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Literature review

Early multiprofessional stimulation in children with impaired neuropsychomotor development: integrative review

Estimulação precoce multiprofissional em crianças com defasagem no desenvolvimento neuropsicomotor: revisão integrativa

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RESUMO | INTRODUÇÃO: A prematuridade é reconhecida como fator de risco para distúrbios do desenvolvimento motor, uma vez que promove interrupção na progressão do desenvolvimento das estruturas cerebrais. **OBJETIVO:** Consiste em analisar o processo de estimulação precoce em crianças com defasagem no desenvolvimento neuropsicomotor de até 2 anos de idade corrigida, através do olhar multidisciplinar. **METODOLOGIA:** Uma revisão integrativa desenvolvida no período de março a maio de 2018, utilizando as bases de dados LILACS, PUBMED, SCIELO e PEDro. Critérios para inclusão: artigo disponível na íntegra, publicados entre 2009 a 2018, em idioma inglês, português ou espanhol, abordando intervenção precoce, deficiência do desenvolvimento, desenvolvimento infantil e destreza motora, como temática central. Artigos que não atendessem aos critérios pré-definidos e não fossem artigos originais foram excluídos. **RESULTADOS:** Encontrados 45 artigos com descritores e recorte temporal, selecionados 28 para leitura completa, destes 12 foram eliminados, por não atender aos critérios de inclusão e exclusão, tendo para elegibilidade do estudo 16 artigos. Dentre alguns estudos observou-se que o acolhimento e o cuidado a essas crianças e a suas famílias, além da estimulação são essenciais para maior ganho funcional possível nos primeiros anos de vida. **CONCLUSÃO:** No âmbito da prematuridade à interdisciplinaridade, considerando que o atraso nessas crianças, são decorrentes não só da falta de estímulos adequados, mas pelo não desenvolvimento de estruturas neurológicas, a estimulação precoce oferece novas experiências, promovendo melhoras significativas e garantindo-lhes uma melhor qualidade de vida.

PALAVRAS-CHAVE: Estimulação precoce. Desenvolvimento. Fisioterapia. Prematuridade. Reabilitação.

ABSTRACT | INTRODUCTION: Prematurity is recognized as a risk factor for motor development disorders, as it promotes interruption in the progression of the development of brain structures. **OBJECTIVE:** It consists of analyzing the process of early stimulation in children with impaired neuropsychomotor development up to 2 years of age corrected, through a multidisciplinary approach. **METHODOLOGY:** An integrative review developed from March to May 2018, using the databases LILACS, PUBMED, SCIELO and PEDro. Criteria for inclusion: an article available in full, published between 2009 and 2018, in English, Portuguese or Spanish, addressing early intervention, developmental disability, child development and motor skills, as the central theme. Articles that did not meet the pre-defined criteria and were not original articles were excluded. **RESULTS:** 45 articles with descriptors and temporal clipping were selected, 28 of which were selected for complete reading. Of these, 12 were eliminated because they did not meet the inclusion and exclusion criteria, and 16 articles were eligible for the study. Among some studies, it has been observed that the reception and care of these children and their families, besides the stimulation, are essential for greater functional gain in the first years of life. **CONCLUSION:** In the context of the prematurity to interdisciplinarity, considering the delay in these children are due not only to the lack of adequate stimuli, but to the non-development of neurological structures, early stimulation offers new experiences, promoting significant improvements and ensuring a better quality of life.

KEYWORDS: Early stimulation. Development. Physiotherapy. Prematurity. Reabilitation.

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Introduction

Prematurity is recognized as a risk factor for motor development disorders (MD), as it promotes interruption in the progression of the development of brain structures, and may affect important events, such as synaptogenesis and myelination in this region. In addition, the presence of comorbidities such as hypoxia, bronchopulmonary dysplasia and the use of some long-term care methods, such as oxygen therapy and invasive mechanical ventilation, may favor neurological injuries, causing transient or long-lasting alterations, ranging from a slight delay in acquisition of the motor stages to the development of cerebral palsy[1].

The Guidelines for Early Stimulation of the Ministry of Health[2] are a multiprofessional clinical follow-up and therapeutic intervention program with high-risk infants and young children affected by organic pathologies, seeking the best possible development, through minimizing sequelae to neuropsychomotor development (NPMD) delays, as well as effects on the acquisition of language, socialization and subjective structuring, and can contribute to the structuring and understanding of the mother / baby bond and the foster family.

Child health care during the first years of life through the monitoring of child development is essential for health promotion, disease prevention and identification of NPMD delays. This monitoring, which must be multiprofessional and inserts the physiotherapist, ensures greater ease of access, earlier, through assessment, differential diagnosis, treatment and rehabilitation, including Early Stimulation (ES), which require specialized care[3].

This care must be integral and articulated between the basic and specialized health care services of the Health Care Network of the Unified Health System (SUS), where it will enable greater functionality for children with disabilities, allowing them a future with more autonomy and social inclusion[3].

ES within physiotherapy is based on neuromuscular behavior and also on the principles of neural plasticity, determining periods of neonatal development as highly receptive to interventions with motor sensory exercises. Within the stimulation, the physiotherapist conducts an initial and continuous assessment of the child, developing goals and objectives, using techniques appropriate to their needs[4].

Knowing the consequences of premature birth and the benefits of early intervention, the present study aimed to analyze the ES process in children with NPMD deficits up to 2 years of age corrected through a multidisciplinary approach.

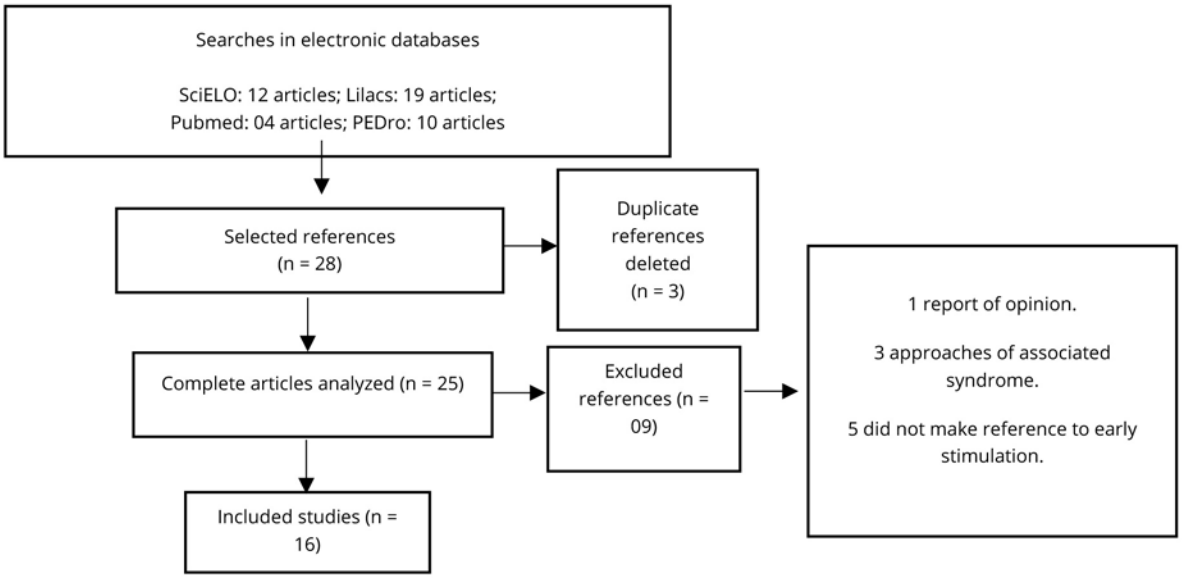
Methodology

The present study is a review of the integrative type, developed from March to May 2018. The bibliographic survey was carried out through the databases LILACS, PUBMED, SCIELO and PEDro. The "OR" and "AND" operators were used to associate the following descriptors: estimulação precoce, desenvolvimento, fisioterapia, prematuridade e reabilitação and their respective in English: early stimulation, development, physiotherapy, prematurity and rehabilitation.

The inclusion criteria applied were articles published in full text available, published between 2009 and 2018, in English, Portuguese and Spanish. With the central themes: early intervention, developmental disability, child development, and motor skills. The articles that did not meet the pre-defined criteria and were not original articles were excluded from the present review and / or that presented some associated syndrome or that was an opinion report.

Flowchart 1 details the methodological procedures for the selection of articles for the present review.

Flowchart 1. Flowchart of the selection of the articles of the PD process in children with a delay in NPMD-2018



Source: The authors (2019).

Results

It were found 45 articles with the descriptors and temporal cut, of which, after reading the title and abstract, 28 were selected to read the full text. After reading these, it was detected that 03 articles had duplicate references and 09 did not meet the inclusion criteria of the present study, 12 articles were eliminated. There were 16 for study eligibility.

The articles included have a multiprofessional approach to NPMD interventions and stimulation, as shown in Table 1, below.

Chart 1. Descriptive analysis of studies of the PD process in children with lag in DNPM-2018 (to be continued)

AUTHOR / YEAR	KIND OF STUDY	INTERVENTION	MAIN RESULTS
Moura et al., 2009[5]	Analysis of medical records	Analysis of birth weight, total days at high and medium risk, tonus, weight / gain, time of Speech Therapy and hospital discharge.	RN1 obtained greater weight gain than RN2 and RN3. RN2 and RN3 presented excellent evolutions in relation to the initial suction and the suction in the period of hospital discharge.
Nair et al., 2009[6]	Controlled and randomized trial	GC: post-natal routine check-up. GI: early stimulation in the home-based CBC model). Evaluated by MDI and PDI	Intervention group had statistically higher scores for MDI and PDI at 1-2 years of age.
Silva et al., 2009[7]	Pilot study of the before and after type	Aquatic stimulation program. Evaluated by Denver II and AIMS.	Before: Denver II test scores range from 2-6 in all domains; and in the AIMS test of 3-6. After: results vary respectively, from 4-6 and 3-7.
Raniero et al., 2010[8]	Longitudinal study	Application of TIMP in GT and GPT	Total TIMP score in both groups did not differ. GPT motor acquisition showed an increase in performance between 1 month (52%), when compared between 3-4 month (12%).
Verson et al., 2010[9]	Serial case report	Non-nutritive suction in the empty breast. Average of 5 daily applications.	Mean of 22 days with gastric tube use and hospitalization of 30 days. Average 23g of weight daily. At hospital discharge there was exclusively breastfeeding.
Blauw-Hospers et al., 2011[10]	Randomized	Stimulation with COPCA or TIP, to analyze neurological capacity through AIMS, PEDI and MDI	Neurological condition at 3, 6 and 18 months of HF at COPCA and TIP were similar. They did not differ in the neurological classification or in the AIMS and MDI scores at 6 and 18 months. In the area of PEDI mobility at 18 months, they performed better than the TIP, requiring less assistance. They did not differ in the other scores of the PEDI.
Dirks et al., 2011[11]	Quantitative video analysis	COPCA or TIP stimulation. Evaluation through filming after 4-6 months of CA and a standard protocol.	COPCA and TIP differed substantially, with TIP sessions being more time-consuming in facilitation techniques than in COPCA. During COPCA, more time was spent on coaching and family education.
Medeiros; Bernardi, 2011[12]	Data collect	Group A: diet per bottle. Group B: diet per cup. Follow-up speech therapist organized in 4 phases.	There was no difference between them for either phase. There was a tendency for the difference in phase 3, in the number of days for glass. The difference may be related to the assessment of corrected gestational age (CGA)
Porto et al., 2011[13]	Transversal, clinical and experimental	Evaluation of the applicability of PEATE TB and RAEE in 200 hz in infants terms and preterm terms	No difference between ears R and L. Comparing the GT and GPT groups had no differences, except for the absolute measure of RAEE relative, where GT presented a shorter time during execution.
Fucile et al., 2012[14]	Randomized	Groups: O, T / K, combined O + T / K Interventions of 30 minutes, with clinically stable children, before feeding by tube with interval of 3 hours between each session.	"O" presented suction with greater amplitudes and controls. Suction and swallowing did not differ between groups. Interventions led to fewer swallows sustained by respiratory pauses compared to control. The T / K and (O + T / K) groups had greater swallowing occurrence than the control groups and "O"
Silveira; Emuno, 2012[15]	Descriptive and transverse	Evaluation by the BSID-III, country responded to CBCL to identify biopsychosocial risks.	BSID-III had lower cognitive performance, due to the higher frequency of emerging risk classifications, followed by expressive language. Psychosocial variables were related to MD, cognitive and linguistic: marital problems, lower parental schooling.
Medeiros et al., 2013[16]	Experimental and double-blind	Water and sucrose group; filmed for 15 minutes, first and last moments without stimulation. And second moment with gustatory stimulation. Being the analysis of	Considering the groups individually together, the hand in the mouth R. remained strong at the end and L. finalized with moderate to strong correlation, according to the behavioral state.
		the behavior of the hand in the mouth R and L, hand suction R and L by three judges.	Hand suction R. in totality and in sucrose presented with strong correlation in the sleepy state, passing to moderate at the end. In the alert state there was a weak correlation in both stimuli, ending with a moderate correlation. Hand suction L. had moderate correlation on alert, ending with weak correlation in sucrose group.
Van Hus et al., 2013[17]	Controlled and randomized trial	Physiotherapeutic intervention with follow-up of 6 months. Evaluated by the AIMS and PDI scales of the Bayley-II scale	AIMS and PDI were effective in evaluating neurobehavioral interventions during MD of infants with 12 months of HF, but the AIMS showed a greater capacity to detect the effects of an intervention.

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Chart 1. Descriptive analysis of studies of the PD process in children with lag in DNPM-2018 (conclusion)

AUTHOR / YEAR	KIND OF STUDY	INTERVENTION	MAIN RESULTS
Costa et al., 2014[18]	Prospective and transverse	Postural alignment, conduct performed by physiotherapist, before and post intervention analysis.	Scapular girdle alignment was subtle in pre and post intervention. Head alignment was positive for nystagmus control, but the physiologic was not effective in visual performance.
Pacheco et al., 2014[19]	Clinical report	Function-focused intervention, and postural control, with guidance to the caregiver. Neurofunctional evaluation, besides the measurement of gross motor function and gross motor function classification system.	After intervention, there was improvement in body reactions, postural control and acquisition of hand and limb movement. The intervention showed improvement in functional performance.
Van Schaik et al., 2014[20]	Qualitative using action research	Play activities, bibliographic survey and observation of the participant through the accompaniment of the group of stimulation of the development.	The results pointed to deficits in the acquisition of functional motor skills when compared to the normal development scale. But in the course of the meetings, there were improvements in the indices of "sitting," "sitting unsupported," "crawling," "getting up," and "standing up."

Legenda: AIMS: Alberta Children's Motor Scale; BSID-III: Bayley-III screening test; CBLC: Child behavior checklist; TIMP: child motor performance test; COPCA: family-centered program; Denver II: screening screening test; MD: motor development; GC: group control; GI: intervention group; GPT: preterm group; GT: group term; CA: corrected age; MID: Bayley Scale Mental Development Index; PEDI: Pediatric Disability Assessment Inventory; PID: Psychomotor development index; TIP: traditional child physiotherapy.

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Discussion

Early Stimulation x Neural Plasticity

According to the ES Guidelines, in the first 3 years of life in children with microcephaly, associated to the congenital Zika virus syndrome, with delay in NPMD due to pathology[2], it has been considered critical for the development of motor, cognitive and sensory abilities. It is in this period that the process of maturation of the central nervous system occurs, being the optimum phase of neuronal plasticity, which depend on the stimulation. The results presented show evidence that ES is primordial in the first years of life for improvement in neural plasticity.

Corroborating with the present study on ES, and other forms of stimulation studies are showing the need for a greater follow-up in the first years of life. It is fundamental because it is associated with neural plasticity, which supports and justifies intervention for infants who present a potential risk of delays in NPMD, especially in the period of zero to 3 years, in which the individual is more susceptible to induced transformations by the external environment[3].

Since the beginning of life, children undergo several modifications to the NPMD, which may present lack of proper initiation of life habits, stimulation is a tool that aims to avoid and / or minimize these losses[21]. The results obtained in the present study show the different applicability of health professionals, not only physiotherapy, the importance of stimulation and the interdisciplinarity of the same, make the work come true.

The acquisition of grasping and reaching skills are important milestones in MD and cognitive up to one year of life. Learning to coordinate and adjust the movements of the upper limbs is an indispensable process for the baby to learn about the environment and reach his goals more accurately[22]. In this study, the children who received ES had a better motor performance by analyzing the scales and consequently better cognitive performance.

Prematurity x Risk Factor

Prematurity is the major risk factor for NPMD delays, but it is not the only one[23-24]. The Denver Development Screening Test II found that the children at highest risk were those with low-income family members and children of mothers who did not perform prenatal care regularly. In addition, it can be seen that the lack of basic sanitation is a powerful influencer of lags in child development.

Early intervention outcomes are best when parents actively participate in the treatment of the child. It was observed that mother-child interaction is responsible for constructing a more adequate environment to stimulate the baby's development[25]. This study corroborates the findings in which a family-based program improved the performance of infants who underwent intervention[10-11].

Standards x Delays

Sleep-wake patterns are still associated with the psychosocial development of premature newborns either directly through effects on brain responsiveness and development, or indirectly overlapping the social stimulation received[26]. The differences between sleep wakefulness and preterm newborns and term imply sleep problems after discharge from maternity. However, preterm infants are prone to neurological damage and may develop intraventricular hemorrhage because they have different state patterns from those of healthy infants.

Stimulation x Equilibrium

The present study presents, for the most part, that post-stimulation changes are positive for children in their infancy. The proposed intervention had a positive effect on the development of the child, through the elaborated treatment plan. Studies have shown that reliable positive changes occurred in the psychomotor items that underwent stimulation. Reliable changes in the stimulated areas corroborate with research that points to the benefits of interventions in MD delays and motor coordination[27].

The majority of the children submitted to activities elaborated within a motor intervention program presented better performance in locomotor and object control activities in relation to the children who were not submitted to an intervention program[28]. With a systematic and sequential approach, it uses techniques and therapeutic resources capable of

stimulating all the domains that interfere in the maturation of the child, in its first years of life since it is known that it is a period in which the development of motor, cognitive, sensorial linguistic and social [3].

Motor Development x Prematurity

Prematurity is one of the main triggers of neonatal complications and risks, leading to development in the newborn. Suction is an important physiological function, which depends on the coordination between swallowing and breathing, so that safe feeding occurs[29]. In this context, as shown in the results of this study, premature newborns need a specialized multiprofessional team, within which the speech therapist is inserted, favoring the transition from oral enteral feeding with safety and efficiency, reducing hospital stay.

The child's MD encompasses several factors about motor, among them, balance, cognition and body schema are highlighted. And the family has a fundamental role in improving MD deficits. To that end, the use of booklets, leaflets and digital media have obtained good results because, besides being simple to do, they can reach a larger number of people with the maximum information[30].

Language x Communication

Welcoming and caring for these children and their families is essential to achieve the greatest possible functional gain in the first years of life, where primordial skills training and neuronal plasticity are strongly present, providing breadth and flexibility for progression of development in the motor, cognitive and language areas[31].

Conclusion

In short, it was possible to observe that multiprofessional treatment besides being factual is indispensable in the treatment of children with delays in NPMD. In the context of prematurity, it is worth highlighting the interdisciplinary work, considering that the delay in these children is due not only to the lack of adequate stimulation, but also to the lack of development of neurological structures.

The ES can offer these children new experiences, as well as provide parents with new experiences in the evolution of NPMD and social when submitted to the proposed therapy, promoting significant improvements and ensuring a better quality of life.

One limitation of this study is the fact that it is an integrative review, so it is not possible to make therapeutic recommendations and to affirm its effectiveness. It is important to point out the importance of new research, given the current literature deficit on the subject. Therefore, systematic reviews with meta-analysis may be carried out in the future, in order to identify the degree of evidence and efficacy of specific techniques for early stimulation.

Author contributions

Vasconcelos LTS was responsible for the study design, literature review and writing of the manuscript. Irineu MEN was responsible for the literature review and writing of the manuscript. Santos JN wrote and proofread the manuscript. Modesto TSFC supervised the research, wrote and approved the final version of the manuscript.

Competing interests

No financial, legal or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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