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Parental intervention improves motor development in infants at risk: case series

Intervenção parental melhora o desenvolvimento motor de lactentes de risco: série de casos

La intervención parental mejora el desarrollo motor de lactantes de riesgo: estudio de serie de casos

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ABSTRACT | Early intervention based on parental activities promotes cognitive, physical, social, and emotional development, which are determinants for the child's health. However, studies about early intervention with parental education are scarce. The objective of this study was to analyze the effect of parental intervention in the motor development of infants. This is a case series, longitudinal, and interventional study, with 100 infants at risk, aged 0-18 months. Motor development of infants was assessed by the Alberta Infant Motor Scale, and the parents received information about positioning and exercises depending on the child's motor score. Risk factors were not related to infants' motor development. However, these risk factors were related to gestational age, which was related to motor development. After parental early intervention, the sample frequency increased from 45% to 69% in the group of children with normal motor development. Frequency was reduced from 55% to 31% in the group with delayed development. Prenatal and/or perinatal risk factors can cause prematurity, and consequently, delays in children's motor development. For these infants, early intervention protocols with parental education are effective to stimulate a normal motor development of children at risk in follow-up in outpatient clinics.

Keywords | Child Development; Risk Factors; Motor Activity.

RESUMO | A intervenção precoce no desenvolvimento, por meio de atividades parentais, favorece ganhos cognitivos, físicos, sociais e emocionais da criança, que são determinantes da saúde infantil. Contudo, estudos com intervenção precoce com atividades parentais são escassos. Assim, o objetivo deste estudo foi analisar o efeito da intervenção parental precoce no desenvolvimento motor de lactentes em seguimento em ambulatório de risco. Este é um estudo de série de casos, longitudinal e intervencionista, em 100 lactentes, com idade entre 0-18 meses, provenientes de um ambulatório de risco. O desenvolvimento motor dos lactentes foi avaliado pela escala motora infantil de Alberta. Foram transmitidas orientações aos pais, a depender do atraso motor observado. Não houve relação dos fatores de risco com o desenvolvimento motor. Porém, esses fatores apresentaram relação com a idade gestacional, que teve, por sua vez, relação com o desenvolvimento motor. Após intervenção precoce parental, a frequência amostral aumentou de 45% para 69% no grupo de crianças com desenvolvimento motor normal. No grupo com atraso no desenvolvimento, a frequência amostral reduziu de 55% para 31%. Fatores de risco pré-natal e/ou perinatal podem acarretar prematuridade e consequentemente atraso no desenvolvimento motor infantil. Para esses lactentes, protocolos de intervenção precoce com atividades parentais são efetivos para promover um desenvolvimento motor normal de crianças em seguimento em ambulatório de risco.

Descritores | Desenvolvimento Infantil; Fatores de Risco; Atividade Motora.

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RESUMEN | Por intermedio de actividades parentales, la intervención precoz en el desarrollo favorece logros cognitivos, físicos, sociales y emocionales a los bebés, factores determinantes para la salud infantil. Pero son pocos los estudios sobre la intervención precoz con actividades parentales. Así en este estudio se propone analizar los resultados de la intervención parental precoz para el desarrollo motor de lactantes en ambulatorio de una maternidad. Estudio de tipo serie de casos, longitudinal e intervencionista, del cual participaron cien lactantes, entre 0 y 18 meses de edad, provenientes del ambulatorio de la maternidad. Se evaluó el desarrollo motor de los lactantes por intermedio de la escala Alberta. Dependiendo del retraso motor observado en los bebés, se hicieron recomendaciones a los padres. No se encontró relaciones entre los factores de riesgo y el desarrollo motor. Sin embargo, estos factores presentaron relación con la edad gestacional, que se relacionó, a su vez, con el desarrollo motor. Tras la intervención precoz parental, la frecuencia del muestreo aumentó del 45% al 69% en el grupo de bebés con desarrollo motor normal. El grupo con retraso en el desarrollo sufrió una disminución en la frecuencia de la muestra del 55% al 31%. Los factores de riesgo prenatal y/o perinatal pueden implicar precocidad y, por consiguiente, retraso en el desarrollo motor infantil. Para lactantes en ambulatorios, estos protocolos de intervención precoz con actividades parentales son eficaces para promocionar su desarrollo motor normal.

Palabras clave | Desarrollo Infantil; Factores de Riesgo; Actividad Motora.

INTRODUCTION

Child growth and development suffer adverse effects from environmental factors[1]. According to the Brazilian Ministry of Health[2], childhood is the period with greatest development for the human being, and is influenced by life experiences, whether they are positive or negative. From the motor point of view, development is understood as the acquisition of motor skills that evolve from simple and disorganized movements to complex and organized movements in a sequential and continuous process, considering the chronological age[3].

Biological and social factors that occurring in the pre-, peri- and/or postnatal period may increase the probability of children presenting delayed development, which could result in neuropsychomotor delays, with changes in the acquisition of motor, cognitive and psychosocial skills[4]. Preterm birth can be considered a risk factor, since premature children are susceptible to a wide variety of neurodevelopmental problems that influence their growth and development when compared to children without a prematurity history[5,6].

Some instruments have been proposed to assess the children's motor development in an attempt to help the understanding of what is typical or atypical in certain age range[2]. Thus, identification of disturbances in the neuropsychomotor development in the first year of life[7] is vital to enable early intervention in developmental delays, and thus the use of appropriate instruments[8] for an effective treatment. The Alberta Infant Motor Scale (AIMS) – used for observational assessment of infant motor performance – discusses concepts of motor development[9,10]. This scale assesses and monitors the motor development of infants through the observation of spontaneous motor activity, identifying children with motor development delayed in relation to a normative group[11-14]. Initially, AIMS was developed and validated for Canadian children[15], but it has been used in researches and clinical practices worldwide[16-21]. It was also validated in countries such as Japan[22] and China[23], and in Brazil it was standardized and validated for the Brazilian population[24-26], where it is frequently used in motor development studies of Brazilian children[27-32].

Early interventions are recognized by their capacity of reducing the risk of motor developmental delay[33-35]. Routines based on early intervention for children with or at risk of delayed development encourages collaboration among professionals and families to foster functional results and achieve the goals selected by the family[36]. The importance of continuous neuromotor development follow-up, as well as its risk factors in children with a history of prematurity, helps health professionals to identify target children who may benefit from early intervention and ensure that children reach their potential of development[37].

Due to the increasing number of children presenting motor development delays that can generate sequelae in psychosocial, cognitive and motor skills in childhood[9] and the scarcity of studies on parental intervention in motor development of infants, this study aims to analyze the effect of early parental intervention in the

motor development of at-risk infants in follow-up in outpatient clinics.

METHODOLOGY

The study was a longitudinal and interventionist case series with 100 children aged 0 to 18 months from the maternity unity of the University. Most children attended in the unity had pre-or perinatal risk factors. Study participants were included consecutively and randomly, upon authorization – the parents signed the informed consent form by the parents –, and according to the following inclusion criteria: they had medical records in the maternity clinic and were not participating in intervention programs. Exclusion factors: osteomyoarticular lesions and infections with fever. Criteria for withdrawal from the study: irritability. The study was approved by Ethics Committee under opinion number 1,292,608.

In the maternity clinic, the pediatrician evaluated the children regarding anamnesis, identified and monitored risk factors, and laboratory tests were performed. In addition, a physical therapy assessment was carried out by a physical therapist to evaluate motor development of the children and the need for intervention through the Alberta infant motor scale (*Alberta Infant Motor Scale, AIMS*)[22,23]. During the assessment, the examiner observed the child's movement in each of the positions, considering aspects such as the surface of the body that sustains the weight, posture and antigravitational movements[11].

The items observed in each of the subscales were added resulting in 4 subtotals, in which the total score (zero-58 points) is the sum of these subtotals[11]. At the end of assessment, the total score was converted into percentiles of the child's gross motor development from a graph available in the test sheet, and could vary from <5TH to 90TH, reference values established for the Brazilian population[32]. Delayed motor development was adopted for percentiles ≤ 10, and normal motor development for >10 percentile .

Children were assessed on a monthly basis, with minimal handling, between 20 and 30 minutes: they were placed on an exercises mat with some toys separated by age. Two independent evaluators assessed and categorized the motor behavior of children. At the end of the assessment, if the child showed signs of normal motor development, he/she would be discharged; if he/she presented delay in motor development, some instructions were provided to parents; and if any development delay was detected in the second evaluation after 30 days, he/she would be forwarded to the intervention in a reference center for early intervention. The instructions given to the parents or caregivers were related to stimuli according to the motor acquisition the children should have in their age: increased experience on the ground; providing stimuli with playful objects (asking the child to crawl on all fours to get an object, or perform lateral gait with support, transfer from supine to prone, or prone to sitting, or sitting to standing, or standing to lateral gait, proprioceptive stimuli with objects of different textures, formats, and environments with different obstacles, such as sand, mattress, soil). The flowchart elaborated in the clinic to assess each child is characterized in Figure 1.

The descriptive statistics was held by relative frequency percentage of gender, gestational age, risk factors and motor development assessment. We used the Pearson's chi-square test (X^2) to relate the nominal and dichotomous variables: gestational age, risk factors and motor development. The significance level adopted was $p < 0.05$.

RESULTS

Study sample consisted of 100 children, but there were losses during the assessment. The group consisted of 45% (n=45) female children and 55% (n=55) male children. About gestational age, 32 (32%) children were born preterm, 62 (62%) full term and 6 (6%) post-term.

Isolated or associated risk factors were present in 72% (n=72) of mothers of the assessed children. Main risk factors were: 11% (n=11) teenage mother, 8% (n=8) with syphilis, 9% (n=9) teenage mother with syphilis, 1% (n=1) crack user with syphilis, 1% (n=1) ingested alcohol and smoked in the first three months of gestation, 6% (n=6) with toxoplasmosis, 5% (n=5) with hypertensive disease during pregnancy, 7% (n=7) with systemic hypertension, 1% (n=1) with *placenta praevia*, 3% (n=3) with *abruptio placentae*, 8% (n=8) with urinary tract infection, 7% (n=7) had maternal hemorrhage, 1% (n=1) with kidney stone, 1% (n=1) with gestational diabetes, 1% (n=1) with gestational diabetes and autoimmune hepatitis, and 2% (n=2) with blood incompatibility.

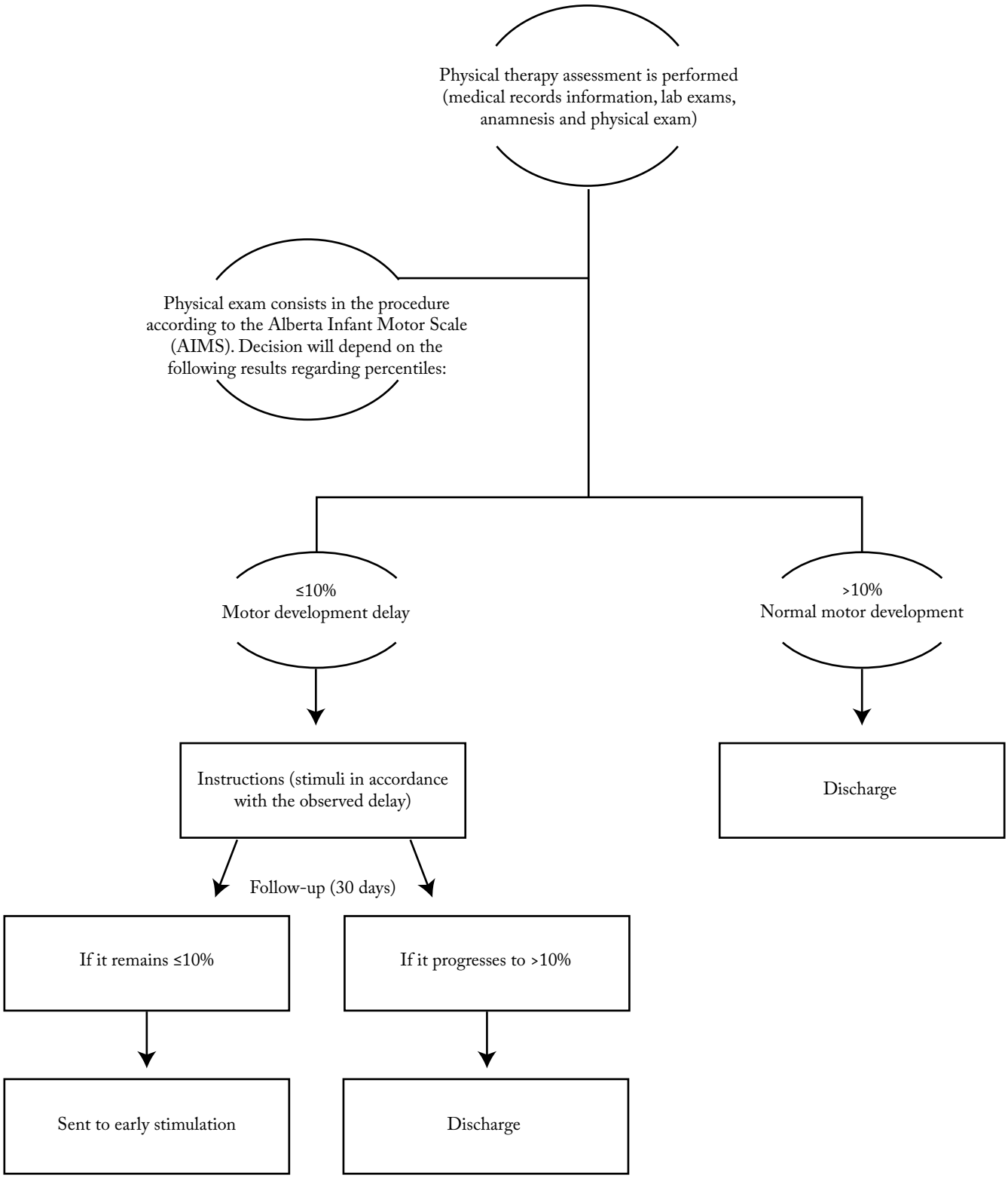

Figure 1. Flowchart for the assessment of each child elaborated in the maternity clinic at the university

During the monthly medical care, four evaluations with the AIMS were carried out; in these assessments, 46 children were absent. According to Figure 2, in the first assessment 100 children were evaluated; the results presented were: 45% (n=45) of children with normal motor development and 55% (n=55) with delayed motor development. In the second evaluation, 8% (n=8) were discharged and 37% (n=37) abandoned the clinical follow-up; 55 children (55%) were then evaluated, of which 49% (n=27) showed normal motor development, 51% (n=28) showed delay in motor development. In the third assessment, 16% (n=9) were discharged and 16% (n=9) abandoned the clinical follow-up, 37 children attended the assessment (68%), of which 76% (n=28) showed normal motor development and 24% (n=9) showed delayed motor development. Until the third evaluation, the sampling frequency increased from 45% to 76% in the group of children with normal motor development. From the first to the third evaluation, sampling frequency decreased from 55% to 24% in the group of children with delayed motor development. In the fourth assessment, 30% (n=11) were discharged and nobody abandoned clinical follow-up, 26 children attended the assessment (70%), of which 69% (n=18) showed normal motor development and 31% (n=8) showed motor development delay.

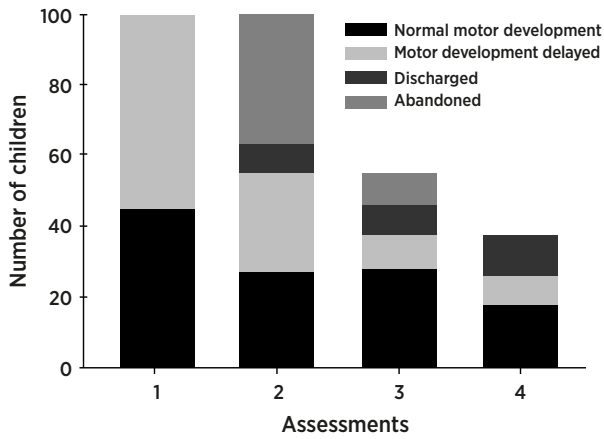

Figure 2. Number of children during the evaluations of motor development that showed normal, suspicious, unusual development, who were discharged and abandoned the follow-up in the maternity clinic at the university

The age, in days, showed strong positive correlation (r=0.74; p<0.01) with AIMS total score during the first evaluation. Analyzed together the risk factors were related to gestational age (preterm, full term and post-term) (X^2=6.63; p=0.03). Motor development (delayed or typical) was related with gestational age (X^2=10.26; p=0.006).

DISCUSSION

Presence of risk factors during pre- and perinatal did not have any relationship with motor development, but it has been shown that exposure to risk factors may cause premature birth and developmental delay. Frequency of children with normal motor development increased and frequency of children with delayed motor development decreased.

Corroborating the study of Kieviet et al. 2009[38], it was possible to verify in this study that due to prematurity, caused by biological risk factors to which children were subjected in pregnancy, there were losses in motor development. Some children were classified as having suspect or atypical persistent motor development during childhood. If there is concomitance of two types of risk factors, biological and environmental, the likelihood of premature birth increases[39].

Prenatal care can contribute to more favorable outcomes by allowing detection and timely treatment of diseases, in addition to controlling risk factors that bring complications to the health of the woman and the baby[34]. Attendance at prenatal visits enables diagnosis and treatment of the complications during pregnancy, and consequent reduction or elimination of risks likely to be corrected, such as hypertensive syndromes, congenital syphilis and urinary infections[1]. Early diagnosis of risks to the development can increase the chances of recovery of children with delay, enable access and adequate care, providing better quality of life. There is evidence that the earlier the delay diagnosis and intervention, the lower the impact of these problems on the child's development and future life[27].

The development in early childhood is positively associated to joint activities between caregivers and children, such as reading, playing, listening to stories, counting, singing or to take a walk outside, which illustrate the importance of a care environment for the child's development[40]. In this study, instructions were given to parents and caregivers of all children who had delayed motor development, with the purpose to provide experiences in different AIMS postures.

If these children still presented development delay, they would be forwarded to early stimulation, and when they returned, during the reassessments, it was possible to notice evolution, as they began to present normal motor development – as a consequence, they were discharged. Early detection with stimulation and the brain plasticity of children are factors that bring proven benefits according to the results of this study.

Therefore, this study proved that AIMS can be used not only to evaluate the motor development of children, but also to test their skills in different positions in space. The time spent on a particular posture positively influences the acquisition of motor gains, whereas the skills in other postures can occur slightly later. When children are unable to move freely, damage may occur in the learning and in the use of *feedback* and *feedforward*, essential for motor skills acquisition. Keeping infants most of the time on one's lap, in cribs, stroller or high chair may delay their motor development[27].

Previous studies confirm the influence of maternal practices in the child's development, highlighting that the children-focused care may improve their performance, if sensory-motor experiences are provided, and may limit their acquisitions as a result of constraints linked to tasks and contexts[41]. It is believed that the pace of development is unstable, with periods of few motor acquisitions and others marked by several behavioral changes[39]; however, if there is a risk factor, the child should be forwarded to clinical follow-up. Changes in the child's development should be detected as soon as possible and the stimulation process should start as early as possible.

This study had limitations such as the time of intervention, since this protocol could last for up to 1 year, and the number of children who abandoned the follow-up.

CONCLUSION

Prenatal and/or perinatal risk factors may cause premature birth and delayed motor development. For these children, early intervention protocols with instructions given to parents or caregivers – depending on the motor delay observed and related to stimuli according to the motor acquisition – are effective for normal motor development of at-risk children in clinical follow-up.

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