

(REVIEW ARTICLE)



The Effectiveness of Hammock Positioning in Regulating Behavioral Patterns in Preterm: A Systematic Review

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Abstract

Background- Preterm newborns benefit from supportive developmental techniques such as hammock placement, which give them a sense of being in the womb that promotes calm, relaxation, and deep restful sleep.

Objective- To identify and synthesize the available evidence on the effect of hammock positioning in regulating behavioral patterns and sleep in preterm infants admitted to the NICU

Data Sources: We searched the Google Scholar, Pubmed, and Scopus databases for reports of primary research studies using a three-step strategy. We also searched for and reviewed the reference lists of retrieved articles.

Methods: We included data from randomized controlled trials, Quasi-experimental and Comparative study measuring the effects of hammock positioning on physiological stress outcomes, defined as oxygen saturation, body temperature, heart rate and respiratory rate, Sleep-wakefulness, and behavioral pattern. The PRISMA model was used to conduct data extraction. We performed a narrative synthesis of all studies when data were available from multiple studies.

Results: Five studies were eligible for inclusion. Infants who received hammock positioning has shown to have a higher mean heart rate, oxygen saturation and temperature, Sleep-wakefulness and improved behavioral patterns.

Conclusions: Current evidence suggests that hammock positioning in the neonatal intensive care unit setting is a safe method that may significantly affect some of the physiological parameters of stress, improved behavioral patterns and Sleep-wakefulness in preterm infants. However, due to clinical heterogeneity, further studies are needed to assess the effects of physiological stress in the neonatal intensive care unit on the development of preterm infants.

Keywords: Hammock Positioning; Sleep-wakefulness; Behavioral Pattern; Neonatal Intensive Care; Preterm; Infant

1. Introduction

Preterm are those born at or before 37 weeks of gestation. The number of preterm infants globally is thought to be around 15 million per year, and it is rising every year.¹ Due to their undeveloped organ systems, premature children must remain in the neonatal intensive care unit (NICU), where they can get the specialized postpartum care and, in some cases, protracted hospitalization is required.^{2,3} Despite being treated and cared for in the NICU, preterm newborns are inevitably exposed to a variety of stimuli, stressful surroundings, or painful interventions during the lengthy hospital stay, which causes clinical instability in this population. Body positioning, a simple technique that has a non-invasive therapeutic effect on participants, is a crucial component of developmental supportive care (DSC).^{4,5}

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Heidelise Als' synchronous active hypothesis of neonatal neurobehavioral organization, first put forth in 1982, defines how infants' behavior is organized and how it develops in relation to how well their neurobehavioral subsystems and interactions with the environment coexist. Included in the subsystems are the autonomous system, the behavioral status, attention-interaction, and motor system all elements of the regulatory system have a sequential and maturation that is interdependent.^{6,7}

Over the past 15 years, initiatives to humanize care within the NICU have emphasized the importance of this type of strategy, articulating the technical quality of care, welcoming technologies, support for patients and family members. These initiatives have been presented in several fields, but have been implemented a priori in care for childbirth and newborns. Among these actions, humanized birth, the kangaroo method, water immersion, and music therapy stand out.⁸

Another straightforward new therapy for preterm neonates who need to stay in NICU for an extended period of time is hammock positioning.⁹ Neonates are placed in a cloth cotton blanket known as a "hammock" that is secured by ropes that are threaded through the circular apertures of the incubator and knotted above it. By maintaining the newborn in a flexed position, hammock positioning mimics the intrauterine position.¹⁰ It aims to support the confinement, vestibular stimulation, sensory integration, and behavioural organisation of premature infants. The sleep-wake cycle is thus positively impacted by this position, which also lowers energy expenditure and noxious sensory stimulation.¹⁰

2. Materials and Methods

2.1. Topic selection

Numerous articles demonstrate how hammock positioning helps to improve the behavioral organization and physiological stability of premature newborns. It is imperative that newborn critical care units incorporate supportive developmental measures into their care regimens. As a result, it is essential to compile the articles to understand the effects of hammock positioning.

2.2. Inclusion and exclusion criteria

2.2.1. Inclusion criteria

- English papers.
- Were designed as randomized controlled clinical trials, Quasi-experimental and Comparative study.
- Studies included a sample of preterm infants.
- The intervention consisted of Hammock positioning.
- The study was conducted in the NICU at the time of research.

2.2.2. Exclusion criteria-

- Duplicate citation.
- Failure to report the necessary data for meta-analysis.
- Infants with brain abnormalities or disability.
- Articles that included maternal mental health.
- Articles not in English.
- Review articles, letters, conference abstracts, case reports, protocols, notes, and editorials.
- Free full-text not available.
- There were other different interventions, besides position intervention for preterm infants.

2.2.3. Search strategy

The following keywords were applied for electronic search, (Hammock positioning) AND (Preterm) AND (Infant) (Randomized Clinical Trials) AND (Quasi-experimental) AND (Comparative study) AND (Behavioral Patterns) AND (neonatal intensive care unit or NICU or newborn intensive care or preterm or premature) AND (Sleep-wakeful status) AND (Positioning or therapeutic positioning or infant positioning)"; Both singularly and together, these keywords were employed. Additionally, reference portions of relevant trials were examined manually to identify additional trials overlooked by electronic searches.

2.2.4. Data sources

In this systematic review the databases of Medline, PubMed, Scopus, Cochrane, NIH and google scholar were searched for published articles in English language.

2.2.5. Study selection

All the searched records were downloaded from the resource. After eliminating duplicates, we independently reviewed all titles and removed articles that are irrelevant to the topic, then we removed some articles according to the inclusion and exclusion criteria by reading abstracts. Finally, the full text of the remaining articles was examined to determine whether articles were included in the final study.

2.2.6. Data extraction

We created tables to record the results of extraction. We read the full text and extracted the characteristics of the included studies, including author, publication year, study type, sample size, inclusion criteria, intervention, main outcomes, findings, and Research design.

2.2.7. Quality appraisal

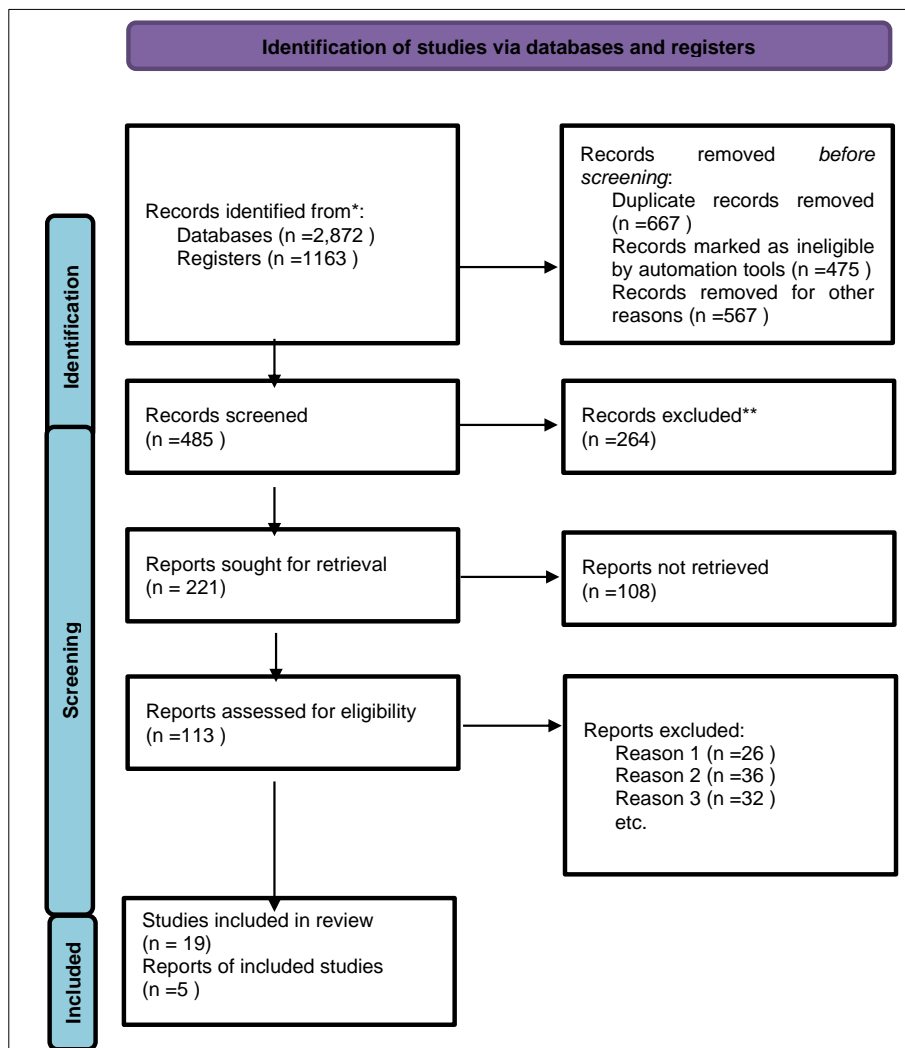


Figure 1 The analysis was reported using the PRISMA checklist.

3. Results

In total, 2,872 articles were searched from the databases, and 1,163 additional articles which were relevant to the study were found in the lists. After removing duplicates, 485 articles were screened by title. Of the 221 articles eligible for the abstract assessed, only 113 met our study theme. After reading the full text of these articles, we excluded 94 articles that did not meet the inclusion criteria. 19 studies were included in the review, Ultimately, 5 articles were included in our study. Due to the significant heterogeneity of the evidence base, we could not conduct a quantitative synthesis (meta-analysis) of the identified studies; therefore, we finally focused on a qualitative synthesis.

Table 1 Characteristics of the included studies

Authors and published year	Study type and sample size	Inclusion criteria	Type of intervention	Main outcomes	Findings
2003 Keller et.al, ¹¹	Comparative study between 2 groups, with 20 infants	weight (difference less than 100 g), gestational age (difference less than eight days), and postnatal age (difference less than eight days)	For ten days in a row, the newborns in the supine hammock group spent three hours per day in a hammock. For the same amount of time, the newborns in the comparative group were nested in the prone position.	Neuromuscular maturity (based on three neurological parameters adopted from the Ballard examination), heart rate, respiratory rate, and weight gain (g/cal)	Infants with VLBW who were born preterm and kept in a hammock may benefit from this arrangement in terms of their neuromuscular development and autonomic stability.
2016 Kassandra Silva Falcão Costa, ¹²	quasi-experimental study, a cross-over trial with 30 preterm newborns	born at gestational age of 32 to 35 weeks, weighing 1400 g – 1800 g, after the first 72 hours of life	nesting and hammock	stress/pain level, posture and organizational status of the preterm infant.	Compared to nesting, preterm infants in the hammock position exhibited reduced stress, exhibited better behavioural organisation, and were more advantageous for getting critical care.
2019-Costa et al ¹³	A randomized controlled cross-over study with 20 subjects.	32–37weeks, 1300–2000g	Group 1: lying in an O-shaped nest after changing the diaper, then lying in the hammock after the next diaper change. Group 2: interventions were in reverse order.	Sleep-wake state; HR; SpO ₂ .	The physiological variables and the sleep-wake state in the hammock group and nest group were not significantly different, but the hammock promoted sleep after a stressful stimulus (diaper change).
2018 Jesus et al ¹⁴	Quasi-experimental with 28 subject	28 to 36 week, <1500 gm	One group Infants were positioned for one hour in hammocks in incubator. Fabric was placed between the cervical and scapular region of	Pain, HR, RR, SpO ₂ and behavioral status	Hammock positioning (Hp) was safe for the participants, vital signs stayed within healthy limits and the intervention did not cause pain. During Hp, most of the newborns drifted into a sleep HR and RR

			the infants' back to prevent hyperflexion or hyperextension of the head		decreased significantly from the second to 60th minute of Hp. No significant difference in pain.
2022 Nagwa Ibrahim Hamad etal ¹⁵	quasi-experimental, pre-post-tests, research design, 90 preterm neonates	newborns without artificial ventilation or those with neurological, cardiac, or pulmonary conditions like intraventricular hemorrhage	Kangaroo mother care and HP were performed in the morning shift for one hour, for 3 consecutive days. After applying KMC or HP, the preterm neonates were placed in the incubator as the routine NICU care	physiological stability and behavioural organization;	Both kangaroo mother care and hammock positioning were proved to be promising in enhancing the preterm neonates' physiological stability and behavioural organization; however, kangaroo care revealed a superior effect over hammock positioning.

4. Conclusion

Embark on a journey into neonatal care, where groundbreaking research unveils the transformative potential of hammock positioning for preterm infants. Recent studies reveal that beyond mere comfort, hammock positioning triggers profound physiological benefits, stabilizing vital signs, regulating sleep patterns, better behavioural organization and even improving respiratory function, crucial for preemies' well-being. However, amidst the promise lies a challenge, clinical heterogeneity across studies complicates drawing definitive conclusions. Moreover, the long-term effects of this intervention remain a mystery. Yet, in this realm, hammock positioning isn't just a fad; it's a paradigm shift, ushering in a future where preterm infants thrive through innovation and compassion, marking the hammock not just as a cradle but a catalyst for change in neonatal care.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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