

FOCUSING ON DISSOCIATED MOTOR DEVELOPMENT IN BRAZILIAN CHILDREN

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ABSTRACT - Dissociated motor development (DMD) is considered when the baby starts independent walking late, with normality of the other fields of development. There is evidence that babies with DMD present an atypical crawling pattern and hypotonia. To investigate the frequency and characteristics of DMD, neurological examination was performed monthly in 177 healthy full-term babies from 6 months age, in urban and rural zone samples in Brazil. Among 20 children with atypical crawling, none presented hypotonia neither did they start independent walking late. The means of the ages at the beginning of atypical crawling and independent walking acquisitions, 7.40mo (SD 1.4) and 12.76mo (SD 2.5) respectively, did not differ from the group with crossed crawling pattern. Thus, in this sample of Brazilian healthy children we did not find cases with DMD.

KEY WORDS: crawling, postural development, child development, motor skills, child.

Desenvolvimento motor dissociado: um enfoque em crianças brasileiras

RESUMO - Desenvolvimento motor dissociado (DMD) é considerado quando o bebê inicia tardiamente a marcha sem apoio, tendo apresentado normalidade em outros setores do desenvolvimento. Tem sido associado à hipotonia e ao engatinhar atípico. Para investigar a frequência e características do DMD, exame neurológico foi realizado mensalmente após os 6 meses em 177 bebês nascidos a termo, em duas amostras procedentes de zona rural e urbana no Brasil. Entre as 20 crianças com engatinhar atípico, nenhuma apresentou hipotonia e nem atraso para a marcha sem apoio. As médias das idades no início do engatinhar atípico e marcha independente foram 7,40 (dp 1,4) meses e 12,76 (dp 2,5) meses respectivamente, que não diferiram do grupo que engatinhou com padrão cruzado. Portanto, nesta amostra de crianças brasileiras não foram encontrados casos com DMD.

PALAVRAS-CHAVE: engatinhar, desenvolvimento postural, desenvolvimento infantil, habilidades motoras, criança.

Illingworth (1958)¹ was the first to use the term dissociated development (DMD) when reporting cases of children who presented delays in one of the five areas of development described by Gesell in relation to others. This author¹ described children with delayed postural development but without delays in other fields, and attributed these deviations to hypotonia, hypertonia or even cerebral palsy. In the same study, Illingworth acknowledged that isolated cases of delays can also occur in motor development without an apparent reason, with perfectly normal future development.

Hagberg and Lundberg, 1969 (Apud Robson²) studied 32 children diagnosed with DMD, and defined DMD as a condition in which the fine, adaptive, linguistic and personal/social development are normal

in accordance with the age, while postural development is significantly retarded. Of this group, 15 children started crawling and walking late (12.5 and 20months on average respectively), and all presented the atypical crawling pattern. This group contained children diagnosed with hypotonia or cerebral palsy, although their postural development became normal later on without requiring treatment. Robson² studied a large quantity of children referred for developmental delay or a disorder of movement and identified a group comprising 30 children who started sitting without support, crawling and walking late, from 18 to 24 months, but did not present any evidence of a compromised nervous system. All these children presented the atypical crawling pattern. He also discovered a comprehensive family background

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for this pattern of crawling, proposing a genetic heritage based on a dominant mode of transmission.

Lundberg³ studied the clinical characteristics of the children with different crawling patterns and distinguished two groups of children who presented the atypical pattern: those diagnosed with DMD with pathological characteristics with detectable hypotonia and those who were suffering from the "idiopathic delayed walking syndrome" without damage to the nervous system and without detectable hypotonia. Lundberg³ also mentions the difficulty distinguishing one group from the other, and cites an important factor: children with the "idiopathic delayed walking syndrome" do not have any pre, peri or post-natal history of nervous system injury, but do possess a comprehensive family history of the atypical crawling pattern. Robson⁴ studied normal children with various patterns of crawling and related these factors with the age these children started to walk. He distinguished two groups: the group that walked earlier formed by children who did not crawl and those with the crossed pattern besides those who started walking later, formed by children with the atypical pattern, and concluded that these different crawling patterns are more closely related to a variation of normal patterns than with a pathological condition, as Touwen⁵ and Illingworth⁶ had already suggested.

The aim of this study was to investigate the occurrence, frequency and characteristics of DMD in healthy full-term babies in two different samples, one from Urban (Gr.U) and another from Rural (Gr.R) origin.

METHOD

Inclusion criteria: 1. full-term babies with a known gestational age of 37 to 42 weeks, based on the date of the last menstrual period or compatible Somatic Capurro Index⁷. 2. male or female, 6 months age. 3. without neurological and/or pediatric antecedents that could interfere in the neurological development. 4. babies without clinical signs of neurological lesions, excepting global hypotonia or hypotonia restricted to the axis, as expected^{1,2} for children with dissociated motor development. 5. cephalic perimeter, weight and stature in the adequate channel of the growth curve, according to the curves of Marcondes & Machado⁸.

Population studied: children who had been attended and accompanied at two Centers maintained by the Department of Pediatrics and Child Welfare of the School of Medicine of Ribeirão Preto, São Paulo University: The Social Community Center of Vila Lobato and The Social Community Medical Center 'Januário Theodoro de Souza'.

The district of Vila Lobato is located in the northeastern

region of the city of Ribeirão Preto, covering an area of 5 thousand houses with an average population of 22 thousand inhabitants, predominantly from the lower middle class. This population presents typically urban characteristics. The group was designated as Urban Group (Gr.U).

The Social Community Medical Center 'Januário Theodoro de Souza', is located in the city of Pradópolis, located 34 Km southeast of downtown Ribeirão Preto Center, which currently has 12 thousand inhabitants. Eight thousand of these inhabitants live in the urban zone and 4 thousand in the rural zone, and are also characterized as a lower middle class population. As to the type of work in the region, agricultural jobs in the sugar cane plantations predominate, with a small percent of jobs in the sugar-alcohol plant. This population has typically rural characteristics and usually bring up their babies without apparatus such as baby-comforts, prams or walkers, that are common in the urban zone. The group was designated Rural Group (Gr.R).

Data collection: the parents were initially informed about the objective of the work and of the subsequent accompaniment; the children were only included in the study after obtaining the consent of the parents.

The evaluations were conducted by the examiner in medical consulting-type rooms with the minimum amount of external interference possible after the child had been attended in Pediatrics. The evaluation took place in the presence of the parents and subsequent visits were scheduled.

The evaluations were only made when the child presented good clinical conditions and proved cooperative during the exam.

This was a longitudinal study. One neurological evaluation was performed every month until the child started walking independently.

Those children who had began a pre-walking locomotor strategy at the age of 5 months were included in the work, based on detailed descriptions provided by the mother and on the short period of time that had passed.

The protocol developed for this survey included a questionnaire for the genitors and/or adult familiar with the daily lifestyle of the child, consisting of information related to motor acquisition, information on maternal work and resources for the child, items from the classic neurological exam and of neurological development, prepared with a basis on the evaluation proposals of Saint-Anne Dargassies⁹⁻¹¹; Amiel-Tison¹²; Lefèvre¹³; Diamant¹⁴; Milani-Comparetti and Guidoni^{15,16}; Zdanska-Brincken and Wolanski¹⁷.

For the data analysis, we separated the children in 3 groups according to the pre-walking locomotor strategy and took the following definitions into consideration:

1. Crossed pattern: children with typical crawling patterns, i.e., characterized as a type of pre-walking locomotion without support, where the propulsion is performed

Table 1. Distribution of the pre-walking locomotor strategy in the Urban (Gr.U) and Rural (Gr.R) groups.

Locomotor strategy	Gr.U	Gr.R	Total	
	n	n	n	%
CROSSED				
Only Crossed	55	42	97	65.5
Abdomen + Crossed	21	17	38	25.7
Buttocks + Crossed	2	8	10	6.7
Rolling + Crossed	1	0	1	0.7
Abdomen+bridge + crossed	1	0	1	0.7
Bridge	1	0	1	0.7
TOTAL	81	67	148	100
ATYPICAL				
Buttocks	6	4	10	50
Abdomen	2	7	9	45
Rolling + Abdomen	0	1	1	5
TOTAL	8	12	20	100

in the prone position (lying down on the stomach) on the four limbs, hands-knees or hands-feet flexed (knees extended), according to the definition submitted by Lundberg³. There can even be asymmetry of the lower limbs as to the position of the knee (flexed or extended). We also included children who presented other forms of pre-walking locomotion in this group, such as dragging of buttocks, abdomen or rolling, and, after a given period, these children passed on to the crossed pattern.

2. Atypical pattern: children with atypical crawling characteristics, i.e., those with pre-walking locomotion:

a. as described by Peiper, 1963 (Apud Robson²): "a sliding movement with the torso erect and the hips flexed. The child supports him/herself on both buttocks or one buttock with the lower limbs flexed, and can use feet or hands or both for propulsion".

b. in the prone position, characterized according to the definition presented by Green et al.¹⁸: "child lying on his/her stomach, using the abdomen as a point of support, with free movement of the pelvic and scapular belt; the propulsion and point of support can be realized by the four limbs."

3. Children who did not crawl: are those in which no locomotor strategy was observed prior to independent walking. (Bottos et al. ¹⁹); Robson⁴ defined these as children who, from the sitting position, stood up and walked. Others define them as children who passed from the rolling phase or from the sitting position to the upright position with support presenting reptilian movements. These children started walking with support first and then without (Largo et al.²⁰).

For calculation purposes, the various forms of crossed pattern crawling were only considered with the crossed pattern while two forms were considered for the atypical pattern: shuffling, i.e., sliding on the buttocks (buttocks)

and dragging of the abdomen (abdomen), and the form rolling + abdomen was considered for calculations such as abdomen locomotion.

The beginning of the crawling and independent walking period was considered in complete months (mo).

For the statistical analysis we used the non-parametric test developed by Mann-Whitney and Kruskal-Wallis.

RESULTS

A total of 177 children were included: 93 belonged to Gr.U (46 males and 47 females) and 84 (46 males and 38 females) to Gr.R. Twelve (12.6%) of Gr.U and 21 (25%) of Gr.R were Black or Mulattoes; one child of Gr.R from Japanese origin and the others were white. 30% from Gr.U and 23% from Gr.R remained in the home, under the direct care of the mother.

From 177 children, 168 (95%) have crawled.

Among 148 with crossed pattern of crawling, 50 (33,7%) presented an atypical pattern before crossing (Table 1).

From 168 children who have crawled, 20 (12%) presented only atypical pattern (buttocks sliding or shuffling and abdominal dragging). In the Gr.R we found a trend to predominance of female children with dragging. (Table 2).

Among the total of 177 children: none of them presented hypotonia in the limbs or body axis, further to that expected for the age bracket. None of them presented asymmetric responses in the classical neurological exam. None of them started the crawling after the 10th month. None of them started independent walking after 18 months age.

Concerning the start of crawling and indepen-

Table 2. Distribution of 20 cases with atypical crawling pattern according to sex.

	Urban		Rural		Total
	Buttocks	Abdomen	Buttocks	Abdomen	
Male	3	1	0	4	8
Female	3	1	2	6	12
Total	6	2	2	10	20

Table 3. Means of ages in months at the start of crawling and independent walking according to the patterns of crawling

Group	Age at the start of crawling pattern of crawling		Age at the start of independent walking pattern of crawling	
	Crossed Mean (SD)	Atypical Mean (SD)	Crossed Mean (SD)	Atypical Mean (SD)
Urban	7.35 (1.3)	7.67 (1.4)	12.30 (2.0)	12.89 (2.8)
Rural	7.04 (1.4)	7.25 (1.2)	12.48 (1.8)	12.67 (2.5)
Total	7.21 (1.3)	7.40 (1.4)	12.38 (1.9)	12.76 (2.5)

dent walking periods according to the patterns of crawling, no significant difference was found comparing Gr.U to Gr.R as the means of the ages at the start of crawling and independent walking according to the patterns of crawling (Table 3).

DISCUSSION

Considering the initial observation made by Illingworth¹ and the subsequent publications some doubts about DMD remain. The aetiology and the peculiarities of the postural development of DMD, such as the pattern of crawling and the characteristics of the muscle tonus have not been clarified at all. Taking into account the family studies of Robson², although he did not provide information about prenatal or perinatal periods, he suggested that there would be a group with different characteristics from those with cerebral palsy: a benign variation of normality, with possible inherited basis, a delay in the independent walking, with shuffling (sliding on the buttocks) as a prewalking strategy and the presence of hypotonia. In this series, Robson described with details the evolution of the hypotonia in the axis and limbs. On the other hand, Lundberg³ considered DMD as a result of a pathological cerebral condition and suggested another new group, different from that with DMD, the "idiopathic delayed walking syndrome" with atypical crawling but without hypotonia, that would be an inherited condition. We con-

sider that the major criterion for DMD diagnosis is the late walking that comes beyond the range of normality in otherwise healthy infants who presented an atypical pattern of crawling. It is quite difficult to think of DMD diagnosis in children with cerebral lesion. These children do not present late walking as a unique sequel; the retard occurs since early phases of postural development; the hypotonia did not hamper the crossed pattern of crawling, as we observe in the clinical practice, and in agreement with Bobath and Bobath²¹. In addition, according to data from Bottos et al.¹⁹ no enhance was seen in the number of shufflers and creepers in the group with cerebral lesion, comparing to the control group.

In the present casuistic of normal babies, around 34% of the crawlers had some type of atypical pattern of crawling before starting the crossed crawling. We could consider that those babies who presented only atypical pattern lacked the crossed phase, and persisted with the same pattern until walking.

In the present, our concern was only about the characteristics of the pattern of crawling and the incidence of late walkers among healthy babies. We found a group of children with atypical crawling patterns, who did not start walking after the normal range, and who did not present signs of hypotonia or asymmetric tonus. Therefore, we did not find DMD nor "idiopathic delayed walking syndrome" in this sample of healthy children, even analysing

their different characteristics such as rural or urban origin.

We concluded that DMD seems to be a rare condition among Brazilian children, and late independent walking, regardless the pattern of crawling, should be faced carefully, towards pathological condition.

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