

The Effect of Massage Stimulation on Sleep Quality among Stunted Children

I Nyoman Sueca¹, Sri Sulistyawati Anton², Ni Made Umi Kartika Dewi², Ni Made Diaris², I Gede Agus Krisna Warmayana^{3,4}, Ni Ketut Sinarsih², Ni Wayan Yusi Armini², I Nyoman Agus Pradnya Wiguna², Ni Made Sinarsari², Ni Wayan Komala Sueca Mahardika², Ni Luh Santhi Icaka Putri², I Gusti Ayu Sri Astuti², Ni Luh Ketut Sri Evita Damayanti², Ni Kadek Hening Reditya Karang²

¹Department of Hindu Religious Education, Faculty of Dharma Acarya, I Gusti Bagus Sugriwa Hindu State University of Denpasar, Denpasar, Indonesia

²Department of Yoga and Health, Faculty of Brahma Widya, I Gusti Bagus Sugriwa Hindu State University of Denpasar, Denpasar, Indonesia

³Department of Informatics, Faculty of Dharma Duta, I Gusti Bagus Sugriwa Hindu State University of Denpasar, Denpasar, Indonesia

⁴Graduate School of Humanity-Oriented Science and Engineering, Kindai University, Japan
Correspondence Author: srisulistyawatianton@uhnsugriwa.ac.id

Abstract:

Sleep is crucial for a toddler's growth. Children's physical health, cognitive abilities, socioemotional processes, and behavioral functioning can be impacted by inadequate sleep, poor sleep quality, and irregular sleep schedules, which could affect the growth and well-being of children. Touch and massage have demonstrated positive benefits on sleep and relaxation in children. This study aims to determine the effect of massage stimulation on sleep quality in stunted children aged 12 – 60 months. This study is a quasi-experimental design involving 21 stunted children who received the 15-minute massage treatment three times a week for four weeks. Children's sleep quality was measured using the Children's Sleep Habits Questionnaire. There was a significant change in CHSQ scores before and after massage intervention ($p=0.000$). The mean CHSQ score before massage was higher (20,809) than after massage intervention (16,761). It was concluded that massage stimulation improves sleep quality among stunted children.

Keywords: CHSQ; Massage stimulation; Stunted; Sleep quality.

Introduction

Sleep is a way for the body to rest and restore cells in the body's organs after a day of activities. Good sleeping conditions are an indicator of healthy physical and psychological health. Two factors determine healthy sleep conditions, including sleep quantity and sleep quality.¹ According to reports, 10% of kids experience sleep issues at some point in their early years, and a sizable minority of kids continue to struggle with these issues throughout their early development.² Studies on neonates, babies, and toddlers have consistently found that the prevalence of child sleep difficulties ranges from 20 to 30 percent.³⁻⁵ They carry a significant risk of continuing⁶ until preschool age⁷ and if treatment is not received, which could have a negative impact on subsequent child development and result in behavioral issues or decreased cognitive function.⁸⁻¹⁰

Stunting is a one of child's growth disorder. Stunted children experience physical and brain growth constraints that are detrimental to their future ¹¹. Children's growth is greatly influenced by nutritional intake as well as children's rest and sleep activities. Children who sleep too late will be at risk of experiencing growth disorders because children who sleep too late will encounter obstacles in the production of growth hormone, which plays a role in increasing height. Lack of sleep and irregular sleeping habits can alter the function of the hypothalamus and pituitary, resulting in changes in the levels of several hormones, including leptin, ghrelin, insulin, cortisol, and growth hormone. The many impacts on children's growth and development that influence the poor quality of toddlers' sleep are indicated by the importance of providing adequate sleep so that their growth is not disrupted.¹²

Sleep quality is a state of sleep experienced by an individual to produce

freshness and fitness when waking up. A good night's sleep is crucial for a toddler's growth. Children's physical health, cognitive ability, socioemotional processes, and behavioral functioning can be impacted by inadequate sleep, poor sleep quality, and irregular sleep schedules, which could have an impact on the growth and well-being of the kids.¹³

The physiological process of sleep, which is marked by relaxed muscle tone and decreased brain activity, is essential for both physical and mental health. Complex biological processes including the circadian rhythm, sleep neurons, and neurochemical regulation control how much sleep an individual gets. The circadian rhythm governs the sleep-wake cycle, sleep neurons control the transition between wakefulness and sleep, and neurochemical regulation involves various nervous systems and chemical substances.¹⁴ The hypothalamic-pituitary-adrenal axis, which controls the release of growth hormone (GH), is largely dependent on sleep. There is an increase in GH secretion during deep (slow-wave) sleep. Growth and muscular development, as well as tissue regeneration and repair, depend on this growth hormone peak during sleep. In deep sleep, GH is highly correlated with brain activity and contributes to tissue homeostasis.^{15,16} Children's behavior, learning, development, and general health can all be negatively impacted by getting too little or poor-quality sleep ^{17,18}, which can also have a negative influence on their physical and mental health.¹⁹ Additional side effects include impaired growth, heightened irritability, melancholy, anxiety, and a reduced immune system.¹⁹

Touch and massage have demonstrated positive benefits on sleep and relaxation in young children when studied in this context. Massage shortened the latency to sleep onset in research including twenty-three older infants and toddlers with sleep onset issues.²⁰

According to another study, children who had massages had better sleep, waking up less frequently at night and sleeping for longer periods.²¹

Research Method

This study is a quasi-experimental design, with a pre-test and post-test design. The sample in this study was 21 stunted children (z-score <-2) who met the inclusion criteria. Before giving the massage intervention, researchers measured sleep quality using a questionnaire. These 21 stunted children received the massage treatment three times a week for four weeks. This massage session is performed for 15 minutes/ session. To ensure the regularity of the massage intervention, the research team provided massage intervention directly to the child and documented by photos and intervention notes. After the 4-week massage intervention, the research team again measured sleep quality using a questionnaire. Children's sleep quality was measured using the Children's Sleep Habits Questionnaire. This research has been approved by the Ethics Commission No. 000823/KEP Dhyana Pura University/2024

and issued by the Research Ethics Committee, Dhyana Pura University.

Results

The results in Table 1 show a significant difference in The Children's Sleep Habits Questionnaire (CSHQ) scores ($p=0.000$). This table also shows the decrease in the mean CSHQ score in children after receiving massage stimulation intervention, from 20.8 to 15.7.

Table 2 shows that before receiving massage intervention, 42.9% of children experienced moderate sleep disturbances. After being given massage intervention, no more children experienced moderate or severe sleep disorders.

Based on the analysis of some CSHQ questionnaire items, before being given massage intervention, parents stated that most of their children experienced less sleep, woke up occasionally during the night, sometimes fell asleep in the middle of activities, and the children looked tired. After being given massage intervention, the items that were the majority of causes of children's sleep disorders improved.

Table 1 Comparison of CSHQ Scores in Children (n=21) Pre and Post Intervention

CSHQ Scores	Min	Max	Mean	Std. Deviation	p-value
Pre Intervention	13	30	20.809	4.632	0.000*
Post Intervention	5	21	15.761	3.998	

*Paired Sample T-test

Source: Primary Data

Table 2 Description of Children's Sleep Quality Pre and Post Intervention

Category	Pre Intervention		Post Intervention	
	n	%	n	%
Mild Sleep Disorders	12	57.1	21	100
Moderate Sleep Disorders	9	42.9	0	0
Severe Sleep Disorders	0	0	0	0
Total	21	100	21	100

Source: Primary Data

Discussion

The results of this study indicate that massage stimulation can affect children's sleep quality. Many factors affect how well young children sleep, which is important for their growth and development. Developing sound sleep habits in early life is crucial for long-term and short-term healthy growth and wellbeing.²² The length of time that each person needs to sleep changes with age. Guidelines provide recommended ranges for what is considered the optimal length of sleep by age group, even if children's sleep needs vary. Children often need less sleep as they get older, with younger children typically needing less sleep than older children or adults.²³ The National Sleep Foundation recommends 12 to 15 hours of sleep per day for newborns, 11 to 14 hours for toddlers, and 10 to 13 hours per day for preschoolers.²⁴ Naps are included in these figures. While naps are common in infancy, by the time a child is 3 or 4 years old, they are less frequent and longer.²⁵

The study result shows a significant difference in children's sleep quality before and after massage stimulation. This research shows that massage can help improve sleep quality in children. One method that combines the psychological and physical advantages of human contact—such as inner connecting or bonding between parents and children—is massage or touch therapy. One advantage of massage for children is that it can help them sleep better. Children who receive massages will feel pressure, stretching, and relaxation, which will enhance the effectiveness of their resting (sleeping) phases.^{6,21}

Massage is one of the non-pharmacological therapy efforts to improve toddler sleep quality. Adequate sleep quality can be obtained if toddlers are regularly massaged.²⁶ Massage is the oldest touch therapy known to humans and the most popular. Massage has long been carried out

almost all over the world, including in Indonesia, and passed down from generation to generation. Massage is a form of therapy that is useful in stimulating motor nerves, changing bad sleep patterns to good ones, helping the digestive process, and providing emotional calm, as well as making the body and muscles healthy.²⁷ Massage can also relieve pain and other symptoms of illness, increase relaxation, and calm crying children so will sleep better and longer.²⁸ Massage done for approximately 15 minutes can increase serotonin levels, resulting in a maximum increase in the quality of the baby's sleep, making the baby more relaxed and sleeping more soundly.²⁹ Children massage is beneficial as a therapy that can make the body relax and comfortable, so it can be applied to children who experience sleep disorders.

Conclusions

This study's findings show that massage stimulation improves sleep quality among stunted children. Massage stimulation can reduce sleep disorders in children. Massage is an effective non-pharmacological therapy to make children sleep more soundly. This study recommends giving massage stimulation to improve and enhance sleep quality in children. Our findings also recommend further studies to identify biomolecular markers related to sleep quality and massage stimulation

Acknowledgements

The DIPA Research Grant of I Gusti Bagus Sugriwa Hindu State University No. 583 of 2024 provided funding for this project. We are grateful to the Blahbatuh 2 Health Centre in Gianyar Regency for their support and assistance in putting this research into practice at the research site.

References

1. Aulia R. Menyegarkan Diri dengan Tidur yang Berkualitas [Internet]. Direktorat Jenderal Pelayanan Kesehatan. 2023 [cited 2024 Jul 1]. Available from: https://yankes.kemkes.go.id/view_artikel/2048/menyegarkan-diri-dengan-tidur-yang-berkualitas
2. Byars KC, Yolton K, Rausch J, Lanphear B, Beebe DW. Prevalence, Patterns, and Persistence of Sleep Problems in the First 3 Years of Life. *Pediatrics* [Internet]. 2012 Feb 1 [cited 2024 Jul 2];129(2):e276–84. Available from: </pediatrics/article/129/2/e276/32631/Prevalence-Patterns-and-Persistence-of-Sleep>
3. Johnson N, McMahon C. Preschoolers' sleep behaviour: associations with parental hardness, sleep-related cognitions and bedtime interactions. *J Child Psychol Psychiatry* [Internet]. 2008 Jul 1 [cited 2024 Jul 2];49(7):765–73. Available from: <https://onlinelibrary.wiley.com/doi/full/10.1111/j.1469-7610.2007.01871.x>
4. Mindell JA, Meltzer LJ, Carskadon MA, Chervin RD. Developmental aspects of sleep hygiene: findings from the 2004 National Sleep Foundation Sleep in America Poll. *Sleep Med*. 2009 Aug;10(7):771–9.
5. Bruni O, Baumgartner E, Sette S, Ancona M, Caso G, Di Cosimo ME, et al. Longitudinal study of sleep behavior in normal infants during the first year of life. *J Clin sleep Med JCSM Off Publ Am Acad Sleep Med*. 2014 Oct;10(10):1119–27.
6. Mindell JA, Kuhn B, Lewin DS, Meltzer LJ, Sadeh A. Behavioral treatment of bedtime problems and night wakings in infants and young children. *Sleep*. 2006 Oct;29(10):1263–76.
7. Honaker SM, Meltzer LJ. Bedtime problems and night wakings in young children: an update of the evidence. *Paediatr Respir Rev*. 2014 Dec;15(4):333–9.
8. Winsper C, Wolke D. Infant and toddler crying, sleeping and feeding problems and trajectories of dysregulated behavior across childhood. *J Abnorm Child Psychol*. 2014;42(5):831–43.
9. Hemmi MH, Wolke D, Schneider S. Associations between problems with crying, sleeping and/or feeding in infancy and long-term behavioural outcomes in childhood: a meta-analysis. *Arch Dis Child*. 2011 Jul;96(7):622–9.
10. Touchette E, Petit D, Tremblay RE, Montplaisir JY. Risk factors and consequences of early childhood dyssomnias: New perspectives. *Sleep Med Rev*. 2009 Oct;13(5):355–61.
11. Sri Sulistyawati Anton; Ni Made Umi Kartika Dewi; Icci Ghina Adiba. Kajian Determinan Stunting Pada Anak di Indonesia. *J Yoga dan Kesehat* [Internet]. 2023;6(2):201–17. Available from: <http://ojs.uhnsugriwa.ac.id/index.php/JYK/article/view/2907/1830>
12. Wadood MOA. The Effect of Sleep Duration on Salivary Growth Hormone and Dental Occlusion in Relation to Height Status among Kindergarten Children. *Int J Sci Res* [Internet]. 2017;6(4):1350–5. Available from: <https://www.ijsr.net/archive/v6i4/ART20172530.pdf>
13. Schlieber M, Han J. The Role of Sleep in Young Children's Development: A Review. *J Genet Psychol* [Internet]. 2021 [cited 2024 Jul 2];182(4):205–17. Available from: <https://www.tandfonline.com/doi/abs/10.1080/00221325.2021.1908218>
14. Koritala BSC, Conroy Z, Smith DF. Circadian Biology in Obstructive Sleep Apnea. *Diagnostics* 2021, Vol 11, Page 1082 [Internet]. 2021 Jun 13 [cited 2024 Jul 2];11(6):1082. Available from: <https://www.mdpi.com/2075-4418/11/6/1082/htm>

15. Antoniazzi F, Cavarzere P, Gaudino R. Growth hormone and early treatment. *Minerva Endocrinol.* 2015 Jun;40(2):129–43.
16. Grimberg A, DiVall SA, Polychronakos C, Allen DB, Cohen LE, Quintos JB, et al. Guidelines for Growth Hormone and Insulin-Like Growth Factor-I Treatment in Children and Adolescents: Growth Hormone Deficiency, Idiopathic Short Stature, and Primary Insulin-Like Growth Factor-I Deficiency. *Horm Res Paediatr.* 2016;86(6):361–97.
17. Taylor RW, Haszard JJ, Jackson R, Morrison S, Beebe DW, Meredith-Jones KA, et al. Effect of Sleep Changes on Health-Related Quality of Life in Healthy Children: A Secondary Analysis of the DREAM Crossover Trial. *JAMA Netw open.* 2023 Mar;6(3):e233005.
18. Perotta B, Arantes-Costa FM, Enns SC, Figueiro-Filho EA, Paro H, Santos IS, et al. Sleepiness, sleep deprivation, quality of life, mental symptoms and perception of academic environment in medical students. *BMC Med Educ.* 2021 Feb;21(1):111.
19. Liu J, Ji X, Pitt S, Wang G, Rovit E, Lipman T, et al. Childhood sleep: physical, cognitive, and behavioral consequences and implications. *World J Pediatr* 2022 202 [Internet]. 2022 Nov 23 [cited 2024 Jul 2];20(2):122–32. Available from: <https://link.springer.com/article/10.1007/s12519-022-00647-w>
20. Field T, Hernandez-Reif M. Sleep Problems in Infants Decrease Following Massage Therapy. *Early Child Dev Care* [Internet]. 2001 [cited 2024 Jul 2];168(1):95–104. Available from: <https://www.tandfonline.com/doi/abs/10.1080/0300443011680106>
21. Field T, Gonzalez G, Diego M, Mindell J. Mothers massaging their newborns with lotion versus no lotion enhances mothers' and newborns' sleep. *Infant Behav Dev.* 2016 Nov 1;45:31–7.
22. Schlieber M, Han J. The Role of Sleep in Young Children's Development: A Review. *J Genet Psychol* [Internet]. 2021;182(4):205–17. Available from: <https://doi.org/10.1080/00221325.2021.1908218>
23. Turnbull K, Reid GJ, Morton JB. Behavioral Sleep Problems and their Potential Impact on Developing Executive Function in Children. *Sleep.* 2013 Jul;36(7):1077–84.
24. Hirshkowitz M, Whiton K, Albert SM, Alessi C, Bruni O, DonCarlos L, et al. National Sleep Foundation's sleep time duration recommendations: methodology and results summary. *Sleep Heal.* 2015 Mar;1(1):40–3.
25. Kurth S, Lassonde JM, Pierpoint LA, Rusterholz T, Jenni OG, McClain IJ, et al. Development of nap neurophysiology: preliminary insights into sleep regulation in early childhood. *J Sleep Res.* 2016 Dec;25(6):646–54.
26. Dewi YC, Nurman M, Dhilon DA. PENGARUH PIJAT BAYI TERHADAP KUALITAS TIDUR BAYI USIA 6-12 BULAN DI ROEMAH MINI BABY KIDS & MOM CARE SIAK. *J Doppler* [Internet]. 2020 Nov 9 [cited 2024 Aug 11];4(2):97–105. Available from: <http://journal.universitaspahlawan.ac.id/index.php/doppler/article/view/1109>
27. Cahyani M, Prastuti B. Pengaruh Pijat Terhadap Kualitas Tidur Bayi Usia 3-6 Bulan Di Klinik Cahaya Bunda. *JOMIS (Journal Midwifery Sci.* 2020;4(2):39–45.
28. Aryani A, Rositasari S, Suwarni A. Peningkatan Kualitas Tidur Bayi Usia 3-10 Bulan dengan Pemberian Baby Massage Menggunakan Virgin Coconut Oil Info Artikel Abstrak PENDAHULUAN Tidur adalah prioritas utama bagi bayi karena perbaikan neuro-otak terjadi saat ini dan menghasilkan sekitar 75 %. *J Ilmu Keperawatan Anak.* 2022;5(1):49–58.

29. Widyaningsih S, Herlinda H, Khoma N. Pelaksanaan Kegiatan Pijat Bayi di Kampung Botol Kota Bengkulu. J Pengabdi. 2022;1(2):83–6.

