and susceptible to complications. Infants with LBW are also highly susceptible to hypothermia, due to the thinness of the fatty reserves under the skin and the immature central heat regulator in the brain.<sup>1</sup> The problems often occur in the infants with LBW are respiratory disorder, hypothermia, hypoglycemia, hyperglycemia, brain hemorrhage, and immunologic disorders.<sup>2</sup>

LBW infant is also sensitive to new environments, which might cause them to be susceptible to illness such as developmental disorders, vision (retinopathy), hearing, chronic lung disease, increased morbidity and frequency of congenital abnormalities and frequent hospitalization.<sup>3</sup>

Conventional LBW treatment with incubators is very expensive and requires trained health personnel and adequate equipment facilities. In developing countries, income and human resources are limited in neonatal care, and usually have limited treatment rooms. In addition, the incidence of nosocomial infections in hospital is high, and infants in the NICU are exposed to the average noise levels of 50-88 dB (reaching a peak level of more than 100 dB) from a variety of sources including ventilators, alarm monitors, incubators, conversations of NICU officers, radios, telephones, water faucets, and cupboard doors,<sup>4</sup> which can make LBW stability decrease. As a result, conditions such as hypoxemia and blood pressure instability may increase apnea and bradycardia, alter cerebral blood flow and intraventricular hemorrhage. Therefore, a practical method is needed as

an alternative to substitute incubator with efficient and effective treatment.<sup>4</sup>

The Kangaroo Mother Care (KMC) is considered as an alternative treatment, which has been performed in infants with low birth weight in hospitals to test the effects of physiological parameters (heart rate, breathing, temperature and oxygen saturation).<sup>5</sup> Research on premature babies showed that the bradycardia incidence is lower in the kangaroo care group who performed kangaroo treatments every hour compared to infants in the incubator ( $p = 0.048$ ).<sup>6</sup> In addition, the number of infants with oxygen desaturation is also lower in the kangaroo care group compared to the infants who received standard care ( $p = 0.02$ ).<sup>6</sup>

In addition to KMC treatment, music therapy provided in the NICU is considered able to reduce the room noise levels. Music has measurable benefits on physiological and psychological states in infants and children and is recommended as part of NICU care in the room.<sup>7</sup> Studies in Lithuanian involving 35 stable infants aged less than 32 postmenstrual weeks showed that infant heart rate (HR) was decreased significantly in live lullaby music group and recorder lullaby group, but not for control group ( $p = 0.02$ ).<sup>8</sup> In addition, the findings also showed that the lullaby live group resulted in deeper sleep than the lullaby recorder group ( $p = 0.02$ ) and the control group ( $p = 0.006$ ).<sup>8</sup> Lullaby music is included in classical music that is easy to find in every human culture, which can be used as baby delivery music, so it is useful to regulate infant behavior (such as calming, focusing on oneself) that accompanies to communicate emotional information.<sup>9</sup> However, little is known about the combination of the two interventions. Therefore, this study aims to determine

the effect of combination of KMC and lullaby music on vital sign change in low birth weight infants.

## METHODS

### *Design*

A quasi-experiment with non-equivalent control group design.

### *Setting*

This study was conducted on October – December 2016 at the General Hospital of Ambarawa and General Hospital of Ungaran, Semarang.

### *Population and Sample*

The target population in this study was all low birth weight infants (LBW) who were outside the incubator treated in the NICU of Ambarawa and Ungaran hospital Semarang. There were 36 samples selected using consecutive sampling divided into three groups, namely: 1) A group of LBW infants with the combination of KMC and Lullaby music (12 infants), 2) A LBW infant group with the Lullaby music intervention (12 infants), 3) A control group given standard care in LBW infants by KMC method (12 infants). The inclusion criteria of this study included: a) Mothers who had a LBW baby who was willing to be a research respondent; Infant weighing 1500-2500 grams; b) Baby was able to suck even if it was still weak; c) Baby was not dependent on oxygen; d) Baby did not get intravenous fluids; Baby with stable clinical conditions such as LBW had no use of respiratory aids; and e) no history of heart disease from parents.

### *Intervention*

The intervention given to the first group was the combination of KMC method given for 1 hour and followed by lullaby music for 20 minutes in 7 days; the

second group was the group given the lullaby music for 20 minutes in 7 days; and the control group was given standard treatment of KMC method according to guideline in the hospitals. The steps of the intervention of the combination of KMC Method and music lullaby as follows: 1) KMC method was done by the respondent's mother, 2) Baby was put in a kangaroo position, using hats, nappies and warmed socks, 3) Place the baby on the mother's chest, in an upright position directly to the mother's skin and make sure the baby's head was fixed on the mother's chest. Position the baby with the elbow and leg flexed. The baby's head and chest resting on the mother's chest with slightly raised head, 4) After a good baby position, kangaroo clothes were tied to support the baby. Furthermore, the baby's mother can do activity as usual while bringing the baby in a perpendicular position in the breast of the mother (skin to skin contact) such as kangaroos, 5) Perform the KMC method for 60 minutes (less than 60 minutes are avoided because too frequent changes will make the baby stress), 6) After 60 minutes performed KMC method, continued with lullaby music therapy provided with 60-75 dB using MP4 and speakers of the same brand to make sounds, and placed 30 cm away from baby's ears or at baby's feet. To guide the sequencing, duration, and frequency of music interventions, no hard and fast rules were applied. However, for short-term sedatives or soothing effects, music exposure was recorded most often around 20-30 minutes per session.

### *Instruments*

The instruments in this research included observation sheets of combination intervention, lullaby and control music, observation sheet of temperature measurement, pulse, respiration and

oxygen saturation; mp4 player with active speaker, digital axillary thermometer, watch, pulse oximetry, KMC shirt for KMC implementation, and academic calendar. In this study, temperature measurements were carried out with a calibrated digital thermometer tool. It was measured in axillary of the LBW infant with a normal value of 36.5°C-37.5°C, if the LBW temperature was <36.5°C then it was said to be hypodermic. While pulse measurement and oxygen saturation were carried out with a calibrated pulse oximetry device. Normal pulse of LBW infant was 120-160x / min and normal oxygen saturation was >95%, the measurement was done on baby's toes. Respiratory measures were performed for one minute by looking at infant's breathing, with a normal value of 30-60x / min.<sup>10</sup>

#### *Ethical consideration*

This study has been approved by the Health Research Ethics Committees (K.E.P.K) of the Health Polytechnic of Semarang with number 175 / KEPK /

Poltekkes-Smg / EC / 2016. Before the intervention was performed in infants, researchers conducted informed consent and provided information regarding research objectives and procedures on KMC methods and lullaby music to infant mothers. After the mothers agreed to be a research respondent, they signed the written informed consent.

#### *Data analysis*

Paired t-test was performed to know the difference of vital sign change before and after given intervention in each group. Levene test was used to test the homogeneity and the results showed p-value >0.05, which indicated that the temperature, pulse, respiration and oxygen saturation in all three groups had no significant difference or homogeneous. In addition, the normality test also showed p-value >0.05, which indicated that the data were normally distributed. MANOVA was also used to determine the differences of each variable after being given treatment when tested simultaneously.

## RESULTS

**Table 1** Difference of temperature, pulse, respiration and oxygen saturation in the combination group, lullaby music group, and control group

Group	Variable	Mean±SD		p-value
		Pre	Post	
Combination of KMC method and Lullaby music	Temperature	36.6±0.1723	36.7±0.1371	0.039
	Pulse	133±8.415	137±8.317	0.018
	Respiration	40±3.646	43±1.545	0.025
	Oxygen Saturation	95±1.147	97±1.769	0.035
Lullaby Music	Temperature	36.6±0.1815	36.5±0.2146	0.175
	Pulse	131±5.959	128±4.079	0.038
	Respiration	34±5.494	37±5.297	0.031
	Oxygen Saturation	94±1.596	94±1.235	0.715
Control (KMC method)	Temperature	36.6±0.1357	36.5±0.1084	0.044
	Pulse	137±5.518	133±4.441	0.025
	Respiration	41±4.830	36±3.742	0.000
	Oxygen Saturation	93±1.303	92±1.215	0.358

Paired t-test result as shown in the table 1 indicated that the mean temperature, pulse, respiration and oxygen saturation before and after intervention in the combination group obtained p-value <0.05, which indicated that there was a significant difference in temperature (p=0.039), pulse (p=0.018), respiration (p=0.025), and oxygen saturation (p=0.035) before and after given combination method (KMC method and Lullaby music) on LBW infants.

In the Lullaby musical group, only pulse and respiration had p-value 0.038, 0.031 (<0.05) respectively, which indicated there was a significant difference in pulse and respiration before and after intervention. While in the control group, there was a significant difference in temperature, pulse, respiration before and after intervention with p-value <0.05. There was no difference in oxygen saturation with p-value 0.358 (>0.05).

**Table 2** Difference of Vital Sign in the combination group, lullaby music group, and control group using MANOVA

Variable	Group	Mean	F	95% confidence Interval		p value	
				Lower Bound	Upper Bound		
Temperature	Combination	0.100	6.956	0.026	0.174	0.003	0.000
	Lullaby music	-0.042		-0.116	0.032		
	Control	-0.083		-0.157	-0.009		
Pulse	Combination	4.00	9.116	1.074	6.926	0.001	
	Lullaby music	-3.83		-6.760	-0.907		
	Control	-3.17		-6.093	-0.240		
Respiration	Combination	2.50	16.286	0.283	4.717	0.001	
	Lullaby music	3.33		1.116	5.551		
	Control	-4.67		-6.884	-2.449		
Oxygen Saturation	Combination	1.75	4.903	0.642	2.858	0.014	
	Lullaby music	-0.25		-1.358	0.858		
	Control	-0.42		-1.525	0.691		

Table 2 shows that there were significant differences between the combination group, lullaby music, and control group in temperature (p=0.003), pulse (p=0.001), respiration (p=0.001), and oxygen saturation (p=0.014). While the overall p-value was 0.000 (<0.05), which indicated that there was a statistically significant difference of vital sign (temperature, pulse, respiratory, oxygen saturation) between the three groups.

Based on the descriptive statistic test, it was found that the mean of temperature change in the combination

group had a higher value compared to the other two groups with a value of 0.100, which means that the combination intervention (KMC method and Lullaby music) is more effectively applied to the temperature change in LBW infants. Similar with the mean of pulse change and oxygen saturation in the combination group that had a higher value than the other two groups with a value of 4.00, 1.75 respectively. This shows that the combination (KMC method and Lullaby music) is more effective to be applied to pulse and oxygen saturation changes in LBW infants. But, for the mean

respiratory changes, the lullaby music group has a higher value than the combination and control group with a value of 3.33, which means that Lullaby music is more effectively applied to mean respiratory changes in LBW infants.

## DISCUSSION

Findings in this study revealed that the combination (KMC method and Lullaby music) intervention was effective on vital sign changes (temperature, pulse, respiration, and oxygen saturation) compared with the lullaby music group alone and control group with KMC method in low birth weight infants. Lullaby music in this study only had an effect on pulse and respiration, and control group with KMC method had an effect on temperature, pulse and respiration.

The combination methods seems effective because there is a maternal neonatal thermal synchrony in the kangaroo mother care method, which the mother's body temperature increases or decreases as needed to maintain the baby within the neutral temperature range (36.5°C-37.5°C).<sup>11</sup> KMC is skin-to-skin contact between mother (or substitute) and infant starting from birth, prolonged, and continuously, both in hospital and after return, with support for infection position, nutrition, prevention and management as well as difficulty breathing in infants. Literature also said that skin contact in the kangaroo method can decrease stress characterized by low cortisol levels and increase inner bonds, decrease physiological pain responses, improve cognitive development, and lower apnea incidence.<sup>1</sup> While in terms of effectiveness, safety and hygiene of kangaroo method is the same as the most sophisticated type incubator, but in terms of cost, it is much different.

In addition, research showed that a lower incidence of bradycardia in LBW infants in the KMC method group for an hour than the LBW in incubator with  $p=0.048$ . The KMC method also can provide stimulus to the hypothalamus that can release corticotropin releasing factor (CRF) and also endorphin so as to create a sense of comfort and calm in the baby. CRF to the anterior hippocampus is continued into the adrenal cortex resulting in decreased cortisol hormone and then decreased stress and an increase in immune system in the elevated infant, characterized by a decreased fever.<sup>12</sup> Research shows that the KMC method group for 5 minutes after delivery is significantly achieving pulse stability (120-160 times / min) compared with the KMC method group performed over 60 min after birth with a value of  $p = 0.001$ .<sup>13</sup> Another study revealed that the occurrence of oxygen desaturation was lower in LBW infants by KMC method compared with LBW infants in incubator with a significance value of 0.017,<sup>6</sup> and this study also showed lower oxygen desaturation events in the group KMC compared with standard treatment with a significance value of 0.03.<sup>6</sup> Thus, the KMC method can reduce the oxygen desaturation of the baby in premature and physiological stability.

On the other hand, lullaby music reduces the impact of exposure to noise levels and will provide beneficial effects on physiological functions, slow pulse and heart rate, lower blood pressure, and reduce stress hormone levels.<sup>14</sup> Lullaby music is slow-moving music, reaching the limbic system that can directly affect emotional reactions and human physical reactions such as heart rate, blood pressure and body temperature.<sup>15</sup> This music therapy is particularly useful for regulating hormones, slowing or



balancing the brain, affecting breathing, heart rate, pulse and blood pressure and body temperature. However, in this study live lullabies music resulted in longer sleep in infants compared with recorded lullaby music group. It is line with the study revealed that maternal singing during the KMC method lowers maternal anxiety and induces autonomic stability in preterm infants.<sup>16</sup>

Elements of music that cause relaxation are as follows: stable tempo; stability or gradual change in volume, rhythm, timbre, pitch, and harmony; consistent texture; predicted harmonic modulation; appropriate kadens (melodic or harmonic configurations that give the impression of equanimity and resolution).<sup>17</sup> Research shows the result that music combined with the mother's voice can also be considered as a variation received on music therapy.<sup>7</sup> The study showed that there was a significant influence between the treatment of music during the KMC method on the respiratory rate decrease of 3.3 times / min.<sup>18</sup>

## CONCLUSION

It can be concluded that the combination (KMC method and lullaby music) intervention is more effectively applied for changes of temperature, pulse, respiration, and oxygen saturation on LBW infants with an average increase in temperature (0.1°C), pulse (4 times/min), respiration (3 times/min), oxygen saturation (2%). It is suggested that the combination of KMC and lullaby music methods can be used as an alternative to improve LBW care for mothers in the NICU and at home and to reach the stability of the baby's vital signs. Further research is needed to control the noise level of the room by performing noise

measurements before giving music therapy.

## Declaration of Conflicting Interest

None declared

## Funding

This study was supported by Magister Applied Midwifery, Health Ministry Polytechnic of Semarang, Central Java, Indonesia.

## Author Contribution

All authors contributed equally in this study.

## References

1. Hockenberry MJ, Wilson D, Rodgers CC. *Wong's essentials of pediatric nursing*. Philadelphia: Elsevier Health Sciences; 2016.
2. Ministry of Health of Indonesia. *Profil Kesehatan Indonesia 2014*. Jakarta: Ministry of Health of Indonesia; 2014.
3. Suradi R, Rohsiswatmo R, Dewi R, Endyarni B, Rustina Y. *Perawatan Bayi Berat Lahir Rendah (BBLR) dengan metode kanguru [Low birth weight infants care using kangaroo method]*. Jakarta: HTA Indonesia; 2008.
4. Alipour Z, Eskandari N, Hossaini SKE, Sangi S. Effects of music on physiological and behavioral responses of premature infants: A randomized controlled trial. *Complementary Therapies in Clinical Practice*. 2013;19(3):128-132.
5. Nirmala P, Rekha S, Washington M. Kangaroo mother care: Effect and perception of mothers and health personnel. *Journal of Neonatal Nursing*. 2006;12(5):177-184.
6. Mitchell AJ, Yates C, Williams K, Hall RW. Effects of daily kangaroo care on cardiorespiratory parameters in preterm infants. *Journal of Neonatal-Perinatal Medicine*. 2013;6(3):243-249.

7. Stouffer JW, Shirk BJ, Polomano RC. Practice guidelines for music interventions with hospitalized pediatric patients. *Journal of Pediatric Nursing*. 2007;22(6):448-456.
8. Garunkstiene R, Buinauskiene J, Uloziene I, Markuniene E. Controlled trial of live versus recorded lullabies in preterm infants. *Nordic Journal of Music Therapy*. 2014;23(1):71-88.
9. Abromeit DH. The newborn individualized developmental care and assessment program (NIDCAP) as a model for clinical music therapy interventions with premature infants. *Music Therapy Perspectives*. 2003;21(2):60-68.
10. Potter PA, Weilitz PB. *Pocket guide to health assessment*. Missouri: Mosby Inc; 2002.
11. Anderson GC. Current knowledge about skin-to-skin (kangaroo) care for preterm infants. *Journal of perinatology*. 1991;11(3):216-226.
12. Putra HA. *Efektifitas bunga rosella untuk penurunan tekanan darah pada pasien hipertensi di Desa Kedondong Kecamatan Kebonsari Kabupaten Madiun [Effectiveness of roselle flower in lowering blood pressure in patients with hypertensin at Kedondong Village Kebonsari District Madiun regency]*. Ponorogo, Indonesia: Universitas Muhammadiyah Ponorogo; 2013.
13. Takahashi Y, Tamakoshi K, Matsushima M, Kawabe T. Comparison of salivary cortisol, heart rate, and oxygen saturation between early skin-to-skin contact with different initiation and duration times in healthy, full-term infants. *Early Human Development*. 2011;87(3):151-157.
14. Salamon E, Kim M, Beaulieu J, Stefano GB. Sound therapy induced relaxation: down regulating stress processes and pathologies. *Medical Science Monitor*. 2003;9(5):RA96-RA90.
15. Campbell DG. *Efek mozart*. Jakarta: Gramedia Pustaka Utama; 2001.
16. Arnon S, Diamant C, Bauer S, Regev R, Sirota G, Litmanovitz I. Maternal singing during kangaroo care led to autonomic stability in preterm infants and reduced maternal anxiety. *Acta Paediatrica*. 2014;103(10):1039-1044.
17. Djohan. *Terapi musik: Teori dan aplikasi [Music therapy: Theory and application]*. Yogyakarta: Galangpress; 2006.
18. Kustio W. Pengaruh musik terhadap respirasi bayi berat lahir rendah selama kangaroo mother care [Effect of music on respiration of low birth weight infants during kangaroo mother care]. *Jurnal Kebidanan dan Keperawatan Aisyiyah*. 2013;9(2):175-182.

**Cite this article as:** Yusuf N, Hadisaputro S, Runjati, Suwondo A, Mashoedi ID, Supriyana. The effectiveness of combination of kangaroo mother care method and lullaby music therapy on vital sign change in infants with low birth weight. *Belitung Nursing Journal*. 2017;3(4): 352-359. <https://doi.org/10.33546/bnj.161>