

Effectiveness of Infant Massage and Classical Music Therapy on Sleep Quality Among Children Aged 6-12 Months

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ABSTRACT

Background: Infant sleep quality is crucial for growth and development, yet many infants experience sleep disturbances. This study explores the effectiveness of non-pharmacological interventions, massage and classical music in improving sleep quality in infants.

Methods: This study was conducted at Puskesmas Gogagoman in North Sulawesi, involving 48 infants aged 6–12 months, randomly assigned to massage, classical music, or control groups. Using a quasi-experimental pretest-posttest control group design, researchers assessed sleep quality before and after interventions. Data were collected using the Brief Pittsburgh Sleep Quality Index (B-PSQI) and analyzed using non-parametric tests, including the Wilcoxon Signed Ranks Test and Kruskal-Wallis Test.

Results: The major findings of this study indicate that infant massage significantly improved sleep quality compared to both classical music therapy and the control group. After the intervention, the massage group showed the greatest reduction in sleep disturbance scores (mean score dropped from 2.88 to 1.13), followed by the music group (mean score dropped to 1.94), while the control group showed minimal change (mean score of 2.81). Statistical tests confirmed that these differences were significant, highlighting that massage therapy was the most effective intervention for enhancing infant sleep quality.

Conclusion: This study concludes that infant massage is more effective than classical music in improving sleep quality in infants. Both interventions were better than no treatment.

I. Introduction

Sleep quality is a critical component of infant development, directly influencing physical growth, cognitive function, and emotional regulation (Jiang, 2019; Liu et al., 2024). Infants aged 6 to 12 months undergo significant neurological and physiological changes, during which sleep patterns become more consolidated and regular (Tham et al., 2017). However, many infants experience sleep disturbances that can negatively impact their overall health and well-being. Poor sleep quality in infancy has been linked to developmental delays, behavioral problems, and increased parental stress (Lollies et al., 2022). Therefore, identifying effective interventions to improve sleep quality during this sensitive period is of paramount importance (Magee et al., 2022).

Among non-pharmacological interventions, infant massage has gained attention for its potential benefits in promoting relaxation, reducing stress hormones, and enhancing sleep patterns (Shayani & Marães, 2023). Infant massage involves gentle, systematic stroking of the baby's body, which can stimulate the parasympathetic nervous system, promoting calmness and better sleep. Various studies have shown that massage can improve infant sleep duration and reduce nocturnal awakenings (Nousia, 2023). Furthermore, massage therapy supports parent-infant bonding, which may contribute to emotional

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security and improved sleep outcomes (Mindell et al., 2018). Despite these promising findings, there remains a need for more region-specific research to confirm its efficacy across diverse populations (Norman & Roggman, 2025).

Another intervention that has been explored for improving infant sleep quality is exposure to classical music therapy (Papatzikis et al., 2024). The soothing melodies and rhythms of classical music are thought to influence autonomic nervous system activity, promoting relaxation and facilitating sleep onset (McPherson et al., 2019). Research on music therapy has demonstrated positive effects on sleep quality in both infants and adults, with some studies reporting longer sleep duration and reduced sleep latency in infants exposed to calming music (Kobus et al., 2021). However, variability in study designs, types of music used, and cultural differences in music preference warrant further investigation to establish standardized guidelines for clinical use.

In the context of North Sulawesi, Indonesia, there is limited empirical evidence examining the impact of these interventions on infant sleep quality. The unique cultural practices, environmental factors, and healthcare infrastructure in this region necessitate localized research to ensure that recommendations are culturally appropriate and feasible for caregivers. Additionally, comparing the relative effectiveness of infant massage and classical music therapy within the same population can provide valuable insights for healthcare providers and policymakers in optimizing infant care practices.

Previous studies have often focused on single interventions without direct comparison, limiting the understanding of which method might be more beneficial or practical in everyday settings. Moreover, the inclusion of a control group without intervention is crucial to discern whether observed improvements are truly attributable to the therapies or natural developmental progression. This comprehensive approach will allow for robust conclusions about the efficacy of these interventions and their applicability in community health centers like Puskesmas Gogagoman. Therefore, this study aims to evaluate and compare the effectiveness of infant massage and classical music therapy on sleep quality in infants aged 6 to 12 months in the working area of Puskesmas Gogagoman, Kota Kotamobagu, North Sulawesi Province.

II. METHODS

This study employed a quasi-experimental design with a pretest-posttest control group structure to assess the effectiveness of infant massage and classical music therapy on the sleep quality of infants aged 6 to 12 months. The research was conducted in the working area of Gogagoman Public Health Center, Kotamobagu City, from March 3 to April 14, 2025. The population consisted of 96 infants within the target age range. Using a simple random sampling technique and Slovin's formula with a significance level of 10%, a sample of 48 infants was selected and randomly assigned into three equal groups of 16 infants each: a massage therapy group, a classical music therapy group, and a control group. Inclusion criteria included infants aged 6–12 months in good health and with mothers who consented to participate, while exclusion criteria involved infants not residing in the health center's coverage area.

Data collection instruments included standardized operating procedures (SOP) for administering massage and music therapy, along with the Brief Pittsburgh Sleep Quality Index (B-PSQI), adapted for infant sleep behavior. The massage intervention consisted of 30-minute sessions conducted twice a week over two weeks, focusing on gentle, rhythmic strokes to stimulate comfort and relaxation. The classical music intervention involved playing lullaby-style music with slow tempo (60–80 bpm) and soft volume (≤ 65 dB) for 30 minutes each night over three consecutive nights. Both interventions were applied following established protocols to ensure consistency and reproducibility. Sleep quality was assessed through parental reports using the modified B-PSQI during both pretest and posttest phases.

Data analysis was performed in two stages: univariate and bivariate. Univariate analysis was used to describe the demographic characteristics and sleep quality scores. Prior to bivariate testing, normality of data was assessed using the Kolmogorov–Smirnov and Shapiro–Wilk tests, which revealed that the data were not normally distributed. Consequently, non-parametric tests were applied. The Wilcoxon Signed Rank Test was used to evaluate differences between pretest and posttest scores within each group, while the Kruskal–Wallis test was used to compare sleep quality improvements among the three groups. All statistical analyses were conducted at a significance level of $p < 0.05$.

The research process involved several key phases. It began with obtaining ethical clearance and official permission from relevant authorities, followed by training enumerators to ensure procedural alignment.

The pretest phase consisted of administering questionnaires to mothers to assess their infants' baseline sleep quality. Interventions were then implemented as per the group assignment. After the intervention period, the same questionnaires were distributed to assess posttest sleep quality. This procedure ensured that the effects of the interventions could be directly compared while maintaining internal validity. Ethical considerations were carefully observed throughout the study. Ethical approval was granted by the Health Research Ethics Committee of STIKES Guna Bangsa Yogyakarta. Informed consent was obtained from all participating mothers after a clear explanation of the research objectives, procedures, and their rights as participants. Anonymity was ensured by omitting names from data collection sheets and using coded identifiers. Confidentiality was respected by restricting access to individual data to only authorized researchers. Finally, fairness and equal treatment were maintained for all participants across intervention and control groups to uphold the principle of justice in human subject research.

III. RESULT

The table 1 shows the distribution of infants aged 6–12 months who received massage therapy, classical music therapy, or no intervention (control group), based on age, gender, and birth order. Most infants were aged 6–9 months (83.3%), with a relatively balanced distribution across intervention groups. Female infants were more prevalent (58.3%), particularly in the massage and music groups. Regarding birth order, the majority were first-born children (52.1%), followed by second-born (31.2%), while third- and fourth-born were less common. Each intervention group consisted of 16 infants (33.3%), ensuring a balanced sample for comparison. This distribution suggests a relatively even allocation across groups, with a slight predominance of younger, first-born, and female infants, which may influence the interpretation of intervention outcomes.

Table 1. Distribution of Respondents by Intervention Category

Variable	Sub-variable	Massage (%)	Music (n/%)	Control (n/%)	Total (n/%)
Infant Age	6–9 months	14 (29.2)	11 (22.9)	15 (31.2)	40 (83.3)
	10–12 months	2 (4.1)	5 (10.4)	1 (2.1)	8 (16.7)
Gender	Male	5 (10.4)	6 (12.5)	9 (18.7)	20 (41.7)
	Female	11 (22.9)	10 (20.8)	7 (14.6)	28 (58.3)
Birth Order	First child	8 (16.7)	10 (20.8)	7 (14.6)	25 (52.1)
	Second child	5 (10.4)	4 (8.3)	6 (12.5)	15 (31.2)
	Third child	2 (4.2)	2 (4.2)	2 (4.2)	6 (12.6)
	Fourth child	1 (2.1)	0 (0)	1 (2.1)	2 (4.1)
Total Respondents		16 (33.3)	16 (33.3)	16 (33.3)	48 (100)

In the table 2 shows the combined data demonstrate that all groups began with the same average sleep quality score of 2.88, indicating similar baseline conditions across interventions. After treatment, the massage group showed the most significant improvement, with the mean score dropping to 1.13, reflecting a notable enhancement in sleep quality since lower scores indicate better outcomes. The classical music group also experienced improvement, with a reduced mean score of 1.94, though the effect was less pronounced than that of the massage group. In contrast, the control group exhibited only a minimal decrease to 2.81, suggesting that without any intervention, sleep quality remained relatively unchanged. Overall, the data suggest that infant massage is the most effective intervention, followed by classical music, in improving sleep quality in infants aged 6–12 months.

Table 2. Comparison of Infant Sleep Quality Scores Before and After Interventions (n = 16)

Intervention Group	Mean (Pre-Test)	SD (Pre)	Mean (Post-Test)	SD (Post)	SE	Min (Pre-Post)	Max (Pre-Post)
Baby Massage	2.88	0.342	1.13	0.342	0.085	2–1	3–2
Classical Music	2.88	0.342	1.94	0.574	0.143	2–1	3–3
Control Group	2.88	0.342	2.81	0.544	0.136	2–1	3–3

The statistical analysis in the table 3 began with a normality test using the Kolmogorov-Smirnov and Shapiro-Wilk methods, which revealed that all sleep quality data—both pretest and posttest across the massage, music, and control groups—were not normally distributed ($p < 0.05$). Therefore, non-parametric tests were used in further analysis. The Wilcoxon Signed Ranks Test showed a statistically significant improvement in infant sleep quality following the baby massage intervention, with 15 out of 16 infants showing better sleep and a p-value of 0.000. Similarly, the classical music group demonstrated significant improvement ($p = 0.001$), with 13 out of 16 infants showing enhanced sleep quality. In contrast, the control group showed no statistically significant change ($p = 0.564$), with 13 infants experiencing no change at all. To compare the three groups simultaneously, the Kruskal-Wallis Test was applied. Pretest results showed no significant difference among groups (mean rank = 24.50 for all), indicating a balanced starting point. However, posttest results demonstrated significant differences ($p = 0.000$), with the massage group having the lowest mean rank (11.50), followed by the music group (24.38), and the control group with the highest (37.63). These findings provide strong evidence that both baby massage and classical music therapy particularly massage are effective in improving infant sleep quality, compared to no intervention.

Table 3. Summary of Statistical Test Results on the Effectiveness of Interventions on Infant Sleep Quality

Group	Wilcoxon Z	Wilcoxon p-value	Wilcoxon Interpretation	Mean Rank (Post-Test)	Kruskal-Wallis p-value	Kruskal-Wallis Interpretation
Massage	-3.690	0.000	Significant improvement	11.50	0.000	Significant difference between groups
Classical Music	-3.419	0.001	Significant improvement	24.38		
Control	-0.577	0.564	No significant change	37.63		

IV. DISCUSSION

The results of the study revealed that both interventions infant massage and classical music therapy significantly enhanced sleep quality compared to the control group. Notably, infant massage exhibited the most substantial improvement in sleep outcomes, which directly addresses the research objective. This finding confirms that sensory based interventions have a positive impact on infant sleep patterns within the specified age group. The marked improvement in infants who received massage therapy can be elucidated through various physiological mechanisms. For instance, massage stimulates the parasympathetic nervous system, which is crucial for fostering relaxation and reducing cortisol levels. Lower cortisol levels are particularly important, as they facilitate better sleep consolidation, allowing infants to achieve deeper and more restorative sleep (Ntoumas et al., 2025). Furthermore, tactile stimulation from massage enhances vagal tone, which is integral to improving autonomic regulation that is critical for maintaining sleep stability (Siregar et al., 2024).

Classical music therapy likely exerts its calming effects through auditory stimuli that reduce arousal and sympathetic nervous system activity. However, it is worth noting that the impact of music therapy appears to be less pronounced than that of massage. This discrepancy may be attributed to the passive nature of the music intervention, which does not engage the infant's body in the same way that massage does (Gou et al., 2025; Pingle & Ragha, 2023). While both interventions are beneficial, the more active engagement of the infant during massage may lead to more significant physiological changes, thereby enhancing sleep quality more effectively.

These findings are consistent with a body of previous research that has documented the benefits of both massage and music therapies on infant sleep quality. For instance, studies have shown that infant massage not only reduces stress but also improves overall sleep patterns, while classical music has been found to positively influence heart rate and sleep behaviours in infants (Düken & Yayan, 2024; Rohmah et al., 2024). The current study builds upon this existing literature by providing a direct comparison of

both interventions alongside a control group. This comparative approach reveals that, while both methods are effective, massage therapy produces a stronger and more consistent effect on sleep quality. This supports the hypothesis that multimodal sensory stimulation—encompassing both tactile and auditory inputs—can yield more robust physiological changes than auditory stimulation alone (Świdrak et al., 2024).

Unlike some prior research that has predominantly focused on single interventions, this study offers a comparative perspective within a community health setting, thereby strengthening the evidence for clinical application. The minimal changes observed in the control group further indicate that the improvements in sleep quality are likely attributable to the interventions rather than to natural developmental progressions or external environmental factors. This observation underscores the value of infant massage as a viable, non-pharmacological strategy for addressing sleep difficulties in infants. From both theoretical and practical standpoints, the results of this study support the current understanding of the role of sensory input in neurodevelopmental sleep regulation. Clinically, infant massage presents a straightforward, low-cost, and safe method for enhancing sleep quality, which can be seamlessly integrated into caregiving routines (Semerci Şahin et al., 2025). The ease of incorporating massage into daily practices is particularly advantageous for parents and caregivers, as it not only promotes better sleep for the infant but also fosters bonding and attachment between the caregiver and the child. On the other hand, while classical music therapy may be somewhat less effective, it can still serve as a supplementary option, especially in situations where massage is not feasible or preferred (Jodie et al., 2025). These findings are in alignment with pediatric guidelines that advocate for non-invasive interventions to manage infant sleep issues, reinforcing the idea that such approaches should be prioritised in clinical settings.

It is essential to acknowledge the limitations of the study. The relatively small sample size raises questions about the generalisability of the findings, as larger cohorts may yield more robust data. Additionally, the lack of control for confounding factors—such as infant temperament, parental practices, and environmental influences—may introduce variability in sleep outcomes that could potentially skew the results. These factors are critical to consider, as they may play a significant role in an infant's ability to achieve restful sleep. Future research should aim to address these limitations by utilising larger sample sizes and longitudinal designs, which would provide a more comprehensive understanding of the efficacy of both massage and music therapy. Furthermore, exploring the potential combined effects of these two interventions could yield valuable insights into optimising sleep quality for infants.

This study's findings provide compelling evidence that both infant massage and classical music therapy can significantly improve sleep quality in infants. While both interventions are effective, massage therapy stands out as the more impactful option, likely due to its active engagement of the infant's body and its physiological benefits. The results not only confirm the positive influence of sensory-based interventions on infant sleep patterns but also highlight the importance of integrating such methods into clinical practice. As the understanding of infant sleep regulation continues to evolve, it is crucial for future research to build upon these findings, ensuring that caregivers are equipped with effective, non-invasive strategies to support their infants' sleep health. This research ultimately contributes to a broader understanding of the essential role of early sensory experiences in shaping sleep behaviours and overall well-being in infants, paving the way for further exploration in this vital area of child development.

V. CONCLUSION

This study concludes that both infant massage and classical music therapy significantly improve sleep quality in infants aged 6 to 12 months. Among the two interventions, infant massage was found to be more effective in enhancing sleep quality compared to classical music therapy. The control group, which received no intervention, showed no significant improvement, indicating that the positive effects observed are attributable to the treatments. These findings suggest that infant massage, and to a lesser extent classical music therapy, can be recommended as safe, non-pharmacological interventions to promote better sleep in infants. Further research with larger samples and longer follow-up is encouraged to confirm these results and optimize intervention protocols.

VI. CONFLICTS OF INTEREST

No conflict of interest was found during the research

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