

# Potential of Massage Therapy for Improved Growth and Development Among Infants Under 9 Months: A Systematic Scoping Review of Intervention Type, Technique, and Outcome

Windy Rakhmawati<sup>1,\*</sup>, Henny Suzana Mediani<sup>1,\*</sup>, Meita Dhamayanti<sup>2,\*</sup>, Ida Maryati<sup>3,\*</sup>, Asty Samiaty Setiawan<sup>4,\*</sup>, Sri Hendrawati<sup>1,\*</sup>, Nenden Nur Asriyani Maryam<sup>1,\*</sup>, Alfiah Hasanah<sup>5,\*</sup>, Aep Maulid Mulyana<sup>6,\*</sup>, Dini Mariani<sup>7,\*</sup>, Imat Rochimat<sup>8,\*</sup>

<sup>1</sup>Department of Pediatric Nursing, Faculty of Nursing, Universitas Padjadjaran, Sumedang, West Java, 45363, Indonesia; <sup>2</sup>Department of Child Health, Faculty of Medicine, Universitas Padjadjaran, Sumedang, West Java, 45363, Indonesia; <sup>3</sup>Department of Maternity Nursing, Faculty of Nursing, Universitas Padjadjaran, Sumedang, West Java, 45363, Indonesia; <sup>4</sup>Department of Public Dental Health, Faculty of Dentistry, Universitas Padjadjaran, Sumedang, West Java, 45363, Indonesia; <sup>5</sup>Department of Economics, Faculty of Economics and Business, Universitas Padjadjaran, Sumedang, West Java, 45363, Indonesia; <sup>6</sup>Faculty of Nursing, Universitas Padjadjaran, Sumedang, West Java, 45363, Indonesia; <sup>7</sup>Department of Nursing, Polytechnic Health Ministry of Health Tasikmalaya, Tasikmalaya, West Java, 46115, Indonesia; <sup>8</sup>Department of Pharmacy, Polytechnic Health Ministry of Health Tasikmalaya, Tasikmalaya, 46115, Indonesia

\*These authors contributed equally to this work

Correspondence: Windy Rakhmawati, Department of Pediatric Nursing, Faculty of Nursing, Universitas Padjadjaran, Sumedang, West Java, 45363, Indonesia, Tel +62 82119492124, Email windy.rakhmawati@unpad.ac.id

**Background:** Infants are in a critical period during which often occur many problems, such as growth, development, and motor delays. One of the interventions that can potentially reduce these problems is by giving a massage therapy.

**Purpose:** This study aims to conduct a systematic scoping review of massage therapy's potential for growth and development among infants under nine months.

**Methods:** This study followed a Preferred Reporting Item for Systematic Review and Meta-analysis (PRISMA-ScR). We collected data from three databases, including PubMed, Scopus, and CINAHL with full text, published in 2013–2022, subjects aged less than nine months, full-text articles, and randomized controlled trials. Studies were excluded if they were not in English.

**Results:** Of the 11 studies found, it shows that therapy massage can effectively increase infants' growth and development, including body weight, length, visual-motor coordination and integration, hand-eye, hearing, speech, social, vagal activity, language, locomotion, stationary, and reflexes. The interventions include medium chain triglyceride oil massage, Dabur Lal Tail massage, oil massage, massage by mothers, and massage therapy without additives for 5–45 minutes. In addition, massage therapy has a positive effect on infants with various conditions, including preterm infants, infants with HIV-infected mothers, and infants with Down's syndrome.

**Conclusion:** Our findings highlight that infants receiving massage therapy were significantly more likely to increase growth and development than the population who were not given massage therapy. However, further investigation into preventing the severity of growth and developmental problems is urgently needed.

**Keywords:** development, growth, infant, intervention, massage therapy

## Introduction

Infancy is a critical period, requiring special and thorough handling to achieve development and growth.<sup>1</sup> Growth and development are a continuous process in human life, starting from the baby in the womb and one of the developments in infants is the early stages of gross motor and motor development.<sup>2</sup>

Problems that often occur in infants are growth, development and motor delays.<sup>3</sup> Failure to thrive (FTT) in infants is defined as suboptimal physical growth, weight failure, or lack of growth.<sup>4</sup> Low body weight or failure to thrive is a baby's condition that triggers health problems. The consequences of child growth broadly impact mortality, morbidity, and impaired cognitive development.<sup>5</sup> Therefore, it is essential to pay attention to the quality of life of infants and young children so that children can develop to their full physical and mental potential.<sup>6</sup>

Child growth is internationally recognized as the best global indicator of physical well-being and mental development. Globally, health goals are assessed based on weight gain in children under five years,<sup>6</sup> including growth-related targets for stunting, wasting, and overweight.<sup>5</sup> Optimal weight is significant for a baby's life and long-term health. However, simultaneous changes in body length, lean tissue, fat mass, and motor and sensory development are critical to optimal health in children.<sup>3</sup>

One of the interventions to potentially increase growth in babies is massage therapy (MT). This therapy is associated with increased body weight and infant mental and motor development.<sup>7</sup> Human touch strongly affects a baby's life and is essential in helping them reach their optimal potential.<sup>8</sup> As such, baby massage is a new trend in caring for babies to optimize baby growth and development.<sup>2</sup> Massaging the baby can have a calming effect and encourage bone growth, stimulate movement and coordination of the limbs, and increase the baby's weight.<sup>9</sup> Research has shown that massage therapy can help improve and stimulate infant motor development.<sup>3</sup> In line with other research, massage affects the growth of premature babies as a form of stimulation, helps improve the physical growth and digestive function of premature babies, and stimulates motor development.<sup>3,10</sup> Infant massage is a type of tactile stimulation that can improve the performance of muscles, bones and organ systems. Massage will activate the vagus nerve to increase the capacity of intestinal peristalsis, which will speed up the emptying of the stomach and cause the infant to feel more hungry. In addition, infant massage can also improve blood circulation and metabolism.<sup>11</sup>

Previous research stated that the obstacles experienced in infant massage therapy include parents having obstacles to be involved in infant massage therapy, such as financial constraints, infant and mother health, having other children, transportation constraints, personal commitment, assessment of health workers who demean parents, and the view of parents' lack of ability.<sup>12</sup> There may be some side effects due to negligence or accidents such as applying too hot oil or improper techniques such as solid massage, exposure to cold, and allergies to massage oils resulting in skin rashes.<sup>13</sup>

The reasons for not massaging babies are the unavailability of experts to provide baby oil massage, having heard of other people's negative experiences, perceptions about the dangers of massage, advice from health service providers who forbid massage, and lack of time.<sup>13</sup> Another study revealed that massage therapy in infants was considered to take a long time.<sup>12</sup> However, previous studies have not provided comprehensive information related to massage therapy for infants under nine months. A systematic scoping review is needed to provide conclusive information about massage therapy in infants under nine months regarding the types of massage interventions, techniques, and outcomes. This conclusive information can optimize their growth and development. Therefore, this study aims to conduct a systematic scoping review regarding the potential of massage therapy for growth and development among infants under nine months.

## Materials and Methods

### Study Design

This study uses Arksey and O'Malley's systematic review framework to present comprehensive research following a Preferred Reporting Item for Systematic Review and Meta-analysis (PRISMA-ScR).<sup>14</sup> This method is suitable for the subject of this study to comprehensively explore one specific topic.<sup>15</sup> The framework consists of five stages, including identifying research questions, identifying relevant studies, selecting studies, analyzing articles and compiling, summarizing, and reporting.<sup>16</sup>

## Search Strategy

Search studies using the PRISMA framework, including PubMed, Scopus, and CINAHL, with full text. The criteria in this study using the PICOS question framework included: (1) population: infant; (2) intervention: massage; (3) comparison: not applicable; (4) outcomes: growth and development; and (5) study: RCTs. Mendeley software was used to eliminate duplicates. Medical Subject Heading (MeSH) was used to search for articles using Boolean operators OR and AND, thus including “massage therapy, baby massage, baby, infant, babies, newborn, neonate, growth, development, and progression”.

## Eligibility Criteria

The inclusion criteria were studies on subjects less than 12 months, full-text articles, randomized controlled trials, and those which reported the impact of massage on an infant’s growth and development. Studies were excluded if they were not in English. Nine researchers independently screened and selected the titles, abstracts, and full texts. Any disputes were discussed to reach a consensus between researchers.

## Data Extraction

Data extraction used a tabular outcome with the following columns: (1) study characteristics, including author and year of publication, study location and study design, intervention, population, sample size, age, weight at study, and gender; (2) Intervention and study outcome, including the name of the group or intervention, the assessment tool used, and outcomes; and (3) the method of massage therapy, including the intervention, duration, and technique.

## Critical Appraisal

Study quality was assessed using the Joanna Briggs Institute (JBI) critical appraisal checklist tool for a Randomized Controlled Trial (RCT),<sup>17</sup> consistent with 13 questions and four categories: yes, no, unclear, and not applicable. Score 0 for “No” and 1 for “Yes” for a total score of 0–13 (See Table 1).

**Table 1** Critical Appraisal Tool

Study	Study Design	JBI Critical Appraisal Tool
Mayor-Mileur et al (2013) <sup>3</sup>	RCT	11/13 (84.61%)
Elmoneim et al (2021) <sup>7</sup>	RCT	11/13 (84.61%)
Gupta et al (2015) <sup>9</sup>	RCT	9/13 (69.23%)
Kumar et al (2013) <sup>10</sup>	RCT	8/13 (61.53%)
Zhang & Wang (2019) <sup>18</sup>	RCT	13/13 (100%)
Campbell & Jacobs (2021) <sup>19</sup>	RCT	10/13 (76.92%)
Liao et al (2021) <sup>20</sup>	RCT	13/13 (100%)
Perez et al (2015) <sup>21</sup>	RCT	12/13 (92.30%)
Pinero-Pinto et al (2020) <sup>22</sup>	RCT	13/13 (100%)
Saedi et al (2015) <sup>23</sup>	RCT	8/13 (61.53%)
Diego et al (2014) <sup>24</sup>	RCT	10/13 (76.92%)

**Abbreviation:** RCT, Randomized Controlled Trial.

## Results

### Study Selection

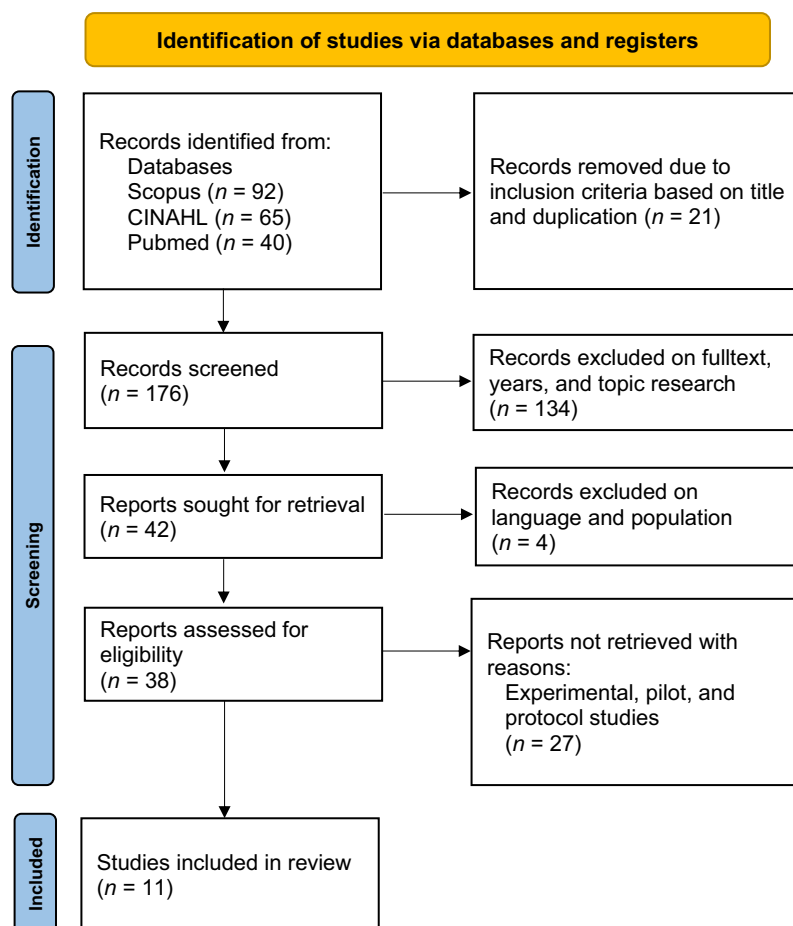
Three databases provided 197 articles from the year 2013 to October 2022. After duplicates, inclusion and exclusion criteria, and those not with full text, 38 articles remained. Twenty-seven excluded articles were not designed RCTs, leaving 11 studies as included and acceptable for a review (See Figure 1).

### Characteristic Study

Analysis of studies were conducted on 11 RCTs, yielding 676 participants, consisting, 356 males and 320 females, including preterm infants, neonates, infants, infants with Down's syndrome, and infants with HIV-infected mothers. The research was conducted in many countries: South Africa (n=2), USA (n=2), India (n=2), Egypt (n=1), Taiwan (n=1), Spain (n=1), Iran (n=1), China (n=1), and published from 2013 to 2022.

The range of weight of the participants in the study was 1000 and >2500 grams, and the range age of the participants from 10 studies was 3–9 months, and one study was <28 days. The populations in the study analyzed were preterm infants (n=7), infants with HIV-infected mothers (n=1), infants with Down's syndrome (n=1), infants (n=1), and neonates (n=1). In addition, 676 participants were further randomized into an intervention group of 333 and a control group of 343. Interventions consisted of massage interventions.

Outcomes were measured using standardized instruments of pediatric growth and development, such as anthropometric, infant medical charts, infantometer, digital scale, Griffiths Mental Development Scales (GMDS), the Brunet-Lezine Early Childhood Psychomotor Development revised scale (BLR scale), dual X-ray absorptiometry (DXA) scan,



**Figure 1** PRISMA Flow diagram.

Adapted from: Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021;372:n71. Creative Commons.

**Table 2** Characteristics of Included Studies

Ref	Location	Design	Population	Intervention	Age (months)	Weight at Study (gr)	Gender		Sample (n)	
							Male (n)	Female (n)	IG	CG
[19]	South Africa	RCT	Preterm infants	Parent-administered infant massage	4–6	>1000	7	10	8	9
[24]	USA	RCT	Preterm infants	Massage therapy	7–8	1,000–1,500	15	15	15	15
[7]	Egypt	RCT	Preterm infants	Massage therapy	<9	1,500–2,000	33	27	30	30
[10]	India	RCT	Preterm infants	Oil Massage	<9	<1,800	27	21	25	23
[20]	Taiwan	RCT	Preterm infants	MCT oil massage	7–9	1500–2000	14	18	16	16
[3]	USA	RCT	Preterm infants	Masked Massage	7–8	> 1500	22	22	22	22
[18]	China	RCT	Preterm infants	Massage by their mothers	NA	NA	58	54	58	54
[9]	India	RCT	Infants	Dabur Lal Tail Massage	4–6	>2500	28	32	30	30
[21]	South Africa	RCT	Infants with HIV-infected mothers	Massage therapy	9	NA	84	77	73	88
[22]	Spain	RCT	Infants with Down syndrome	Massage therapy	4–8	NA	21	11	16	16
[23]	Iran	RCT	Neonates	MCT oil massage	<28 days	NA	47	33	40	40

**Abbreviations:** RCT, Randomized Controlled Trial; Peabody PDMS, Developmental Motor Scales Second Edition; BSID-III, Bayley Scales of Infant and Toddler Development Third Edition; MCT oil massage, medium-chain triglyceride oil massage; DXA scan, dual X-ray absorptiometry; GMDS, Griffiths Mental Development Scales; BLR scale, The Brunet-Lézine Early Childhood Psychomotor Development revised scale; NA, Not Applicable.

Bayley Scales of Infant and Toddler Development Third Edition (BSID-III), and Peabody Developmental Motor Scales Second Edition (PDMS-2) (See [Table 2](#)).

## Study Outcomes

### The Summary Analysis of Massage Intervention Among Infants

The intervention of massages for infants' growth and development utilizes various techniques, including medium-chain triglyceride oil massage (MCT oil massage), masked massage, oil massage, Dabur Lal Tail massage, parent-administered infant massage, and just massage therapy without any additives.<sup>3,7,9,10,18–24</sup>

Overall, the 11 studies analyzed were grouped by demographics. The majority of findings from the analysis included age 7–9 months (37.84%), preterm infants (52.26%), Europe, the Middle East and Africa region (50.15%), massage without oil (66.67%), duration 5–15 minutes (68.17%), growth (88.29%) and development (33.63%) (See [Table 3](#)). This study shows that massage therapy is more effective in increasing the growth and development of infants' than those who do not apply massage. In addition, massage therapy has a positive effect on infants with various conditions, including growth and development in preterm infants and infants with HIV-infected mothers, growth in neonates and infants, and development in infants with Down's syndrome. The efficacy of massage therapy for each intervention and technique is shown in [Table 4](#).

### Efficacy of Massage Intervention for the Growth Domain

Ten studies revealed that massage therapy could improve growth domains, including body weight and length of infants receiving massage therapy. In addition, one study found that the efficacy of massage can increase total body-less head (TBLH) tissue mass. Techniques used to enhance this growth domain include medium chain triglyceride oil massage (MCT oil massage), Dabur Lal Tail massage, oil massage, massage by their mothers, and massage therapy without additives. Overall, these nine studies demonstrated the significant efficacy of the massage intervention for the growth domain (See [Table 4](#)).

**Table 3** Summary Analysis of Intervention Massage by Demographic Variable in Selected Studies

Subgroup	Number of Studies (N)	Sample Size (N)	Percentage (%)
<b>Overall studies (RCT)</b>	11	333	100
<b>Age (months)</b>			
0–3	1	40	12.01
4–6	2	38	11.41
7–9	4	126	37.84
<9 (UC)	3	71	21.32
NA	1	58	17.42
<b>Population</b>			
Preterm infants	7	174	52.26
Neonates	1	40	12.01
Infants with HIV-infected mothers	1	73	21.92
Infants with Down syndrome	1	16	4.81
Infants	1	30	9.00
<b>Country Region</b>			
Europe, the Middle East and Africa	5	167	50.15
North America	2	37	11.11
Asia-Pasifik	4	129	38.74
<b>Intervention</b>			
Just Massage	7	222	66.67
Massage with Oil	4	111	33.33
<b>Duration of technique (minutes)</b>			
5–15	9	227	68.17
>15	2	106	31.83
<b>Outcome</b>			
Growth	8	294	88.29
Development	4	112	33.63

**Abbreviations:** RCT, Randomized Controlled Trial; NA, Not Applicable; UC, Unclear or not age-specific; <, less than.

### Efficacy of Massage Intervention for the Development Domain

Five studies showed that massage therapy could improve the developmental domains of infants who receive massage, between smooth motoric and rough motoric development, such as visual-motor coordination, visual-motor integration, hand-eye, hearing/speech, social, vagal activity, language, locomotion, stationary, and reflexes. Techniques that effectively improve an infant's development include massage therapy and massage by parents (See Table 4).

Table 4 Intervention and Outcome

Ref	Population	Intervention	Control	Instrument	Outcome (Change/Increased)			
					Domain	Subdomains	Intervention	Control
[19]	Preterm infants	Parent-administered infant massage	NA	PDMS-2	Development	Reflexes Stationary Locomotion Grasping Visual-motor integration	2.00 (%) 3.13 (%) 2.64 (%) -1.13 (%) 5.00 (%)	1.22 (%) 2.45 (%) 2.45 (%) -0.89 (%) 4.11 (%)
[19]		Parent-administered infant massage	NA	BSID-III	Development	Cognition Language Motor Social-emotional Adaptive behaviour	0.00 (%) 17.63 (%) 20.38 (%) 16.00 (%) 67.75 (%)	8.67 (%) 17.56 (%) 18.78 (%) 16.56 (%) 71.56 (%)
[24]		Massage therapy	Exercise	Infant's medical charts	Development	Vagal activity Calorie consumption	NA NA	NA NA
[7]		Massage therapy	Routine care group	Anthropometric	Growth	Cumulative weight gain Growth velocity Cumulative length gain	77.5 (%) 12.5 (g) 0.50 (%)	25 (%) 3.6 (g) 0 (%)
[7]		Massage therapy	Routine care group	DXA	Growth	TBH tissue mass	19.8 (%)	4.2 (%)
[10]		Oil Massage	Standard care without massage	Anthropometric	Growth	Weight Length	477 (g) 2.6 (cm)	443 (g) 2.3 (cm)
[20]		MCT oil massage	Massage alone	Infantometer	Growth	Weight Length	39.17 (g) 0.02 (cm)	2.92 (g) 0.01 (cm)
[3]		Masked Massage	Licensed massage therapists	Anthropometric	Growth	Weight Length	664 (g) 1.1 (cm)	667 (g) 1.1 (cm)
[18]		Massage by their mothers	Standard care	Digital scale	Growth	Weight Length	400.1 (g) 2.8 (cm)	141.4 (g) 2 (cm)
[9]	Infants	Dabur Lal Tail Massage	Massage with Placebo (Talcum)	Anthropometrical measurements	Growth	Weight Gain Velocity Velocity of Length	-0.72 (g) 0.5 (cm)	-0.12 (g) 0.6 (cm)
[21]	Infants with HIV-infected mothers	Massage therapy	No message	Anthropometric Z-scores	Growth	Weight-for-age length-for-age weight-for-length	8 (%) 14.8 (%) 7.5 (%)	8.2 (%) 13.7 (%) 7.9 (%)

(Continued)

Table 4 (Continued).

Ref	Population	Intervention	Control	Instrument	Outcome (Change/Increased)			
					Domain	Subdomains	Intervention	Control
[21]	Infants with HIV-infected mothers	Massage therapy	No message	GMDS	Development	Locomotor Social Hearing/speech Hand-eye	21.8 (%) 17.3 (%) 40.0 (%) 11.6 (%)	13.4 (%) 15.1 (%) 27.6 (%) 3.2 (%)
[22]	Infants with Down syndrome	Massage therapy	No message	BLR scale	Development	Global development motor development visual-motor coordination development language development social development	17.59 20.40 12.92 17.18 21.26	0.3 2.08 -0.72 3.44 -2.39
[23]	Neonates	MCT oil massage	Massage alone	Digital scale	Growth	Weight	105 (g)	52 (g)

**Abbreviations:** PDMS-2, Peabody Developmental Motor Scales Second Edition; BSID-III, Bayley Scales of Infant and Toddler Development Third Edition; GMDS, Griffiths Mental Development Scales; BLR scale, The Brunet-Lezine Early Childhood Psychomotor Development revised scale; DXA, dual X-ray absorptiometry scan; MCT oil massage, medium-chain triglyceride oil massage; TBLH, total body less head; NA, Not Applicable.



## The Technique of Massage Therapy

The 11 analyzed articles found that massage therapy was carried out with a short duration of 5–45 minutes per day, according to several techniques. Overall, massage therapy has excellent efficacy in promoting infant growth and development. An impressive finding from this systematic scoping review is that many massage techniques applied to infants have efficacy in enhancing infant development and growth without the addition of pharmacological interventions (See [Table 5](#)).

## Discussion

The findings of this study revealed that infants under nine months of age with various conditions, such as preterm infants, neonates, infants, infants with HIV-infected mothers, and infants' with Down's syndrome, can increase growth and develop better by applying massage therapy than was observed in the group that did not get treatment. The results showed a significant increase in the daily growth rate of children who received massage compared to those not involved in the treatment.<sup>7</sup> Another meta-analysis study by Li et al (2016) revealed that oil massage effectively promotes the baby's physical growth.<sup>25</sup> This study added the previous systematic review, which revealed that massage could increase head circumference and total body weight in premature infants and did not affect length gain.<sup>26</sup>

Infants' massage can meet four basic needs of infants, namely physical-biological needs, emotional needs, love needs, and stimulation needs. Infant massage is one of the treatments that stimulate infants' motor movements, which affects their growth and development.<sup>1</sup> Infant massage also stimulates the brain's core work structure and function.<sup>2</sup> According to this study, infants' massage can improve the growth and motor development of infants aged 3 and 9 months. Another study found that infants' massage is effective for weight growth and for infants' length aged 3–12 months.<sup>27</sup>

Based on the analyzed studies, another finding is that massage therapy can be used in stimulating the growth and development of infants in conditions other than normal, such as preterm infants, infants with Down's syndrome, and infants with HIV-infected mothers. A previous study revealed that massage therapy has been shown to have beneficial effects on a variety of conditions, including prenatal depression, premature infants, preterm infants, autism, skin diseases, autoimmune conditions, asthma, and immune conditions, including HIV and cancer.<sup>24</sup> This study adds to the literature by reporting on the benefits of massage therapy to promote infants' growth and development, including preterm infants, neonates, infants, infants with HIV-infected mothers, and infants with Down's syndrome.

Another finding from this study is that the intervention type used to increase infant growth and development is only massage and massage with oil. Other studies show that various massage interventions are used, including flexion and extension movements,<sup>24</sup> MCT oil massage therapy,<sup>23</sup> sunflower oil massage,<sup>10,28</sup> and Qigong massage, to improve motor development and reduce disability.<sup>29</sup>

Our study found several techniques used in infant massage to increase growth and development in infants under nine months of age. Several research results have shown different percentage increases in weight and development, mostly due to differences in the use of massage technique protocols. Several decades ago, several iterations in the development of tactile-kinesthetic protocols were applied in research studies, including variations in kinesthetic stimulation, tactile stimulation, variations in stimulation, amount of pressure, duration, and frequency of the protocol.<sup>24</sup> The Touch Research Institute in Miami used a 15-minute protocol, three times a day, for ten days in healthy premature infants less than 30 weeks gestation and found increased weight gain after massage compared with those who did not receive it.<sup>7,30</sup> Two meta-analysis studies with the same protocol showed daily weight increases of 5.1 g and 5.07 g/day in children who received massage.<sup>31,32</sup>

The pressure in tactile stimulation is essential to massage because only infants who receive strokes with moderate pressure rather than light pressure show more significant weight gain and vagal activity. Apart from that, frequency and duration are also essential components in getting optimal results from massage.<sup>24</sup> Previous studies revealed an increase in the daily growth of infants who received massage. However, there was no difference in outcomes in the group that received massage and regular care, which may be related to the short-term intervention protocol.<sup>7</sup> Given the importance of the massage technique, pediatric nurses and parents can be given a demonstration and stimulation session.

**Table 5** The Technique of Massage Therapy

Ref	Population	Intervention	Duration	Technique
[19]	Preterm infants	Parent-administered infant massage	10–15 minutes per day	Massage the infants' lower limbs, stomach, chest and upper body
[24]		Massage therapy	10 minutes per day	<ol style="list-style-type: none"> <li>1. From the top of the head to the neck and back and back to the top of the head</li> <li>2. From the neck across the shoulders, then back to the neck</li> <li>3. From the upper back to the lower waist and back to the upper back</li> <li>4. On both legs, from the thighs to the feet and then back to the thighs</li> <li>5. From both shoulders to hands, then back to shoulders</li> </ol>
[7]		Massage therapy	45 minutes per day	<ol style="list-style-type: none"> <li>1. Done after lunch</li> <li>2. Tactile stimulation phase (15 minutes): The infant is placed in a prone position, and strokes are given with moderate pressure using the ventral part of the fingers of both hands to the head, neck, shoulders, buttocks, arms and legs.</li> <li>3. Kinesthetic stimulation phase (15 minutes): The infant is laid supine, and six passive flexion/extension movements are carried out simultaneously on the right arm, left arm, right leg, left leg, and both legs.</li> <li>4. Another tactile stimulation phase (15 minutes)</li> </ol>
[10]		Oil Massage	10 minutes, four times a day.	<ol style="list-style-type: none"> <li>1. The massage consists of twenty gentle strokes</li> <li>2. Position the infant on his stomach</li> <li>3. Massage both shoulders, starting from the neck</li> <li>4. Massage from upper back to waist</li> <li>5. Position the infant on his back</li> <li>6. Massage both upper and lower legs separately</li> </ol>
[20]		MCT oil massage	Five minutes per day	<ol style="list-style-type: none"> <li>1. Massage is given in prone and supine positions</li> <li>2. Gently massage the head, back and limbs (1 minute each),</li> <li>3. Six passive flexion and extension movements of the arms and legs (10 seconds each)</li> <li>4. Massage both feet (1 minute)</li> </ol>
[3]		Masked Massage	20 minutes per day	<ol style="list-style-type: none"> <li>1. Both lower legs: massage the upper thighs to the ankles and feet</li> <li>2. Massage the chest area (above the ribs)</li> <li>3. Both upper legs: massage shoulders down arms into hands</li> <li>4. Massage the head from the crown to the neck</li> <li>5. Massage along the back from the neck to the bottom of the waist</li> </ol>
[18]		Massage by their mothers	10 minutes per day	<ol style="list-style-type: none"> <li>1. Tactile stimulation phase (5 minutes): the infant is placed in a prone position, and strokes are given with moderate pressure using the ventral part of the fingers of both hands to the head, neck, shoulders, buttocks, arms and legs.</li> <li>2. Kinesthetic stimulation phase (5 minutes): The infant is laid supine, and six passive flexion/extension movements are carried out simultaneously on the right arm, left arm, right leg, left leg, and both legs.</li> </ol>

[9]	Infants	Dabur Lal Tail Massage	10 minutes every day	<ol style="list-style-type: none"> <li>1. The first massage is given to the legs and feet (4 minutes)</li> <li>2. Back massage (1 minute)</li> <li>3. Arm massage (4 minutes)</li> <li>4. Chest and stomach massage (45 seconds)</li> <li>5. Massage the face and head (15 seconds)</li> </ol>
[21]	Infants with HIV-infected mothers	Massage therapy	15 minutes per day	Massage is performed on the face, limbs, and back using firm pressure
[22]	Infants with Down syndrome	Massage therapy	10 minutes per day	<ol style="list-style-type: none"> <li>1. Massage both lower legs, from feet to thighs</li> <li>2. Massage the stomach clockwise</li> <li>3. Chest massage</li> <li>4. Massage from shoulders to hands</li> <li>5. Massage the face from forehead to chin, infant in the prone position</li> <li>6. Massage from head to lower back</li> </ol>
[23]	Neonates	MCT oil massage	Five minutes, four times a day	<ol style="list-style-type: none"> <li>1. Massage is done on the whole body (below the neck) with 10cc/kg/day MCT oil.</li> <li>2. Massage is done one hour after eating.</li> </ol>

**Abbreviation:** MCT oil massage, medium-chain triglyceride oil massage.

## Implication and Limitations

This study has limitations. The article search was limited to three databases, and the literature search excluded non-English studies, making it possible that there was still literature that needed to be included from other databases and causing the literature to be incomplete. The sample in this scoping review was small, so the findings cannot be generalized to different populations.

However, despite its limitations, several strengths of this study must also be recognized. The clinical implication of this study is that this scoping review examines types of massage interventions, techniques, and outcomes in a population of children under nine months of age. However, the literature analyzed represents four country regions, including Europe, the Middle East and Africa, North America, and Asia-Pacific so these findings can be used as information for relevant countries as a clinical basis for implementing interventions to increase the growth and development of infants under nine months. This study has the potential to provide insight into massage interventions and techniques used to help improve the weight of premature infants, neonates, infants with HIV-infected mothers, and infants with Down's syndrome under nine months, both at home and in the hospital.

## Conclusion

This systematic review found that the therapy massages effectively increased infants' growth and development. Through the massages, it can improve the performance of muscles, bones and organ systems. Massage will activate the valgus nerve to increase the capacity of intestinal peristalsis, which will speed up the emptying of the stomach and cause the infant to feel hungrier. In addition, infant massage can also improve blood circulation and metabolism. The interventions include medium chain triglyceride oil massage (MCT oil massage), Dabur Lal Tail massage, oil massage, massage by the mothers, and massage therapy without additives. A therapy massage finding shows that the technique's benefits can improve growth and development domains, such as body weight, length, visual-motor coordination, visual-motor integration, hand-eye, hearing/speech, social, and vagal activity locomotion, stationary, and reflexes.

Our findings highlight that infants receiving massage therapy were significantly more likely to increase growth and development than the population who were not given massage therapy. In the future, a comprehensive approach to improving quality of life-related to growth and development is needed, starting with increasing awareness, educating patients and families, and offering information to increase massage as an effective and efficient alternative therapy. In addition, further investigation on the prevention of severity in infants who are already experiencing developmental problems is urgently needed.

## Acknowledgments

The authors appreciate Universitas Padjadjaran, Bandung, West Java, Indonesia, for facilitating the search database for this systematic review. The Ministry of Education, Culture, Research and Technology, the Republic of Indonesia, supports this study.

## Disclosure

The authors declare no conflicts of interest in this work.

## References

- Wayan NN. The impact of baby spa on the growth and development of infants aged 3-6 months at puskesmas i denpasar selatan. *Int J Res Med Sci*. 2018;6(8):2601–2605. doi:10.18203/2320-6012.ijrms20183239
- Kurnaesih E. The influence of baby spa toward growth and development rough and smooth motoric babies, age 3 – 12 months in the subdistrict lapongkoda district of tempe wajo regency. *Indian J Forensic Med Toxicol*. 2020;14(4):933–938. doi:10.37506/ijfimt.v14i4.11613
- Moyer-Mileur LJ, Haley S, Slater H, Beachy J, Smith SL. Massage improves growth quality by decreasing body fat deposition in male preterm infants. *J Pediatr*. 2013;162(3):490–495. doi:10.1016/j.jpeds.2012.08.033
- Goh LH, How CH, Ng KH. Failure to thrive in babies and toddlers. *Singapore Med J*. 2016;57(6):287–291. doi:10.11622/smedj.2016102
- De Onis M. *Child Growth and Development BT-Nutrition and Health in a Developing World*. In: de Pee S, Taren D, Bloem MW, eds.. Springer International Publishing; 2017:119–141. doi:10.1007/978-3-319-43739-2\_6
- Spencer C, Roberts L. *Humanitarian Emergencies*. 2021. doi:10.1093/med/9780198816805.003.0104.

7. Elmoneim MA, Mohamed HA, Awad A, et al. Effect of tactile/kinesthetic massage therapy on growth and body composition of preterm infants. *Eur J Pediatr.* 2021;180(1):207–215. doi:10.1007/s00431-020-03738-w
8. Benoit B, Boerner K, Campbell-yeo M, Chambers C The power of human touch for babies. *Can Assoc Paediatr Heal Centres.* 2015. Available from: [https://static1.squarespace.com/static/50056474c4aa4387b4e629ea/t/5719260ac2ea517c03d5d582/1461265930827/The\\_Power\\_of\\_Human\\_Touch\\_for\\_Babies.pdf](https://static1.squarespace.com/static/50056474c4aa4387b4e629ea/t/5719260ac2ea517c03d5d582/1461265930827/The_Power_of_Human_Touch_for_Babies.pdf). Accessed August 08, 2024.
9. Gupta A, Vagha J, Lakhkar B, Srivastava R, Kanjilal S. A placebo controlled, randomized, prospective and comparative study to assess the efficacy and safety of dabur lal tail massage on the growth and behavioral assessment of neonates and infants. *Int J Pharm Res.* 2015;7(2):102–109.
10. Kumar J, Upadhyay A, Dwivedi AK, Gothwal S, Jaiswal V, Aggarwal S. Effect of oil massage on growth in preterm neonates less than 1800 g: a randomized control trial. *Indian J Pediatr.* 2013;80(6):465–469. doi:10.1007/s12098-012-0869-7
11. Taqwin T, Linda L, Kusika SY, Ramadhan K, Radhiah S, Bohari B. The effectiveness of baby massage in stunting prevention: study based on body length gain in infants aged 0–3 months. *Open Access Maced J Med Sci.* 2022;10(E):1184–1189. doi:10.3889/oamjms.2022.8906
12. Abdallah B, Whitford H, Bradbury-Jones C, Jones M. Perceptions and attitudes of parents and healthcare professionals about the option of using infant massage in neonatal intensive care units. *J Clin Nurs.* 2021;30(3–4):499–507. doi:10.1111/jocn.15564
13. Chaturvedi S, Randive B, Pathak A, et al. Prevalence and Perceptions of Infant Massage in India: study from Maharashtra and Madhya Pradesh States. *BMC Pediatr.* 2020;20(1):N.PAG–N.PAG. doi:10.1186/s12887-020-02416-y
14. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol Theory Pract.* 2005;8(1):19–32. doi:10.1080/1364557032000119616
15. Peterson J, Pearce PF, Ferguson LA, Langford CA. Understanding scoping reviews: definition, purpose, and process. *J Am Assoc Nurse Pract.* 2017;29(1):12–16. doi:10.1002/2327-6924.12380
16. Bradbury-Jones C, Aveyard H, Herber OR, Isham L, Taylor J, O'Malley L. Scoping reviews: the pager framework for improving the quality of reporting. *Int J Soc Res Methodol.* 2022;25(4):457–470. doi:10.1080/13645579.2021.1899596
17. JBI. The Joanna Briggs institute critical appraisal tools for use in jbi systematic reviews 2017. The Joanna Briggs Institute Critical.;2017. Available from: <https://jbi.global/critical-appraisal-tools>. Accessed August 08, 2024.
18. Zhang X, Wang J. Massage intervention for preterm infants by their mothers: a randomized controlled trial. *J Spec Pediatr Nurs.* 2019;24(2). doi:10.1111/jspn.12238
19. Campbell M, Jacobs L. The effect of parent-administered infant massage on the developmental outcomes of premature infants. *S Afr J Occup Ther.* 2021;51(1):36–43. doi:10.17159/2310-3833/2021/vol51n1a6
20. Liao YC, Wan YH, Chen PH, Hsieh LY. Efficacy of medium-chain triglyceride oil massage on growth in preterm infants: a randomized controlled trial. *Med.* 2021;100(30):E26794. doi:10.1097/MD.00000000000026794
21. Perez EM, Carrara H, Bourne L, Berg A, Swanevelder S, Hendricks MK. Massage therapy improves the development of hiv-exposed infants living in a low socio-economic, peri-urban community of South Africa. *Infant Behav Dev.* 2015;38:135–146. doi:10.1016/j.infbeh.2014.12.011
22. Pinero-Pinto E, Benítez-Lugo ML, Chillón-Martínez R, Rebollo-Salas M, Bellido-Fernández LM, Jiménez-Rejano JJ. Effects of massage therapy on the development of babies born with down syndrome. *Evid Based Complement Altern Med.* 2020;2020(1). doi:10.1155/2020/4912625
23. Saeidi R, Ghorbani Z, Shapouri Moghadam A. The effect of massage with medium-chain triglyceride oil on weight gain in premature neonates. *Acta Med Iran.* 2015;53(2):134–138.
24. Diego MA, Field T, Hernandez-Reif M. Preterm infant weight gain is increased by massage therapy and exercise via different underlying mechanisms. *Early Hum Dev.* 2014;90(3):137–140. doi:10.1016/j.earlhumdev.2014.01.009.Preterm
25. Li X, Zhong Q, Tang L. A meta-analysis of the efficacy and safety of using oil massage to promote infant growth. *J Pediatr Nurs.* 2016;31(5):e313–e322. doi:10.1016/j.pedn.2016.04.003
26. Erçelik ZE, Doğan P, Yılmaz HB. The effect of massage on growth in premature babies: a systematic review and meta-analysis. *J Educ Res Nurs / Hemsirelikte Egit ve Arastirma Derg.* 2022;19(2):191–197. doi:10.5152/jern.2022.13285
27. Sudiro K, Mulyati S. Baby spa effect on growth. *Asian J Appl Sci.* 2018;6(5):390–395. doi:10.24203/ajas.v6i5.5538
28. Fallah R, Akhavan Karbasi S, Golestan M, Fromandi M. Sunflower oil versus no oil moderate pressure massage leads to greater increases in weight in preterm neonates who are low birth weight. *Early Hum Dev.* 2013;89(9):769–772. doi:10.1016/j.earlhumdev.2013.06.002
29. Silva LM, Schalock M, Garberg J, Smith CL. Qigong massage for motor skills in young children with cerebral palsy and down syndrome. *Am J Occup Ther.* 2012;66(3):348–355. doi:10.5014/ajot.2012.003541
30. Scafidi FA, Field TM, Schanberg SM, et al. Massage stimulates growth in preterm infants: a replication. *Infant Behav Dev.* 1990;13(2):167–188. doi:10.1016/0163-6383(90)90029-8
31. Wang L, He J, Zhang X. The efficacy of massage on preterm infants : a meta-analysis. *Am J Perinatol.* 2013;30(09):731–738. doi:10.1055/s-0032-1332801
32. Lu LC, Lan SH, Hsieh YP, Lin LY, Chen JC, Lan SJ. Massage therapy for weight gain in preterm neonates: a systematic review and meta-analysis of randomized controlled trials. *Complement Ther Clin Pract.* 2020;39(500):101168. doi:10.1016/j.ctcp.2020.101168