


## INTERVENÇÃO FISIOTERAPÊUTICA POR MEIO DE ESTIMULAÇÃO PRECOCE EM RECÉM-NASCIDO PRÉ-TERMO: REVISÃO DE LITERATURA

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### RESUMO

**Introdução:** O Programa de Estimulação Precoce é um serviço clínico-terapêutico para crianças de 0 a 3 anos, que promove, experiências sensório-motoras essenciais para a melhoria do desenvolvimento neuropsicomotor. A fisioterapia em recém-nascidos inclui estimular o desenvolvimento motor com técnicas de facilitação neuromuscular, exercícios de mobilização e posicionamento terapêutico, além de prevenir complicações musculoesqueléticas, como contraturas e displasia. **Objetivo:** Analisar a intervenção fisioterapêutica por meio de estimulação precoce em recém-nascidos pré-termo. **Metodologia:** Foi realizada uma revisão sistemática, por meio das bases de dados eletrônicas como BVS, *Lilacs*, *SciELO*, PubMed, *PEDro* e Portal CAPES. **Considerações Finais:** A intervenção fisioterapêutica precoce apresenta resultados positivos no desenvolvimento motor de recém-nascidos pré-termo, sendo uma ferramenta indispensável para reduzir riscos e melhorar a qualidade de vida desde os primeiros dias de vida.

**Palavras-chave:** Estimulação Precoce. Fisioterapia. Pré-termo. Desenvolvimento Motor. Prematuridade. Desenvolvimento Infantil.

## PHYSIOTHERAPEUTIC INTERVENTION THROUGH EARLY STIMULATION IN PRETERM NEWBORN INFANTS: LITERATURE REVIEW

### ABSTRACT

**Introduction:** The Early Stimulation Program is a clinical-therapeutic service for children aged 0 to 3 years, aimed at promoting essential sensory-motor experiences to enhance neuropsychomotor development. Physiotherapy for newborns includes stimulating motor development through neuromuscular facilitation techniques, mobilization exercises, and therapeutic positioning, as well as preventing musculoskeletal complications such as contractures and dysplasia. **Objective:** To analyze physiotherapeutic intervention through early stimulation in preterm newborns. **Methodology:** A systematic review was conducted using electronic databases such as BVS, LILACS, SciELO, PubMed, PEDro, and the CAPES Portal. **Final Considerations:** Early physiotherapeutic intervention shows positive results in the motor development of preterm newborns, proving to be an essential tool to reduce risks and improve quality of life from the very first days of life.

**Keywords:** Early Stimulation. Physiotherapy. Preterm Infants. Motor Development. Prematurity. Infant Development.



## INTERVENCIÓN FISIOTERAPÉUTICA MEDIANTE ESTIMULACIÓN PRECOZ EN RECIÉN NACIDOS PREMATUROS: REVISIÓN BIBLIOGRÁFICA

### RESUMEN

**Introducción:** El Programa de Estimulación Temprana es un servicio clínico-terapéutico para niños de 0 a 3 años, que promueve experiencias sensoriomotoras esenciales para mejorar el desarrollo neuropsicomotor. La fisioterapia en el recién nacido incluye la estimulación del desarrollo motor con técnicas de facilitación neuromuscular, ejercicios de movilización y posicionamiento terapéutico, así como la prevención de complicaciones musculoesqueléticas como contracturas y displasias. **Objetivo:** Analizar la intervención fisioterapéutica mediante estimulación precoz en recién nacidos prematuros. **Metodología:** Se realizó una revisión sistemática utilizando bases de datos electrónicas como BVS, Lilacs, SciELO, PubMed, PEDro y Portal CAPES. **Consideraciones finales:** La intervención fisioterapéutica precoz muestra resultados positivos en el desarrollo motor de los recién nacidos pretérmino y es una herramienta indispensable para reducir riesgos y mejorar la calidad de vida desde los primeros días de vida.

**Palabras clave:** Estimulación precoz. Fisioterapia. Pretérmino. Desarrollo Motor. Prematuridad. Desarrollo Infantil.

## 1 INTRODUCTION

Prematurity is classified as birth before 37 weeks of gestation, which leads to clinical complications that require a complex adaptation of the newborn (NB) to the extrauterine environment, including instability of physiological, neurological and motor functions. Approximately 340 thousand premature births occur annually, representing 12% of the total number of births. It is estimated that about 15 million babies are born prematurely each year (Ministry of Health, 2023; Ferreira et al., 2024).

The prevalence of complications is notorious and grows mainly in developing countries, since the complexity of its etiology involves numerous factors such as maternal age, socioeconomic status, genetic factors, previous cesarean section, infections, preeclampsia, and use of psychoactive substances during pregnancy (Ministry of Health, 2023).

Therefore, this condition profoundly affects the development of babies, generating a series of complications that compromise both their physical health and their emotional and cognitive well-being. In this way, these babies become vulnerable to challenges related to nutrition and adequate motor development (Araújo et al., 2024; Ferreira et al., 2024).

Physiotherapy, through early stimulation, plays a fundamental role in helping the motor development of newborns, favoring the improvement of posture, balance, muscle tone and strength. In addition to identifying and correcting possible changes, she also offers guidance for parents and contributes to the therapeutic environment.

Therefore, its approach aims to promote more appropriate postures, prevent inappropriate movement patterns, and minimize developmental delays later in childhood. The aim is to provide better functionality in daily activities, facing challenges and positively impacting the quality of life of the NB (Gonçalves et al., 2024; Saints; dos Santos; dos Anjos, 2023).

In summary, early stimulation in physical therapy intervention has positive results in the adequacy of the NB's development, and therefore, it is believed that through this physical therapy technique, motor development takes the expected time (Ferreira et al., 2024).

## 2 OBJECTIVE

To describe physical therapy intervention through early stimulation in newborns.

## 3 METHODOLOGY

This is a descriptive, analytical and systematized study, a literature review was carried out, with a bibliographic survey in the following scientific databases: Virtual Health

Library (VHL), Latin American and Caribbean Literature in Health Sciences (Lilacs), Scientific Electronic Library Online. The search was guided by: Health Science (DeC's) descriptors: "Early Stimulation", "Physiotherapy", "Pre Term", "Motor Development", "Prematurity", "Child Development".

Recent studies published between 2021 and 2024 were selected, totaling 19 articles, 8 of which were systematic reviews and 11 clinical trials were scientific databases.

The inclusion criteria were case studies, literature searches and systematic reviews, published in full texts in Portuguese and English, which evaluated the efficacy of physical therapy intervention through early stimulation in preterm infants.

And opinion articles, single case studies, and editorials were excluded.

Considering the methodological nature of the study, which is exclusively bibliographic, it was not necessary to submit it to the Research Ethics Committee (REC), according to the guidelines of Resolution No. 510/2016 of the National Health Council.

## 4 RESULTS

Seven articles were used, all of the clinical trial type, which met the defined inclusion criteria, which presented data on the efficacy of physical therapy intervention through early stimulation in preterm infants.

Most studies have compared the efficacy of physical therapy intervention through early stimulation in preterm infants.

**Table 1**

*Presents the main methodological characteristics of the selected articles.*

Author/ year	Methodology	Intervention	Findings
Cardoso <i>et al.</i> (2021).	Study: clinical trial; Sample: 215 preterm infants; Gender: both sexes; 109 sex ♀ ; 106 sex ♂ Age: 0 to 18 months.	Stimulation on the floor with colorful, textured, postural objects and encouragement of movement with support. Protocol: 70 days of consultations, 1x/week; 30 min.	In the first evaluation, 76.7% had normal motor performance. Most were low-risk (57.6%) and 13% were preterm, of which 53.5% were high-risk. There was a significant association between risk and gestational age ( $p < 0.001$ ) and between risk and motor performance ( $p = 0.001$ ).
P; Bombara (2021).	Study: case studies; Sample: 7 preterm; Gender: both sexes; 4 sexes ♀; 2 sexes ♂. Age: 0 to 4 months.	Tactile-kinesthetic stimulation in preterm newborns. Protocol: during the stay in the NICU, 1x/per day; 10 min.	Increase in RR ( $p = 0.020$ ), T <sup>o</sup> ( $p = 0.042$ ) and behavioral status ( $p = 0.024$ ).

Almeida; Pianessola; Gerzson (2022).	Study: clinical trial; Sample: 7 preterm; Gender: both sexes; 4 sexes ♀; 3 sexes ♂ . Age: 01 to 12 months.	Motor, visual and cognitive stimulation with toys, postural control, family interaction and problem- solving activities. Protocol: 120 days of consultations, 2x/week; 50 min.	Significant improvement in posture and movement (85%), object exploration (71%) and function recognition (57%), all with ( $p < 0.05$ ). Less progress was in tasks under command (57%, $p > 0.05$ ).
Ochandorna- acha <i>et al.</i> (2022).	Study: clinical trial; Sample: 48 preterm infants; Gender: both sexes; Age: 0 to 8 months.	Tactile-kinesthetic stimulation with a motor- postural focus, guidance to parents and home program (48 babies: 24 interventions/ 24 controls). Protocol: 60 days of care, 2x/week; 2hrs.	There were no significant differences between the groups in motor scores and overall development at 2 and 8 months of corrected age ( $p >$ 0.05).
Rigoni <i>et al.</i> (2022).	Study: clinical trial; Sample: 6 preterm infants; Gender: both sexes; Age: 0 to 3 months.	Tactile stimulation with gentle glides 10 min. each region of the body, followed by kinesthetic stimulation with 5 rep. of passive flexion and extension movements in the joints.	Increase in scores in all domains tested ( $p \leq 0.05$ ).
Apaydin <i>et al.</i> (2023).	Study: clinical trial; Sample: 38 preterm infants; Gender: both sexes; Age: 0 to 3 months.	G1: In the 10-week SAFE approach, stimulation in cognition, speech and language, motor development, sensory processing. G2: In the <i>NDT group</i> after the 10 weeks of the program at home, cognitive, speech and language stimulation, motor development and sensory processing were performed.	The <i>SAFE</i> approach showed significant improvements in cognitive ( $p < 0.05$ ) and motor language ( $p < 0.05$ ) scores, while the <i>NDT group</i> did not show relevant advances in these aspects.
Altunalan <i>et al.</i> (2023).	Study: clinical trial; Sample: 57 preterm infants; Gender: both sexes Age: 0 to 6 months.	G1: <i>Explorer Baby</i> <i>Program</i> with motor, cognitive, linguistic and social stimulation. G2: <i>NDT Program</i> focused on handling techniques in daily care to promote symmetry and body control.	<i>Explorer Baby</i> had improvements in cognitive ( $p = 0.83$ ) and exploratory language ( $p = 0.65$ ) skills, while <i>NDT</i> showed improvement in dysfunctional parent-child interaction ( $p = 2.66$ ).

Legend: G1: Group 1; G2: Group 2; RR: Respiratory Rate; T°: Temperature; Explorer Baby Program: Early intervention aimed at the development of babies, especially in the first months of life; NDT Program (Neuroevolutionary Treatment): Improve the motor and functional development of babies through postural strategies and proper handling in daily life; SAFE Intervention (Sensory Strategies, Attachment, Family Support, and Environment): Promote the baby's overall development through sensory strategies, motor training, family participation, and stimuli in the home environment.

Source: Authorship.

## 5 DISCUSSION

Early stimulation has as its main objective to promote healthy and appropriate development for the baby's age group, preventing delays and acting in a rehabilitative and

preventive way. The ideal window for intervention comprises the period from birth to three years of age, a phase known as very early childhood, when the brain has its greatest neuroplasticity (Almohalha, Cesário, 2023; Saints; dos Santos; dos Anjos, 2023).

Therefore, very early childhood is key, as the baby's experiences and interactions with the environment around him play an indispensable role in brain development. This process is driven by brain plasticity, that is, by the ability of the Central Nervous System (CNS) to adapt to external influences (Raimundo et al., 2021).

Thus, Almeida's study; Pianessola and Gerzson (2022), highlight the influence of early hospitalization on the development of at-risk babies, observing cases of both sexes, with intervention starting at 0 to 3 months of corrected age. The authors demonstrate that prolonged hospitalization, especially in the Neonatal Intensive Care Unit (NICU), negatively interferes with motor and cognitive development, reinforcing the importance of immediate initiation of early stimulation during hospitalization.

As in the study Ferrero and his collaborators (2022), who performed early intervention on the 2nd day of the NB's life and continued for 4 consecutive weeks.

The study by Almohalha and Cesário (2023), used early stimulation strategies in babies 0 to 6 months of age lasting 10 weeks.

Kanagarabai et al. (2022), on the other hand, indicate 10 to 15-minute consultations, performed 2 times a day, for approximately 15 days. On the other hand, Ochandorena-acha et al. (2022), indicate protocols of 15 to 20 minutes, 2 times a day for 5 days a week, for 10 weeks.

It is recommended that early stimulation be carried out continuously and regularly, with a minimum frequency of 2 to 3 weekly appointments, adapted according to the clinical condition and responsiveness of the baby. This practice has demonstrated significant benefits, such as greater clinical stability, reduced length of hospital stay, and advances in the neurodevelopment of hospitalized neonates (Almeida; Pianessola; Gerzson, 2022; Saints; Saints; Anjos, 2023).

Ferrero et al. (2022) conducted a randomized controlled trial, consisting of preterm newborns, dividing them into G1: no interventions, G2: in which they received passive mobilizations 2 times a day, G3: passive mobilizations once a day. The following early stimulation protocol was performed: passive mobilization consisting of flexion-extension of the extremities (upper limbs and lower limbs) and evaluation of bone mineralization by ultrasound. As a result, they reported a decrease in bone loss in G2 compared to the other groups ( $p=0.03$ ), suggesting that passive mobilization performed 2 times is more effective to prevent demineralization.

Following this reasoning, Liu et al. (2021), conducted an investigation in preterm infants who were allocated into two groups: CG and IG. The CG participated exclusively in motor activities, including exercises for cervical support, rolling, sedation with and without support, stimulation for crawling and for gait with support. In turn, the IG received, in addition to motor activities, additional stimuli involving visual and auditory stimulation, training of oral motor functions, support for respiratory functions and exercises aimed at neurological development. The results showed that the IG obtained significantly higher scores in the first 3 weeks in visual and auditory, oral motor and respiratory functions, as well as in neurological development, compared to the CG ( $p < 0.05$ ).

However, Rigoni et al. (2022) evaluated preterm newborns before and after the implementation of an early stimulation program that consisted exclusively of motor stimuli. This program included handling and exploration of postures, ranging from the supine position: dorsal, ventral and lateral to the acquisition of gait. Through anamnesis and application of the PEDI (Pediatric Evaluation of Disability Inventory) scale, the authors found a significant increase in the scores evaluated in all domains evaluated by the scale after the motor intervention ( $p < 0.05$ ).

From another perspective, Israel et al. (2021), argue that, although the preterm newborns included in their study received sensory, tactile, proprioceptive, and motor stimuli, approximately half of them still showed signs of hypotonia during the physiotherapy reassessment. These findings reinforce the need to start stimulation early to prevent possible future complications, in addition, there is a need for a treatment based on repetition and frequency to stimulate Neuropsychomotor Development (NPMD).

Complementing this thought, the work of Almohalha and Cesário (2023), emphasizes the strategies used by physiotherapists in early stimulation. The therapeutic plan was elaborated based on anamnesis and constructed in an individualized way and focused on the specific needs of each baby, using playful materials with visual contrasts, lights, brightness, textures and sounds, as well as psychomotor equipment such as cones, ladders, tatami, positioning rollers, balls and swings. Also included were puppets and games focused on tactile, motor, and proprioceptive stimulation, all adapted for infants with monthly home visits by physiotherapists who assessed the infants' progress and adjusted interventions as needed.

According to the authors of the intervention, the treatment was carried out with body recognition stimuli (skin to skin), midline stimulation and postural transitions such as changes in decubitus, integrating sensory and motor approaches that favor the baby's global



development, highlighting the importance of the home environment and the active participation of the family as essential factors for child evolution (Almohalha, Cesário, 2023).

Corroborating the study above, Kanagasabai et al. (2022), describe several combinations of sensory stimuli that can be applied in the physiotherapeutic and home context to enhance the motor and functional recovery of preterm newborns. Auditory, tactile, visual and vestibular stimuli stand out, which can be used alone or in combination with motor stimulation, contributing to the improvement of sensorimotor function.

At the same time, Raimundo et al. (2021) and Cardoso et al. (2021), preach that family participation plays a central role in early stimulation. Both studies demonstrate that family-centered approaches are more effective for child development, especially when parents are instructed to perform stimulation at home. Interventions carried out through home visits or guidance during childcare have been shown to be effective in involving parents or guardians in simple activities, such as conversations, reading, and motor games, all adapted to the child's corrected age.

However, Ochandorena-Acha and authors (2022), report uniformly negative results ( $p>0.05$ ) in relation to early stimulation and family participation, in which they found no significant effects of early stimulation, a result attributed to low parental adherence or inadequate intensity of interventions. The authors above used a physical therapy program with positioning activities to stimulate postural and motor control, through functional positioning and stimulation. Parents received a diary to record the practices and were followed up by up to 4 home visits by physiotherapists throughout the period.

While the above study points to the ineffectiveness of early stimulation and family interaction, Apaydin et al. (2023), present a promising alternative by applying the SAFE (Sensory Adapted Family Engagement) approach, focusing on structured environment, family support, and sensory interaction, demonstrating positive effects on cognition and affective bonding. This finding raises a relevant discussion about the dose-response of therapies and the fundamental role of family engagement in early stimulation programs.

Thus, the authors also describe that in a comparative study between the SAFE and NDT programs, it was found that only the group submitted to SAFE showed significant gains ( $p<0.05$ ) in the areas of cognition, language and motor development, when compared to the NDT group, highlighting the effectiveness of protocols that involve multiple stimuli and greater family engagement. In the SAFE program, the physiotherapists applied behaviors centered on four main pillars: sensory stimulation (visual, tactile, auditory and vestibular), motor exercises based on functional positions, environmental enrichment with materials appropriate to the stage of development and active participation of caregivers in the therapeutic process.



These strategies have been shown to be effective in promoting the global motor development of preterm infants, reinforcing the importance of early stimulation with a multisensory focus and family collaboration (Apaydin et al., 2023).

In summary, studies show that physical therapy treatment, through early stimulation, plays a fundamental role in the motor development of preterm newborns. Through individualized exercises, based on careful evaluations and analysis of the specific needs of each patient, early stimulation contributes to improving motor coordination, muscle tone, posture and functionality. In addition, continuous support for family members strengthens the therapeutic bond and enhances the results obtained, integrating rehabilitation into the daily routine. In this way, early stimulation not only promotes motor gains, but also favors cognitive, emotional, and social aspects, contributing significantly to quality of life (Altunalan et al., 2023).

## 6 FINAL CONSIDERATIONS

After the bibliographic survey carried out in this study, it is concluded that the physical therapy intervention, through early stimulation, presents positive results in the motor development of preterm newborns, being an indispensable tool to reduce risks and improve the quality of life from the first days of life, reducing future risks and contributing to the adequacy of motor development.

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