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## **THE EFFECT OF MASSAGE AND MUSIC THERAPY FOR PREMATURE INFANTS: A LITERATURE REVIEW**

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### **ABSTRACT**

**Background:** Premature infants are prone to loose skin stimulation through skin contact with the amniotic fluid and the uterine wall of the mother during the intrauterine phase. This situation becomes one of the decisive factors in the growth and development of infants' nerves. In addition to the initial sensory deficiency, prematurity raises other related factors such as the absence of bonding between the mother and the newborns due to the need to remain in the neonatal intensive care unit (NICU). Prematurity also has adverse effects on the psychological and biological development of the children and the parents' welfare.

**Aims:** The aim of this study was to analyze the literature relating to holistic care in massage and music therapy for premature infants and summarize the benefits of both therapies.

**Methods:** The method used in finding articles was a literature review, using the keywords. Search was conducted electronically using several databases, including Pubmed, Science Direct, and Google Scholar

**Results:** The massage and music therapy contribute positive impact on infant development. Massage therapy not only provides comfort but also improves sleep quality, insulin levels, pulse frequency and body temperature, and induces weight gain. Likewise, music therapy helps to accelerate the baby's growth by reducing the effects of psychological stress.

**Conclusion:** Massage and music therapy have benefits for premature infants growth.

**Keywords:** Premature infants, preterm, massage therapy, music therapy

### **INTRODUCTION**

Infant mortality and morbidity are influenced by various factors, one of which is the birth condition of the baby. Based on WHO (World Health Organization) data, every year about 15 million babies are born prematurely, and in the first year of birth, premature complications contribute one million children death[1]. Prematurity remains a major health problem worldwide [2].

In Indonesia, it is mentioned that around 675,700 infants were born prematurely or with low birth weight. The pattern of the causes of death indicated that the highest proportion of neonatal death causes in the age group of 0-7 days were premature and low birth weight and birth asphyxia. In Indonesia, the handling of low birth weight infant complications is with integrated management of young toddlers and coverage of low birth weight infant handling is 59.68% in 2014 and 51.37% in 2015 (Intercensal population surveys, 2015).

Birth before 37 weeks of pregnancy is responsible for 75% of perinatal death and more than 50% of infant morbidity [3]. The perinatal period will cause prematurity consequence that will develop during lifetime in the form of disability with significant impact on social welfare and health, such as cerebral palsy, chronic

lung disorders, sensory disturbances (especially visual and auditory), difficulties, attention deficits and coordination disorder [1, 4, 5].

Premature infants are prone to loose skin stimulation through skin contact with the amniotic fluid and the uterine wall of the mother during the intrauterine phase. This situation becomes one of the decisive factors in the growth and development of infant's nerves [6].

In addition to the initial sensory deficiency, prematurity raises other related factors, such as the absence of bonding between the mother and newborns due to the need to remain in the neonatal intensive care unit (NICU). Prematurity also has adverse effects on psychological and biological development [7] of the children and the parents' welfare [8].

Massage therapy and music therapy are emphasizing in awakening the preterm infants' immune system and thoroughly preventing disease-causing factors.

## **METHODS**

The method used was a literature review, using keywords such as Music Therapy, Massage therapy, and Preterm Neonates. The research was conducted digitally using several databases, including 126 publications about massage therapy and 39 publications about music therapy from Pubmed, 274 publications of massage therapy and 135 publications of music therapy from Science direct, and 1,120 of massage therapy and 1,610 of music therapy from Google scholar.

After the initial screening of titles and abstracts and elimination of duplicates, 65 studies were selected for retrieval of full text and 3,239 were excluded. These were excluded if they were irrelevant to the research question or inaccessible. The 65 articles selected for retrieval of full texts were subjected to inclusion and exclusion criteria. After review and consensus, 39 studies were excluded and 26 studies were included for this review. The inclusion criteria were population of premature babies with gestational age of 32 – 37 weeks and with birth weight of  $\leq 2500$  grams, intervention method of massage with oil or/and without oil and music therapy as lullaby song, mother song and relaxations music. The study design were Systematic review, Meta-analysis, and Quasi-experimental studies. The outcome were development as measured in physiological and behavioral responses, weight gain, and pain reduction. This research was conducted from academic papers published within 2013 until 2017.

## **RESULTS**

Massage therapy is a treatment that is mostly done in premature infants who are treated in the currently NICU. One of the studies conducted by Karbasi et al made a comparison for weight, height and head circumference of neonates at two weeks after intervention. Infants with massage therapy have a more constant weight gain compared to infants who only follow the NICU cares[9]. Infant growth is not only seen from the growth of anthropometry but also the psychological side like a stress behavior and activity. Massage therapy can reduce stress and tension. This is indicated by stress reduction or pacifying effect. Massage therapy with olive oil for healthy preterm infants had a positive effect on their pain scores before and after the massage, on their pain responses at discharge, and on their mental development at 12 months[10]. Stressful events adversely affect the immune system, particularly the natural killer (NK) cells. Infants in the NICUs are exposed to stressful stimuli. Massage therapy administered to preterm infants was associated with higher NK cytotoxicity and more daily weight gain[11].

In other studies, massage therapy showed the lower number of PIPP (Premature Infant Pain Profile). PIPP includes seven multidimensional indicators of pain; behavioral, physiological, and contextual measures (gestational age, behavioral state, heart rate, oxygen saturation, brow bulge, eye squeeze, and nasolabial furrow)[10]. Massage therapy had a significantly lower PIPP scores with  $p = 0.041$  and had lower PIPP scores on discharge,  $p = 0.011$  compared to the non- massage infants. Infants who had the massage experience receive significant benefit including stabilization of the ANS, promotion of growth and

development, and shorter hospital stays[12]. Massage therapy improves a vagal tone that is measured by ANS (Autonomic Nervous System). ANS was quantified by heart rate variability. Heart rate variability increased weekly, followed by preterm infants for 4-weeks suggesting an improved ability to manage NICU related stressors[13]. Massage as multisensorial interventions have been recommended for pain and stress relief in preterm neonates[12].

Besides massage therapy, music therapy is also developed in infants in NICU. Music like a rhythm, breath, and lullaby can be an option in premature infants' treatment. Music that is played either in the morning or afternoon can provide calming effects. The other benefit found by Loewy, et al is an improved cardiac and respiratory function in premature babies [14]. Entrained with a premature infant's observed vital signs, sound and lullaby may improve feeding behaviors and sucking patterns[15]. In addition to the music presented through the recording, maternal singing can make values of heart rate, oxygen saturation and respiratory rate of infants more stable[16].

Other studies mentioned short-term benefits of music for preterm infants. Music therapy improved oxygen saturation in preterm infants of 28 weeks and older [17, 18]. Music therapy have beneficial effects among stable preterm infants on HR (Heart rate) and decreased HR during and following heel lance, but only in older infants (>31 weeks)[18, 19]. Music therapy was associated with decreased pain response following a medical procedure in preterm infants (>31 weeks) after the procedure[20] while lullabies and rhythm showed an increased sucking behavior in preterm infants[15] and improvement in sleep quality [18, 21]. In medium-term, music therapy has beneficial effects among stable preterm infants (>28 weeks) on weight gain, improved feeding behaviors, decreased in the length of hospitalization among preterm infants (>28 weeks). Maternal voices was also associated with long-term development babies in 3-6 months[18].

## **DISCUSSION**

### *Massage*

Baby massage has been known for centuries, in various nations and cultures, with various forms of therapy and goals. Baby massage is the expression of affection between parents and children through touch on the skin that has an incredible impact. White and Field stated that multi-stimulation modalities provided a positive effect such as weight gain, better and more active baby response and shorter hospital stay. Monitoring conducted when the baby was eight months old had a more positive effect [22, 23].

A massage is a process of transferring mechanical energy to the soft tissues of the body through the skin to obtain certain physiological or psychological effects and is a manual or mechanical procedure [22, 24]. In other study conducted by Melyana, *et al* (2011), one way to reduce pain is with massage. A massage is one of the non-pharmacological therapies for reducing or relieve pain. Massage stimulation causes a fast moving impulse of the peripheral nerve receptors to reach the first gate door of the pain impulse and running more slowly along the pain fibers. Then the brain receives and interpreted in general a massage sensation and does not receive a pain[25].

Knowledge of complications in premature infants leads many neonatal units to review neuromotor and emotional development of infants by introducing a series of somatic treatment actions (stimulation of the somatosensory system), kinesthetic (stimulation by movement) and sensory stimulations (sensory stimuli: sight, hearing, tactile, olfaction and gustatory) [23, 26]. One of the most common interventions used in NICU to provide premature infants with somatic stimulation (somatosensory system stimulation of some modalities on sensory receptors covering the skin, muscles, bones, and joints) [27] is massage therapy [22]. The effects of massage on infants based on neurological mechanisms are poorly understood, but infant massage has been shown to increase insulin levels, insulin growth, vagal activity and gastric motility [23]. Increased insulin levels in premature infants is part of an increase in the number of cytotoxic cells. Increased infants' insulin levels were reinforced by weight gain in premature infants who got massage therapy on five consecutive days [11]. Premature babies are more easily to lose the available skin stimulation during

intrauterine development through skin contact with the amniotic fluid and the uterine wall of the mother. It has been proven that this condition is one of the decisive factors in the growth and development of infant nerves [6]. Infant growth in the NICU is associated with the development of vital signs, anthropometry, and infant immune system.

Infants who received massage experience clinically had significant difference compared to infants who received standard care in NICU. Babies who were given regular massages had static weight gain each day, not only on weight, massage also provided differences in height and head circumference in the group of infants aged two months [9]. Other studies by Smith, et al (2013) suggest that massage therapy does not only affect anthropometry growth but can also increase the pulse rate and temperature of the baby. The increase in pulse frequency resulting from a touch given, tends to provide comfort to the baby, which reduces physical stress in premature infants. A comfortable state resulted in a decrease in the pulse rate of the baby to normal [13, 28]. The baby's sense of comfort also affects the quality of the baby's sleep to become more sound [13]. Sleep quality is seen from closed eyes, movement during sleep, regular breathing or not.

Baby massage procedure is performed for 15 minutes with three phases of tactile, kinesthetic, and tactile for five minutes in each massage phase. This is in accordance with the procedural undertaken by Ahmed, et al (2015)[29] in Sudan. Massage can be done with or without oil. A study suggested that there was an increase in the growth parameters' mean (weight, height and head circumference) evaluated 14 days after intervention, in babies aged one and two months. The study also mentioned that adding sunflower oil during massage therapy had no side effects on infants[30].

Premature infants undergo many procedural treatments that result in neurobiological disorders. Currently music therapy is widely used in the NICU to improve the physiological and behavioral state of premature babies. The physiological state is associated with oxygen saturation and weight gain. Neurobiological conditions can be caused by persistent high levels of stress during medical treatment and neonatal care in the intensive care unit (NICU). The extra uterine environment causes impaired growth and development of the baby [31].

### *Music*

Music therapy is one of the relaxation techniques to improve, maintain, and develop person's psychological and physiological state. Not only for relaxation, music therapy can also relieve pain, reduce anxiety with the aim to boost one's health status [32].

Music rendezvous, especially before bedtime, provides benefits for infant health. The benefits are especially for premature babies who are undergoing special treatment at the Neonatal Intensive Care Unit (NICU). The results of research experts from Beth Israel Medical Center is revealed, there is an increase in the breathing rate and heart rate in premature babies who listen to music. This study has been published in the Journal of Pediatrics.

Ocean rhythms also find that live music would improve the diet and sleep. In premature infants, this is in line with an increase in heart rate and breathing rate. In addition, the parent's preferred lullaby would enhance the inner bond of parent and child. The study involved 272 premature infants treated at NICUs of 11 different hospitals. These babies were born with 32 weeks' gestational age. Premature infants are those born with gestational age less than 37 weeks. These babies had various complications such as less sensitive sensors, respiratory problems, cerebral palsy, and learning difficulties.

The therapist and the parents also sang songs, which were chosen by them. Due to no reference to the song, the parents chose the song of "Twinkle-Twinkle Little Star". Infants who were listening to music showed positive health effects, such as increased diet and sleep duration. The meaning of eating was drinking milk. While in newborns, this exposure improved the oxygen level in the blood and the duration of calm time.

The influence of parental voice has a significant importance. Parents' voice while singing can calm the baby. This has a positive effect on the growth process being undertaken. This effect is more useful if supported by the music therapist. The study from Arnon, et al (2014) showed that the lullaby song chosen by the parent actually strengthens the inner bond of parent and child. This could be seen from children who calmed down faster when parents began to sing.

For premature infants, instability conditions tend to lead to hypoxemia, blood pressure instability, increased apnea and bradycardia, altered cerebral blood and intra-ventricular flows. This condition will obviously interfere with the sleep cycle and prevent sleep rapid movement (REM) which is the stage of organ maturation and weight gain [31].

Music therapy (lullaby) is known to be used as a baby bedtime companion, it affects the baby's heart and breathing to be more stable than infants who do not get music [31]. Not only that, music therapy can improve the physiological states of the baby's vital sign, fluency of breastfeeding and quality of baby sleep. Babies who get music will be more comfortable in the process of breastfeeding so that affect the quality of sleep to be longer [15].

While music therapy may be provided through pre-recorded voice, the mother's singing voice has a stronger effect by not only stabilizing the baby's heart rate and breathing, but also bonding the relationship between mother and baby [16]. Not only has a good effect on the baby, the mother's singing also reduces the pain experienced by the mother.[16]

## **CONCLUSION**

Massage and music can have a positive impact on infant development. For instance, massage therapy can not only provide comfort but also improve sleep quality, insulin levels, improve pulse frequency and temperature, and weight gain. In addition, music therapy helps to accelerate the baby's growth by reducing the effects of psychological stress.

The present review suggests that a clear benefit is obtained from the administration of both therapies in premature infants care. Massage therapy and music therapy can be optimized by developing them into a procedural of premature infants care in the NICU. Both methods might be used as an effective, safe, and relatively low-cost non-medical intervention for premature infants.

## **CONFLICT OF INTEREST**

There is no conflict of interest.

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