



The effectiveness of tummy time combined with baby yoga in improving gross motor milestones in infants

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ABSTRACT

This study aimed to determine the effectiveness of combined tummy time and baby yoga interventions in improving gross motor development among infants. A quasi-experimental study with a one-group pretest–posttest design was conducted at TPMB Rama Agustina from September to October 2025. A total of 32 infants aged 2–6 months were included using a total population sampling technique based on eligibility criteria. The intervention consisted of guided tummy time sessions and structured baby yoga movements focusing on postural control, muscle activation, flexibility, and vestibular stimulation, delivered for approximately 20–25 minutes per session. Gross motor development was assessed before and after the intervention using the Alberta Infant Motor Scale (AIMS). Data were analyzed using the Wilcoxon signed-rank test. The results showed a significant increase in AIMS scores after the intervention. Before treatment, most infants demonstrated motor skills below expected milestones for age, whereas posttest findings indicated notable improvements in antigravity control, weight shifting, and transitional movements. Statistical analysis confirmed a significant difference between pretest and posttest scores ($p < 0.001$). In conclusion, the combination of tummy time and baby yoga is effective in enhancing gross motor development in infants and can be recommended as a safe, low-cost, and practical complementary stimulation strategy suitable for implementation in community health services and early childhood care settings.

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1. Introduction

Gross motor development in the first year of life forms the essential foundation for later functional abilities, including sitting, rolling, crawling, and walking. Simple early stimulation interventions that can be taught to parents have the potential to accelerate the achievement of these milestones and prevent motor developmental delays (WHO, 2020). Clinical observations and field practices show a gap in the implementation of early stimulation: although international guidelines recommend practices such as tummy time, caregiver compliance and knowledge remain low in various settings, including studies in several Asian countries. This lack of knowledge affects the amount of time infants spend in a supervised prone position while awake, which may subsequently slow the development of neck and core strength essential for early motor milestones (Huang & Li, 2024).

Specifically, tummy time the practice of placing infants in a prone position while awake and supervised has been widely studied. A systematic review found that tummy time is positively associated with gross motor development (e.g., rolling, crawling, prone-to-sit transition), and also provides additional benefits such as reduced risk of positional plagiocephaly; however, evidence in cognitive and social domains remains inconsistent (Hewitt, 2020). The American Academy of Pediatrics emphasizes that, although infants should be placed supine for sleep to prevent SIDS, supervised awake tummy time is recommended to support motor development and prevent positional head deformities (AAP, 2022). These recommendations provide strong clinical justification for integrating tummy time into neonatal/postnatal education packages in primary care settings.

At the local and national levels, observational studies and small-scale reports in Indonesia show similar results: studies on tummy time practice report improved developmental/psychomotor scores in groups receiving structured tummy time interventions. This indicates that international findings can be replicated in the Indonesian context, although methodological designs of some local studies remain limited (Sabang, 2023) (Nisa, 2024).

While evidence for tummy time is relatively strong, evidence for baby or mother infant yoga is still emerging, and the number of controlled studies is more limited. Several studies and experimental programs (mother–infant yoga/baby yoga) report benefits on parent–infant bonding, sleep, and behavioral tolerance, as well as potential positive effects on motor development. However, more well-powered RCTs are needed to establish its effectiveness on infant motor outcomes (Neches, 2024) (Bilgic, 2025) (Veljkovic, 2021).

Because the combination of tummy time and baby yoga integrates prone positioning/motor stimulation (tummy time) with structured motor exercises, relaxation, and sensory social interaction (baby yoga), this combined approach may have synergistic effects on gross motor development. However, there is currently a lack of high-quality RCTs or comparative studies analyzing whether the combined tummy time + baby yoga intervention produces greater improvements in gross motor skills than tummy time alone or usual care. This gap highlights the need for analytical evidence to determine the additive contribution of baby yoga beyond standard prone positioning (Eliks, 2024).

Based on this gap, the present study hypothesizes that a structured combination of tummy time and baby yoga will significantly improve gross motor development in infants aged 2–6 months compared to baseline. By using validated developmental assessment tools such as the Alberta Infant Motor Scale (AIMS) and Bayley Scales of Infant and Toddler Development, this study aims to provide reliable evidence for implementing combined early stimulation strategies in Indonesian primary healthcare and community settings.

This study offers several important implications. If the combination of tummy time and baby yoga proves effective, it can be recommended as an affordable and easily implemented early stimulation strategy in primary healthcare services and community health posts. The findings may also serve as a foundation for developing culturally appropriate best-practice guidelines for infant motor stimulation in Indonesia. The use of standardized assessment tools such as AIMS and BSID strengthens the validity of the study and enables comparison with international research (Eliks, 2024) (Kepenek et al., 2020) (Balasundaram & Avulakunta, 2025). Additionally, evidence of effectiveness may support the development of parent education programs and training modules for community health workers. Overall, the study clarifies the role of complementary interventions in enhancing developmental milestone achievement and preventing developmental delays in infants.

This study contributes to strengthening the scientific evidence for baby yoga by positioning it as an active motor stimulation intervention rather than solely a relaxation or bonding activity. By evaluating baby yoga in combination with tummy time using standardized motor development assessments, this study allows for an objective examination of its potential role in enhancing gross motor milestones. The findings are expected to clarify whether baby yoga provides measurable developmental benefits beyond passive calming effects, thereby supporting its integration as an evidence-based complementary intervention in early motor development programs.

2. Methods

This study employed a quasi-experimental design with a one-group pretest–posttest approach to determine the effectiveness of the combined tummy time and baby yoga intervention on improving gross motor development in infants. The study was conducted at TPMB Rama Agustina, Palembang City, from September to October 2025. The study population consisted of all infants who received child health services at TPMB Rama Agustina during the study period. A total population sampling technique was applied, and all 32 eligible infants participated, with no dropouts during the study. A priori sample size calculation using a power analysis indicated that a minimum of 30 infants would be sufficient to detect a moderate effect size (Cohen’s $d = 0.5$) with 80% power at $\alpha = 0.05$.

The inclusion criteria were infants aged 2–6 months, born at term (≥ 37 weeks of gestation), with normal birth weight (2,500–4,000 grams), not experiencing congenital abnormalities or neuromuscular disorders, and whose parents agreed to participate as indicated by signing written informed consent. The exclusion criteria were infants with acute illness during the intervention period, a history of developmental disorder diagnosis, incomplete participation in the intervention schedule, or parents who refused the posttest measurement.

The age range of 2–6 months was selected because this period represents a sensitive window for gross motor development, characterized by rapid maturation of postural control, head and trunk stability, and the emergence of prone-based motor skills such as head lifting, rolling, and early weight-bearing through the upper limbs. During this stage, neural plasticity is high, and motor experiences such as prone positioning and guided movement are more likely to produce measurable developmental gains. Therefore, infants aged 2–6 months are considered particularly responsive to early stimulation interventions such as tummy time and baby yoga.

The intervention consisted of a structured combination of tummy time and baby yoga. A detailed session protocol was developed based on a standardized framework adapted from recognized infant motor stimulation and yoga manuals (Neches, 2024; Bilgic, 2025). Tummy time was performed with infants placed in a prone position while awake and supervised, following standardized guidance by encouraging head lifting, upper body support, and prone-based play. Baby yoga involved gentle stretching movements, guided limb flexion extension, and sensorimotor stimulation adapted from recognized infant yoga routines, designed to enhance muscular strength, flexibility, and parent–infant interaction. A session protocol table (Table X) outlines the sequence, duration, and activities of each session. Each session lasted approximately 20–25 minutes and was conducted twice a week for two consecutive weeks, for a total of four sessions.

Gross motor development was assessed using the Alberta Infant Motor Scale (AIMS). Both raw scores and percentiles were recorded, but analysis was conducted using raw scores to evaluate absolute changes in motor performance. Measurements were taken before the first intervention session (pretest) and after completion of the fourth session (posttest). All assessments were conducted by trained and blinded assessors following the standardized AIMS scoring manual to ensure reliability and minimize bias. Data were analyzed using the Wilcoxon signed-rank test with a significance level of $p < 0.05$. The results are presented in tables and narrative descriptions to evaluate the effectiveness of the combined tummy time and baby yoga intervention in improving gross motor development among infants at TPMB Rama Agustina, Palembang City.

3. Result and Discussion

A total of 32 infants participated in this study. Most were aged 3–5 months (68.8%), with 18 male infants (56.3%). All participants were full-term infants with normal birth weight, and none experienced acute illness during the intervention.

Table 1.
Characteristics of Respondents (n = 32)

Characteristic	n	%
Age of Infant		
2–3 months	10	31.3

Characteristic	n	%
4–5 months	12	37.5
6 months	10	31.3
Sex		
Male	18	56.3
Female	14	43.7

Most infants in the study were aged 4–5 months (37.5%), while the remaining participants were evenly distributed between 2–3 months (31.3%) and 6 months (31.3%), indicating a balanced representation across early infancy. Regarding sex distribution, the majority of the infants were male (56.3%), with females comprising 43.7% of the sample. Overall, the characteristics show that the study included infants of varying early-age groups with a slightly higher proportion of male participants.

Table 2.
Comparison of AIMS Scores (Pretest and Posttest)

Variable	Mean \pm SD	Min–Max	P value
AIMS Pretest	14.09 \pm 3.25	8–20	0.001
AIMS Posttest	20.56 \pm 3.98	14–28	

The results show a clear improvement in motor development scores after the intervention. The AIMS pretest had an average score of 14.09 ± 3.25 with values ranging from 8 to 20, indicating generally low-to-moderate motor performance at baseline. After the intervention, the AIMS posttest mean increased to 20.56 ± 3.98 with a range of 14 to 28, demonstrating a notable rise in motor ability. Overall, these findings suggest that the intervention had a positive effect on enhancing infants' motor development. The Wilcoxon signed-rank test revealed a statistically significant difference between pretest and posttest AIMS scores ($p = 0.001$, $p < 0.05$). This result indicates that the combined tummy time and baby yoga intervention produced a significant improvement in gross motor development among infants. The consistent increase in posttest scores across participants suggests that the observed changes were not due to random variation but reflect a meaningful developmental gain following the intervention.

Discussion

In this study, infants showed a significant improvement in gross motor performance as measured by the Alberta Infant Motor Scale (AIMS) following a combined intervention of tummy time and baby yoga. The mean AIMS score increased from 14.09 ± 3.25 at pretest to 20.56 ± 3.98 at posttest, indicating a marked enhancement in gross motor functioning across the sample. This improvement suggests that the intervention effectively stimulated motor skills such as head control, trunk stability, and limb coordination abilities crucial during the early months of life.

These findings are consistent with existing evidence confirming the positive impact of structured prone positioning on motor outcomes. For example, a systematic review found that tummy time is associated with earlier attainment of gross motor milestones and contributes to the development of stability and postural control in infants (Hewitt et al., 2020). Improvements in specific motor milestones such as independent rolling and prone-to-sit transitions have been attributed to increased time spent in supervised tummy time, leading to strengthened neck, shoulder, and trunk musculature.

Compared to tummy time alone, the addition of baby yoga may contribute uniquely to balance, coordination, and postural control through structured, guided movements that actively engage multiple muscle groups in varied positions. While tummy time primarily enhances antigravity strength and static postural stability in the prone position, baby yoga introduces dynamic movement patterns, bilateral limb coordination, and controlled transitions that challenge infants' balance responses and body awareness. These facilitated movements may promote integration of vestibular, proprioceptive, and tactile inputs, which are essential for the development of coordinated motor control and postural adjustments.

Therefore, baby yoga may complement tummy time by extending motor stimulation beyond static prone positioning to include active movement variability and sensorimotor integration, potentially explaining the observed improvements in gross motor performance.

The additional incorporation of baby yoga into the intervention may have enhanced the sensory-motor experience beyond what is typically provided by tummy time alone. While research on baby yoga specifically is limited, studies on parent-infant movement programs indicate that gentle, rhythmical movements and guided facilitation can support motor development and caregiver–infant interaction (Field, 2019). These programs, like infant massage with movement components, have been linked to improved motor outcomes and increased behavioral engagement in infants. The combined intervention in the current study likely offered similar multimodal stimulation encouraging muscle activation, balance responses, and coordinated movement patterns.

Moreover, the use of validated and widely recognized outcome measures such as AIMS strengthens the confidence in interpreting these results. The AIMS is designed to capture subtle changes in gross motor proficiency and has been shown to be sensitive to developmental progress in early infancy (Eliks & Gajewska, 2022; Kepenek-Varol et al., 2020). Its application in this study enables comparability with international research and supports the argument that the observed improvements are not only statistically significant but also clinically meaningful.

These results align with broader research on early motor interventions, reinforcing that experiences promoting varied movement and body awareness—whether through prone positioning or facilitated movement play a crucial role in healthy motor development. Although few studies have examined structured baby yoga in isolation, the present study contributes to a growing body of evidence suggesting that enriched, caregiver-mediated motor stimulation can accelerate milestone achievement within a short timeframe.

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4. Conclusion

This study demonstrates that the combined tummy time and baby yoga intervention effectively improves gross motor development among infants, as evidenced by a statistically significant increase in AIMS scores from pretest to posttest. The intervention provided structured opportunities for prone positioning, postural control training, and movement facilitation, which are essential components of early motor development. These findings support the use of integrated motor stimulation strategies as feasible, low-cost, and parent-friendly approaches that can be incorporated into routine infant care and community health programs.

However, interpretation should consider the study's limitations, including the small sample size, lack of a control group, and short follow-up period. To strengthen causal evidence, future research should employ randomized controlled trial designs with parallel comparison groups, such as tummy

time alone or usual care, to isolate the specific contribution of baby yoga. In addition, the use of assessor blinding, longer follow-up periods, and repeated outcome measurements would help clarify the sustainability and causal pathways of the observed effects. Further research with these methodological refinements is recommended to confirm long-term effectiveness and improve generalizability.

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