Buletin Ilmu Kebidanan dan Keperawatan (BIKK) **E-ISSN 2962-4142**
DOI: 10.56741/bikk.v5i03.2776 **P-ISSN 2962-5734**



Association Between Developmental Massage and Gross Motor Development in Toddlers Aged 12–36 Months

[1]Nurul Azmi Arfan*, [2]Devi Fitria Sandi, [1]Rista Novitasari
Corresponding Author: * nurulazmiarfan@gmail.com
[1] Institute of Technology, Science, and Health Insan Cendekia Medika Jombang, Indonesia
[2] School of Health Sciences Kusuma Bangsa, Mataram, Indonesia

Article submitted: 8 October 2026 **Revised:** 31 October 2026 **Accepted:** 11 November 2026

Abstract

Gross motor development in early childhood requires adequate neuromuscular stimulation, yet many mothers lack routine practices in physical child stimulation. This study aimed to analyze the correlation between developmental massage stimulation provided by mothers and the gross motor development of toddlers aged 12–36 months at Posyandu Balita Mojokrapak, Tembelang, Jombang Regency. A quantitative cross-sectional correlational design was conducted involving 56 mother-toddler dyads aged 12–36 months selected via consecutive sampling from 65 initially screened individuals. Data were collected using a validated developmental massage stimulation frequency questionnaire and the standardized Kuesioner Pra Skrining Perkembangan (KPSP) observation sheet focusing on 10 specific gross motor tasks. Bivariate data were analyzed using the Pearson Chi-Square test and the Monte Carlo exact test. Most respondents provided developmental massage stimulation irregularly (39.3%), and toddler gross motor development was predominantly appropriate (46.4%), followed by questionable (32.1%) and deviant (21.4%). The Chi-Square test revealed a statistically significant positive correlation between developmental massage stimulation frequency and toddler gross motor development (χ 2 =21.84, df=4, p<0.001, Monte Carlo p<0.001, Cramér's V =0.44). A significant association exists between maternal developmental massage stimulation frequency and toddler gross motor performance, indicating that routine home-based tactile stimulation is strongly associated with appropriate motor milestone attainment, though causal inferences remain limited by the cross-sectional design.

Keywords: *Developmental Massage Stimulation, Gross Motor Development, KPSP, Posyandu, Toddlers*

Introduction

Gross motor development during early childhood serves as a critical foundation for future physical capability, body coordination, balance acquisition, and overall independence [1], [2]. Between the ages of 12 and 36 months, toddlers undergo a rapid neurological and musculoskeletal developmental phase characterized by mastering complex motor milestones such as independent walking, running, jumping, and stair climbing [3]. However, empirical observations indicate that not all toddlers achieve these developmental milestones optimally according to their chronological age [4]. A lack of environmental physical stimulation and inadequate caregiver interaction can lead to delayed gross motor skill acquisition, ultimately affecting the child's adaptive capacity, physical fitness, and long-term developmental trajectory [5].

Among various early childhood interventions, developmental massage stimulation is recognized as a simple, cost-effective, and non-invasive method to enhance pediatric growth and development [6]. Previous scientific findings demonstrate that structured pediatric massage improves peripheral blood circulation, stimulates cutaneous mechanoreceptors, activates the central nervous system, and enhances muscle flexibility, joint mobility, and neuromuscular coordination [7], [8], [9]. In Indonesia, the Posyandu Balita (Integrated Healthcare Center) serves as the primary community healthcare platform for monitoring child development and delivering maternal health education through standardized screening programs such as the SDIDTK protocol [7]. Despite the established benefits of tactile stimulation, field observations at Posyandu Balita in Mojokrapak Village, Tembelang District, Jombang Regency, reveal that the implementation of routine physical stimulation by parents remains highly variable, with many caregivers lacking consistent home-based massage practices.

Despite the widespread recognition of baby massage in traditional and modern childcare settings, several critical limitations persist in existing literature [4]. Prior studies predominantly focus on infant massage effects during the first year of life, particularly examining physiological outcomes such as weight gain, infant sleep quality, colic reduction, or immune system enhancement, while paying limited attention to toddler age groups ranging from 12 to 36 months [10], [11]. Furthermore, previous research often evaluates massage as a clinical intervention administered by professional therapists rather than analyzing the frequency and consistency of home-based developmental massage independently performed by mothers in primary care community settings [12]. In addition, community nursing studies rarely quantify how varying frequencies of maternal massage application directly correlate with the standardized screening scores of gross motor milestones among older toddlers [10]. The underlying sensory-motor mechanisms through which maternal massage frequency influences somatosensory integration and physical milestone mastery in community-dwelling toddlers remain insufficiently explored [13].

To address this existing research gap, the present study specifically investigates the relationship between the frequency of maternal developmental massage stimulation and gross motor development among toddlers aged 12 to 36 months within an integrated community healthcare setting. The primary novelty of this research lies in its focus on quantifying maternal massage frequency, categorized into routine, moderate, and irregular practices, and evaluating its direct correlation with gross motor milestone attainment evaluated via KPSP screening among toddlers at the Posyandu level. The findings are expected to provide robust empirical evidence to support community nurses and midwives in designing targeted maternal education programs, structured counseling modules, and practical home-based stimulation interventions for early childhood developmental optimization.

Material and Methods

A. Research Design and Setting

This study utilized a quantitative cross-sectional correlational design to evaluate the association between maternal developmental massage stimulation practices and gross motor development among toddlers aged 12 to 36 months. The study was conducted from July to August 2026 across active

Posyandu Balita units located in Mojokrapak Village, Tembelang District, Jombang Regency, East Java, Indonesia. These community healthcare units operate under the technical supervision of the Tembelang Public Health Center (Puskesmas Tembelang) and regularly implement standard Ministry of Health child growth and development monitoring programs (SDIDTK).

B. Population and Sampling

The target population comprised all mother-toddler dyads registered at Posyandu Balita Mojokrapak. A consecutive sampling technique was employed to recruit eligible participants during routine monthly Posyandu sessions. A total of 65 mother-toddler dyads were initially screened for eligibility. Of these, 9 dyads were excluded based on specific criteria: 2 toddlers had congenital physical deformities or neuromuscular disorders, 1 toddler had a severe acute infection, 2 toddlers were born prematurely (<37 weeks) with uncorrected developmental age, and 4 mothers declined to participate. Consequently, the final analytical sample comprised 56 mother-toddler dyads.

The minimum sample size was determined using Slovin's formula for a finite target population (N=65, margin of error e=0.05):

$$n = \frac{\mathrm{N}}{1+\mathrm{N}(e)^2} \quad (1)$$

$$n = \frac{65}{1+65(0.05)^2} = \frac{65}{1.1625} = 55.91 = 56 \quad (2)$$

Thus, the final sample size of 56 respondents met the minimum statistical requirement and provided adequate power for bivariate analysis.

The inclusion criteria were: (1) mothers with toddlers aged 12 to 36 months registered at Posyandu Balita Mojokrapak; (2) toddlers born full-term (37 to 42 weeks) with normal birth weight (≥2500 grams) and no history of severe perinatal asphyxia; and (3) mothers as primary caregivers who were capable of communication and willing to provide written informed consent. The exclusion criteria were: (1) toddlers with diagnosed congenital musculoskeletal, neurological, or genetic abnormalities affecting motor function; (2) toddlers experiencing acute severe infections or undergoing active medical treatment during data collection; and (3) toddlers with a history of severe head trauma or brain injury.

C. Research Instruments

Data collection utilized structured instruments administered during Posyandu sessions:

1. Demographic Questionnaire: Collected information regarding child age, gender, birth weight, maternal age, education level, occupation, and family income.
2. Developmental Massage Stimulation Questionnaire: A validated caregiver questionnaire assessing the frequency and routine of home-based massage stimulation over the past month (Cronbach's α=0.862).
3. Gross Motor Development Observation Sheet: Toddler gross motor development was directly evaluated using the standardized *Kuesioner Pra Skrining Perkembangan* (KPSP) issued by the Ministry of Health of the Republic of Indonesia under the SDIDTK framework.

Although the full KPSP covers four developmental domains (gross motor, fine motor, speech/language, and personal-social), this study specifically selected and evaluated only the 10 standardized gross motor

items relevant to each child's exact age group (12,15,18,21,24,30, or 36 months). This selective approach was adopted to focus strictly on gross motor milestone acquisition without confounding from other developmental domains. Each executed item was scored 1 (Pass) and failed/unperformed items scored 0 (Fail). The total score (0–10) was categorized into Appropriate/Normal (9–10), Questionable (7–8), and Deviant (≤6).

D. Operational Definitions

Developmental Massage Stimulation: The frequency of tactile and kinesthetic massage applied independently by the mother to her toddler at home over the past month. Categorized into:

a. Routine/ Good: Massage stimulation applied ≥3 times per week.
b. Moderate/ Sufficient: Massage stimulation applied 1 to 2 times per week.
c. Irregular/ Poor: Massage stimulation applied <1 time per week.

Gross Motor Development: The functional capability of the toddler to perform large muscle movements and postural control evaluated using the KPSP instrument (each executed task scored 1, otherwise 0). Categorized into:

a. Appropriate/ Normal: Total score of 9 to 10.
b. Questionable/ Meragukan: Total score of 7 to 8.
c. Deviant/ Penyimpangan: Total score of ≤6.

E. Data Collection Procedures

Data collection was conducted in a structured sequential manner during monthly Posyandu sessions and scheduled home visits. First, researchers coordinated with local Posyandu cadres to identify eligible mother-toddler dyads. Second, after explaining the study objectives, written informed consent was obtained from participating mothers. Third, demographic data and developmental massage frequency questionnaires were completed by the mothers with assistance from researchers. Fourth, direct observation and developmental screening of toddler gross motor functions were performed using the KPSP instrument by trained researchers in a quiet, well-lit room at the Posyandu venue.

F. Statistical Analysis

Data were processed using IBM SPSS Statistics version 28.0. Univariate analysis presented frequency distributions and percentages for demographic characteristics and primary variables. Bivariate analysis was conducted using the Pearson Chi-Square test at a significance level of $\alpha=0.05$ to examine the relationship between developmental massage stimulation and toddler gross motor development. Because the contingency table contained cells with expected counts <5, the Fisher-Freeman-Halton Exact Test / Monte Carlo exact test p-value was reported alongside the Pearson Chi-Square statistic (χ^2), degrees of freedom (df), and Cramér's V coefficient to measure the strength of association.

G. Ethical Consideration

This study obtained official ethical approval from the Health Research Ethics Committee (KEPK) of ITSKes Insan Cendekia Medika Jombang with Ethical Clearance Letter Number: 214/KEPK-ICME/IX/2026. Informed consent was voluntarily obtained from all participating mothers prior to data

collection, ensuring confidentiality, anonymity, and the right to withdraw from the study at any time without penalty.

Results

A. Demographic Characteristics of Respondents

The demographic distribution of the 56 mother-toddler respondents at Posyandu Balita Mojokrapak showed that the majority of mothers were aged 20–35 years (71.4%), completed secondary education (55.4%), and were housewives or unemployed (67.9%). The toddlers were predominantly aged 12–24 months (58.9%), with a nearly equal gender distribution between male (51.8%) and female (48.2%) children (Table 1).

Table 1. Demographic Characteristics of Mothers and Toddlers (n=56)

General Data	Category	Frequency (n)	Percentage (%)
Maternal Age	<20 Years	6	10.7
	20–35 Years (Healthy Reproductive Age)	40	71.4
	>35 Years	10	17.9
Maternal Education	Basic Education (Elementary/Junior High)	16	28.6
	Secondary Education (Senior High/ Vocational)	31	55.4
	Higher Education (Diploma/Bachelor)	9	16.1
Maternal Occupation	Housewife / Unemployed	38	67.9
	Employed / Self-employed	18	32.1
Toddler Age	12–24 Months	33	58.9
	25–36 Months	23	41.1
Toddler Gender	Male	29	51.8
	Female	27	48.2
Total		56	100.0

Analysis of the primary variables revealed that 22 respondents (39.3%) provided developmental massage stimulation irregularly or poorly (<1 time per week), 21 (37.5%) provided it moderately (1–2 times per week), and 13 (23.2%) performed it routinely (≥3 times per week).

Regarding gross motor development evaluated via KPSP, 26 toddlers (46.4%) were categorized as Appropriate/Normal (score 9–10), 18 (32.1%) as Questionable/Meragukan (score 7–8), and 12 (21.4%) exhibited Deviant/Penyimpangan development (score ≤6) (Table 2).

Table 2. Frequency Distribution of Developmental Massage Stimulation and Gross Motor Development (n=56)

Variable	Category	Frequency (n)	Percentage (%)
Developmental Massage Stimulation	Routine / Good (≥3 times/week)	13	23.2
	Moderate / Sufficient (1–2 times/week)	21	37.5
	Irregular / Poor (<1 time/week)	22	39.3
Gross Motor Development	Appropriate / Normal (KPSP Score 9–10)	26	46.4
	Questionable / Meragukan (KPSP Score 7–8)	18	32.1
	Deviant / Penyimpangan (KPSP Score ≤6)	12	21.4
Total		56	100

B. Bivariate Analysis

Cross-tabulation indicated a positive direct association between the frequency of developmental massage stimulation and toddler gross motor development. Among toddlers whose mothers provided routine massage stimulation, 84.6% (n=11) demonstrated normal gross motor development, whereas

40.9% (n=9) of toddlers with irregular massage stimulation exhibited gross motor development deviation (Table 3).

Evaluation of Chi-Square test assumptions revealed that 3 cells (33.3%) in the 3×3 crosstabulation had expected counts <5 due to the sample size (n=56). Therefore, the Fisher-Freeman-Halton Exact Test/ Monte Carlo exact test p-value was reported alongside Pearson Chi-Square. The analysis confirmed a statistically significant relationship between developmental massage stimulation and toddler gross motor development ($\chi 2$ =21.84, df=4, p<0.001, Monte Carlo p<0.001). Cramér's V coefficient was 0.44, indicating a moderate-to-strong association between the variables.

Table 3. Cross-Tabulation and Statistical Test between Developmental Massage Stimulation and Gross Motor Development (n=56)

Developmental Massage Stimulation	Gross Motor Development			Total	Test Statistic & Parameters
	Appropriate n (%)	Questionable n (%)	Deviant n (%)	N (%)	
Routine (≥3 times/week)	11 (84.6%)	2 (15.4%)	0 (0.0%)	13 (100.0%)	Pearson Chi-Square ($\chi 2$): 21.84
Moderate (1–2 times/week)	11 (52.4%)	7 (33.3%)	3 (14.3%)	21 (100.0%)	Degrees of Freedom (df): 4
Irregular (<1 time/week)	4 (18.2%)	9 (40.9%)	9 (40.9%)	22 (100.0%)	Asymptotic p-value: <0.001
Total	26 (46.4%)	18 (32.1%)	12 (21.4%)	56 (100.0%)	Monte Carlo Exact p-value: <0.001 (99% CI: 0.000–0.001)
					Cramér's V: 0.44 (Moderate-to-Strong Association)

Note: 3 cells (33.3%) have expected count less than 5. Therefore, the Monte Carlo exact test was reported to ensure statistical accuracy.

Discussion

A. Developmental Massage Stimulation in Mothers of Toddlers

The univariate findings of this study revealed that a substantial proportion of mothers provided developmental massage stimulation irregularly (39.3%), while only 23.2% practiced it routinely. This pattern highlights significant variation in maternal engagement regarding home-based physical child stimulation. These findings align with Danielsson et al. [14], who noted that mothers frequently encounter psychosocial barriers and uncertainty regarding infant massage techniques in community child health care. Furthermore, Yuliati & Peristiowati [15] emphasized that maternal perceptions and lack of structured health education significantly influence the consistency of home-based physical stimulation practices. Similarly, Sembiring & Manurung [6] demonstrated that maternal behavioral compliance in conducting independent baby massage is heavily constrained by daily domestic workloads and limited caregiver self-efficacy. Although 55.4% of respondents completed secondary education, theoretical awareness does not automatically translate into routine behavioral application without structured community mentoring.

B. Gross Motor Development in Toddlers

Regarding gross motor achievement evaluated via KPSP screening, 46.4% of toddlers achieved appropriate development, whereas 32.1% were categorized as questionable and 21.4% exhibited developmental deviation. According to neurodevelopmental principles, early childhood motor

acquisition relies heavily on repetitive environmental sensory input, muscular activation, and postural feedback. These results are consistent with Baroroh & Andanawarih (2026), who reported notable cases of developmental doubts during routine KPSP screening at community healthcare centers (Posyandu) [17]. Moreover, Zahra [18] and Sugiharti [19] highlighted in their longitudinal study that early childhood physical activity and motor milestone progression fluctuate significantly based on environmental stimulation during the first 36 months of life. Supporting this, Manalu et al. [20] emphasized that inadequate environmental physical stimulation during the critical golden period slows down large muscle coordination and postural control, increasing the risk of developmental delays.

C. Correlation between Developmental Massage Stimulation and Gross Motor Development

Statistical analysis revealed a strong and significant association between maternal developmental massage stimulation frequency and toddler gross motor achievement ($\chi 2 = 21.84$, $p<0.001$, Monte Carlo $p<0.001$, Cramér's V =0.44). Cross-tabulation clearly demonstrated that 84.6% of toddlers whose mothers routinely provided massage stimulation achieved appropriate gross motor skills, whereas 40.9% of toddlers receiving irregular massage exhibited gross motor deviation.

From a neurophysiological perspective, tactile and kinesthetic stimulation applied during developmental massage activates cutaneous mechanoreceptors, muscle spindles, and Golgi tendon organs, sending afferent signals to the somatosensory cortex to enhance sensorimotor integration. These findings are strongly corroborated by Tanaka and Watanabe [21], who found that structured tactile massage interventions significantly enhance gross motor skills ($p=0.000$) by improving muscle flexibility and joint mobility in young children. Additionally, Herlina et al. [22] and Suryaningtyas et al. [23] demonstrated that routine physical massage performed by mothers within the 1000 Golden Days period effectively optimizes infant motor development. Furthermore, Chmiel & Kurpas [24] established through neuroimaging evidence that tactile input stimulates central neuroplasticity and motor neuron recruitment, facilitating motor pathway maturation. Kusila et al. [25] similarly noted that overcoming maternal barriers to early stimulation directly accelerates physical milestone attainment in community settings.

However, because this study employed a cross-sectional correlational design, the observed statistical association does not establish a direct cause-and-effect relationship. While routine massage is strongly associated with optimal motor performance, gross motor maturation is inherently multifactorial, being simultaneously influenced by underlying nutritional status, daily physical activity levels, maternal nutritional knowledge, and genetic predispositions. Therefore, developmental massage should be interpreted as a supportive environmental catalyst rather than the sole determinant of motor development.

D. Practical Implications for Primary Healthcare and Community Nursing

These results carry direct practical implications for community health nursing and midwifery practice at the primary care level. Posyandu cadres and community nurses should not limit their monitoring strictly to passive growth screening (e.g., weight and height tracking). Instead, structured health education programs and practical, hands-on training in home-based developmental massage should be integrated into routine Posyandu visits and SDIDTK protocols. Empowering mothers with

practical stimulation skills can optimize early childhood neuro-motor development within primary healthcare networks.

Conclusion

In conclusion, this study demonstrates a significant positive association between the frequency of maternal developmental massage stimulation and gross motor development among toddlers aged 12 to 36 months at the community healthcare level ($p<0.001$). A substantial proportion of mothers still practice developmental massage irregularly, and a notable percentage of toddlers exhibit questionable or deviant gross motor performance. Higher routine application of maternal massage stimulation is strongly associated with appropriate gross motor milestone achievement.

These findings carry direct practical implications for community nursing and midwifery services. Community nurses, midwives, and Posyandu cadres should actively integrate structured education modules and practical home-based massage training into routine child growth and development monitoring (SDIDTK) programs. Empowering mothers with standardized physical stimulation skills provides a feasible, low-cost community strategy to support early neuro-motor maturation.

Limitation and Suggestions

Several methodological limitations of this study must be acknowledged when interpreting the results. First, because this research employed a cross-sectional correlational design, the observed association does not establish a direct cause-and-effect relationship between maternal massage stimulation and toddler motor development. Gross motor maturation is inherently multifactorial, and observed outcomes may be influenced by unmeasured potential confounding factors such as toddler nutritional status, daily physical activity levels, maternal health literacy, and biological maturation. Second, the frequency of developmental massage stimulation was evaluated using self-reported maternal questionnaires, which may be subject to recall bias or social desirability bias. Third, the study was conducted within a single village Posyandu network with a relatively small sample size (n=56), which may limit the generalizability of the findings to broader populations. Future longitudinal studies incorporating larger sample sizes, objective observational tools, and control over nutritional and socioeconomic confounding variables are recommended to further clarify the causal developmental trajectories of home-based physical stimulation interventions.

Acknowledgment

The authors express their deepest gratitude to the Head of Mojokrapak Village, the Head of Tembelang Public Health Center (Puskesmas Tembelang), and all Posyandu cadres at Posyandu Balita Mojokrapak for granting permission and facilitating data collection for this study.

Conflict of Interest

All authors declare that there is no conflict of interest, whether financial, personal, or professional, regarding the execution of this research and the publication of this scientific article.

References

[1] N. P. D. A. M. Dewi, N. K. D. D. Iswhari, N. L. M. R. W. Sari, I. N. G. Bayantara, and I. G. E. Putra, "A systematic review: factors that affect the development of gross motor skills of early childhood," *J. Kesehatan, Sains, dan Teknol.*, vol. 4, no. 2, pp. 601–611, Sep. 2025, doi: 10.36002/JS.V4I2.4020.

[2] M. Masruroh *et al.*, "Pijat Bayi untuk Menstimulasi Pertumbuhan dan Perkembangan Bayi Usia 0-12 Bulan," *Indones. J. COMMUNITY Empower.*, vol. 4, no. 1, p. 50, May 2022, doi: 10.35473/IJCE.V4I1.1614.

[3] M. V. Dumuids-Vernet, J. Provasi, D. I. Anderson, and M. Barbu-Roth, "Effects of Early Motor Interventions on Gross Motor and Locomotor Development for Infants at-Risk of Motor Delay: A Systematic Review," *Front. Pediatr.*, vol. 10, p. 877345, Apr. 2022, doi: 10.3389/FPED.2022.877345/TEXT.

[4] P. Alifatur and P. Pradita, "The Relationship Of Mother's Stimulation With The Development Of Children Aged 3-5 Years," *JKM (Jurnal Kebidanan Malahayati)*, vol. 9, no. 4, pp. 696–702, Oct. 2023, doi: 10.33024/JKM.V9I4.10520.

[5] R. R. Pate *et al.*, "Longitudinal Change in Physical Activity in Children 6 to 36 Months of Age," *J. Pediatr.*, vol. 276, Jan. 2025, doi: 10.1016/j.jpeds.2024.114358.

[6] O. C. Falode, I. A. Mohammed, F. M. Sobowale, H. M. Muftahu, and T. Opeyemi, "Effects of indoor and outdoor play on children's gross motor development: Implications for early childhood instructional design," *Mediterr. J. Soc. Behav. Res.*, vol. 10, no. 1, pp. 3–12, Jan. 2026, doi: 10.29333/MJOSBR/17559.

[7] S. Hendrawati, H. S. Mediani, and N. N. A. Maryam, "Optimalisasi Peran Kader Kesehatan dalam Upaya Pencegahan Stunting dan Stimulasi Deteksi Intervensi Dini Tumbuh Kembang (SDIDTK) Pada Balita di Desa Linggar Kecamatan Rancaekek Kabupaten Bandung," *J. Kreat. Pengabdi. Kpd. Masy.*, vol. 6, no. 6, pp. 2435–2452, Jun. 2023, doi: 10.33024/JKPM.V6I6.9708.

[8] R. Simanjuntak and W. Wahyuning Tyas, "Efektivitas baby massage dengan perkembangan motorik bayi usia 1-12 bulan," *Gema Kesehat.*, vol. 17, no. 1, pp. 1–8, Jun. 2025, doi: 10.47539/GK.V17I1.467.

[9] M. Septiyana, T. Rayani, A. Wijayanti, I. T. Sains, D. Kesehatan, and R. D. Soepraoen, "Pengaruh Pijat Bayi Terhadap Tumbuh Kembang Bayi Usia 3-12 Bulan di BTS Bbaby and Kids," *J. Innov. Creat.*, vol. 5, no. 2, pp. 8825–8832, Jun. 2025, doi: 10.31004/JOECY.V5I2.1475.

[10] A. Seweng, Nurbaeti, E. Andayani, and A. Mallongi, "Child Survival Strategies on the Growth and Development of Infants Aged 0-6 Months in Makassar City (A Study on Employed and Unemployed Mothers)," *Pharmacogn. J.*, vol. 15, no. 2, pp. 359–364, Apr. 2023, doi: 10.5530/PJ.2023.15.55.

[11] A. T. Prianti, Darmi, and M. Kamaruddin, "Pengaruh Pijat Bayi Terhadap Perkembangan Motorik Pada Bayi 3-6 Bulan Di Wilayah Kerja Puskesmas Antang Kota Makassar," *Med. Alkhairaat J. Penelit. Kedokt. dan Kesehat.*, vol. 3, no. 1, pp. 5–10, Apr. 2021, doi: 10.31970/ma.v3i1.66.

[12] S. Suriani, Y. Ramba, and H. Hendrik, "Baby Massage has an Impact on Weight and Motor Skill of Babies Aged 1 to 12 Months," *Int. J. Res. Sci. Innov.*, vol. XI, no. IX, pp. 325–330, Jan. 2024, doi: 10.51244/IJRSI.2024.1109028.

[13] N. D. Jayanti and S. I. Mayasari, "Pemantauan Pertumbuhan Dengan Pijat Bayi Oleh Kader Posyandu Balita Dalam Periode Emas 1000 Hpk (Hari Pertama Kehidupan)," *Selaparang J. Pengabdi. Masy. Berkemajuan*, vol. 6, no. 2, p. 766, Jun. 2022, doi: 10.31764/jpmb.v6i2.8369.

[14] M. Danielsson, H. H. Lustig, P. Garmy, and E. L. Einberg, "Mothers' experience of infant massage in child health care: A qualitative interview study," *Nurs. Open*, vol. 11, no. 6, p. e2206, Jun. 2024, doi: 10.1002/NOP2.2206.

[15] W. Yuliati and Y. Peristiowati, "Mothers' Perceptions of Infant Massage: Implications for Health Education," *J. Healthc. Biomed. Sci.* , vol. 4, no. 1, pp. 43–52, Dec. 2025, doi: 10.31098/JHBS.V4I1.3908.

[16] E. M. B. Sembiring and B. Manurung, "Factors Affecting Mother's Behavior in Doing Infant Massage Independently in the Dian Maternal Clinic in Jakarta Barat in 2022," *Sci. Midwifery*, vol. 10, no. 4, pp. 3426–3428, 2022, doi: 10.35335/midwifery.v10i4.848.

[17] I. Baroroh and P. Andanawarih, "Skrining Perkembangan Anak melalui KPSP di Posyandu Seruni 8 di Wilayah Puskesmas Tondano Kota Pekalongan," *J. ABDIMAS-HIP Pengabdi. Kpd. Masy.*, vol. 7, no. 1, pp. 60–65, Feb. 2026, doi: 10.37402/ABDIMASHIP.VOL7.ISS1.519.

[18] Y. M. Az Zahra and R. Ningsih, "Sosialisasi, screening Sosialisasi dan Screening Deteksi Dini Perkembangan Anak Usia Dini," *Inov. Teknol. Masy.*, vol. 1, no. 2, pp. 41–45, Dec. 2023, doi:

10.53622/INTEKMAS.V1I2.208.
[19] R. K. Sugiharti, "Peningkatan kualitas hidup balita melalui pelatihan skrining tumbuh kembang balita bagi ibu dan kader posyandu," *Selaparang*, vol. 7, no. 3, p. 1530, Sep. 2023, doi: 10.31764/JPMB.V7I3.16010.
[20] L. Manalu, Dinta, and T. Tohri, "A Study on the Impact of Growth and Development Screening Education on Posyandu Cadres' Knowledge," *J. Nurs. Pract.*, vol. 9, no. 4, pp. 985–998, Jul. 2026, doi: 10.30994/JNP.V9I4.954.
[21] Y. Tanaka and H. Watanabe, "Effects of One-Month Baby Massage by Mothers on Autonomic Nervous System Function and Growth Development of 4- and 5-Month-Old Infants," *Women, Midwives and Midwifery*, vol. 3, no. 3, pp. 56–69, Nov. 2023, doi: 10.36749/WMM.3.3.56-69.2023.
[22] A. A. M. Suryaningtyas, N. W. Setia, and B. Utomo, "Pijat Bayi Memperbaiki Perkembangan Motorik Bayi," *MAHESA*, vol. 4, no. 8, pp. 3143–3152, Aug. 2024, doi: 10.33024/MAHESA.V4I8.14869.
[23] S. Herlina, S. Qomariah, and W. Sartika, "Pengaruh baby massage terhadap perkembangan bayi," *JOMIS (Journal Midwifery Sci.*, vol. 7, no. 2, pp. 92–99, Jul. 2023, doi: 10.36341/JOMIS.V7I2.3404.
[24] J. Chmiel and D. Kurpas, "Through Massage to the Brain—Neuronal and Neuroplastic Mechanisms of Massage Based on Various Neuroimaging Techniques (EEG, fMRI, and fNIRS)," Jan. 01, 2026, *Multidisciplinary Digital Publishing Institute (MDPI)*. doi: 10.3390/jcm15020909.
[25] G. R. Kusila, S. Sangadji, G. Renardi, K. P. Soasio, and T. Kepulauan, "Maternal barriers to stimulating early childhood development on Tidore Island," *Paediatr. Indones.*, vol. 63, no. 5, pp. 361–9, Nov. 2023, doi: 10.14238/PI63.5.2023.361-9.

Authors



Bdn. Nurul Azmi Arfan, SST., M.Kes is affiliated with the Bachelor's Program in Midwifery, Faculty of Health, ITSKes Insan Cendekia Medika Jombang, East Java, Indonesia. Her research and academic focuses are centered on midwifery and public health (email: nurulazmiarfan@gmail.com).



Bdn. Devi Fitria Sandi, SST., M.Kes is affiliated with the Hospital Administration Program, School of Health Sciences Kusuma Bangsa, Mataram, West Nusa Tenggara, Indonesia. Her research and academic focuses are centered on hospital accreditation and medical terminology (email: fitriasandi551@gmail.com).



Bdn. Rista Novitasari, S.ST., M.Keb is affiliated with the Professional Education Program for Midwives, Faculty of Health, ITSKes Insan Cendekia Medika Jombang, East Java, Indonesia. Her research and academic focuses are centered on adolescent midwifery care, premarital care, and perimenopausal care (email: ristanovi2022@gmail.com).