

Relationship between parental practices and motor development milestones in the first year of life

Relação entre práticas parentais e marcos do desenvolvimento motor no primeiro ano de vida

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RESUMO | INTRODUÇÃO: Os pais são responsáveis por organizar uma variedade de experiências dentro de casa e na comunidade, que favorecem o desenvolvimento infantil. Embora seja importante e amplamente estudado nos diferentes domínios do desenvolvimento, existem poucos estudos sobre a relação entre práticas parentais e o desenvolvimento motor. **OBJETIVO:** Verificar quais práticas parentais estão mais relacionadas com o desenvolvimento motor no primeiro ano de vida. **MÉTODOS:** Estudo transversal, exploratório, metodologia Apoio Multicritério à Decisão e Correlação de Spearman. Foram aplicados questionários estruturados sobre práticas parentais e marcos do desenvolvimento motor no primeiro ano de vida em 35 pais ou cuidadores de crianças com idade entre 12 a 24 meses. **RESULTADOS:** Verificou-se que de quatro a seis meses as práticas de não deixar no berço, colocar de pé com apoio, colocar no chão, dar brinquedos variados, apresentaram correlação moderada e inversa com a idade de aquisição de quatro apoios ($r = -0,440$ $p = 0,010$), engatinhar ($r = -0,418$ $p = 0,013$) e passos ($r = -0,397$ $p = 0,018$). Entre seis a doze meses as práticas de não deixar no berço, colocar de pé com apoio, estimular passos, apresentaram correlação moderada e inversa com a idade de aquisição de sentar-se ($r = -0,368$ $p = 0,030$), sentar-se bem ($r = -0,388$ $p = 0,021$), em pé ($r = -0,407$ $p = 0,015$) e passos ($r = -0,373$ $p = 0,027$). **CONCLUSÃO:** Foi possível verificar que há relação entre as práticas parentais e o surgimento dos marcos do desenvolvimento motor no primeiro ano de vida, a partir de 4 meses de idade. Aquelas práticas relacionadas com a oferta de material para aprendizagem e liberdade de movimento foram as mais favoráveis.

PALAVRAS-CHAVE: Desenvolvimento infantil. Relações pais-filho. Destreza motora.

ABSTRACT | INTRODUCTION: Parents are responsible for organizing a variety of experiences that foster child development. Although it is important and widely studied in the different domains of development, there are few studies on the relationship between parental practices and motor development. **OBJECTIVE:** To verify which parental practices are most related to infant motor development in the first year of life. **METHODS:** Cross-sectional, exploratory study with application of multi-attribute utility theory and Spearman correlation. We applied structured questionnaires on parental practices and motor development milestones in the first year of life in 35 parents of children aged 12 to 24 months. **RESULTS:** It was verified that from four to six months the practices of do not leaving in the crib, standing with support, putting on the floor, giving varied toys, presented moderate and inverse correlation with age of acquisition of four supports ($r = -0.440$ $p = 0.010$), crawling ($r = -0.418$ $p = 0.013$) and steps ($r = -0.397$ $p = 0.018$). Between six and twelve months, the practices of do not leaving the crib, standing with support, stimulating steps, presented moderate and inverse correlation with age of acquisition of sit ($r = -0.368$ $p = 0.030$), sits well ($r = -0.388$ $p = 0.021$), standing ($r = -0.407$ $p = 0.015$) and steps ($r = -0.373$ $p = 0.027$). **CONCLUSION:** There is a relationship between parental practices and motor development milestones in the first year of life. Those practices related to the supply of learning material and freedom of movement were the most favorable.

KEYWORDS: Child development. Parent-child relationships. Motor skills.

Child development involves the emergence of skills in the motor, cognitive and affective-social domains, which depends on the child's physical well-being, the family context and the vast social network¹. Therefore, it refers to a multifaceted process in which factors intrinsic to the child, such as their genetic inheritance, interact with external factors, coming from the physical, social and cultural environment in which the child lives².

Several studies prove that of the many factors that compose the environment, the home is a fundamental influential factor for lifelong learning and development, especially during the early years^{3,4}. The family environment plays a key role in children's motor development. It is up to parents to provide basic needs such as affection, food, safety and health, as well as providing an environment that stimulates the child's development⁴. In addition, it is they who transmit to their children cultural and educational values that support the process of social adaptation¹.

Parents are responsible for organizing a variety of experiences, both at home and in the community, that foster child development. They are routines, games and activities, as well as offering toys, books and materials that promote an appropriately stimulating environment^{2,4}. Although there are studies on parental practices and child development, specifically in the motor domain, literature is scarce⁵. Sacconi and Valentini⁶, when comparing the motor development of Brazilian babies with the Canadian Alberta Infant Scale (AIMS), recommend researches investigating Brazilian maternal practices aiming to contribute to the understanding of the different trajectories of children's motor development.

Thus, the objective of the present study was to verify the relationship between parental practices and the emergence of motor development milestones in the first year of life. It is believed that the results of the present study may aid in intervention proposals for parents in the field of motor development.

Study Design

It is a cross-sectional, exploratory and correlational study. The study was carried out at the headquarters of the municipality of Diamantina, MG and approved by the Research Ethics Committee (CEP) of *Universidade Federal dos Vales do Jequitinhonha e Mucuri* (UFVJM), number 1.611.923.

Participants

It is a convenience sample and the caregivers of the children attending the "Nada Melhor" aquatic stimulation, extension project of UFVJM Federal University. Also caregivers with children enrolled in two Municipal Centers for Early Childhood Education (CMEI) participated in this study. The selection criterion was to have a child enrolled in the project or duly enrolled in the day care centers, within the age group of 12 to 24 months. Caregivers of children with a medical diagnosis of congenital or acquired disease that might affect motor development were excluded from the study. Also excluded were caregivers of children who received treatment or specialized professional guidance related to child development.

Instruments

For the economic classification of the families of the children, the Brazilian Economic Classification Criterion (CCEB) of the *Associação Brasileira de Empresas e Pesquisa*⁷ was used. It is a well-known instrument and the economic classification is defined according to the durable goods at home, the quantity of toilets, the existence of a monthly maid and the degree of education of the head of the family. Each item has a score that is summed and interpreted with the help of an economic ranking table, in ascending ordinal scale format, ranging from E to A1⁷.

To characterize the studied population, a questionnaire was developed to collect data on the sociodemographic conditions of the families and the biological profile of the participating children. The investigation of the proposed theme occurred through the application of two structured questionnaires of own elaboration from the literature: a questionnaire

on parental practices in motor development, another on motor development milestones. The questionnaires were prepared for the purpose of being answered by the child's primary caregiver.

The structured questionnaire to investigate the parental practices performed at the time of the child's vigil consisted of 30 questions about care practices performed in the first year of life and the alternatives of answers were provided through a Likert

Scale with five categories 01-never, 02 -rarely, 03-sometimes, 04-almost always and 05-always. This questionnaire is described in the study by Gomes et al⁹. The questionnaire to investigate the acquisition of children's motor milestones was composed of 12 questions to which caregivers had age options that the child reached for each motor frame cited in the questions. If there was no option for your child, the caregiver would tick the "other" option and note the appropriate age.

Procedures

Initially a pilot study was carried out to verify the adequacy of the questionnaires for the population that participated in the research. Participants were 10 mothers from another nearby municipality, being the only criterion of participation to have children aged between zero and 48 months. Through the pilot study it was possible to verify that: the questions were easy to understand and to define the age of the children, that is, caregivers of children between 12 and 24 months, to minimize memory bias. The pilot also made it possible to identify the time needed to conduct the interview for the final study.

In the definitive study, from August to December 2016, the approach to the caregivers of the children, participants of the study, took place during the sessions of the aquatic stimulation project. Since most of the parents belonged to economic classes A and B, in order to have a representation of all economic classes, it was decided to invite the parents of two kindergartens located in the periphery of the municipality to participate. The study was approved by the Municipal Department of Education and parents were approached at the children's daycare centers. Caregivers were invited to participate and, upon accepting, signed the informed consent form. Then, the application of the questionnaire was carried out right there by the researcher, in just one event. In some cases, the collection was performed at home, because it meets the demand of the caregiver of the child. Initially the ABEP application was carried out followed by practice questionnaires and motor development milestones.

Data analysis

The multi-attribute utility theory (MAUT) was used to create an index based on several maternal practices (criteria). MAUT is an adequate tool when multiple factors are involved in the evaluation process, allowing the identification, characterization and combination of different variables⁹. The analysis followed the following steps.

Phase 1 - Selection of criteria

According to MAUT, the criteria selected must represent in a faithful way what is being evaluated¹⁰. Thus, the criteria selected were the parental practices presented in frame 1, extracted from the questionnaire about parental practices.

Frame 1. Parental practice related to motor development in the first year of life

Criteria		
0 a 3 months	4 a 6 months	More than 6 months
- Mobile use	- Carrying on your lap	- Carrying on your lap
- Wrapping the baby	- Leaving in the cradle*	- Leaving in the cradle*
- Carrying on your lap	- Leaving in stroller	- Leaving in stroller
- Leaving in the cradle*	- Putting Stand up with support	- Leaving in the walker*
- Leaving in stroller	- Putting on the floor	- Putting on the floor
- Playing with smiles and faces	- Playing with smiles and faces	- Putting on stand up with support
- Putting rattles in child's hands	- Giving assorted toys	- Stimulating firsts steps

* Practices scored as negative.

Phase 2 - Establishment of a utility scale for the scoring of each criterion and its evaluation perspective

The objective of this phase is to compare the quantifications of the selected criteria on the same ordinal scale. Within MAUT, some selected criteria may have different units of measure (time, cost, efficiency%, etc.), that is, quantified by means of attributes¹¹. In the present study, the selected criteria have quantified responses by attributes (never, rarely, sometimes, almost always and always). Thus, at this stage the conversion of these responses into numerical variables was carried out by means of an ascending ordinal scale of one (1) never; (2) rarely, (3) sometimes; (4) almost always; (5) always.

For each practice a positive value was attributed when the practice was considered favorable for child motor development. In this way, the practice of “leaving the child in the cradle when awake”¹², and “leave the child in the walker”¹³ received negative values. After this step, a Spearman Correlation analysis was performed between the variables of the parental practice questionnaire and the motor development milestones questionnaire. We discarded the practices in which the mean correlation with developmental milestones was considered small or non-existent, that is, below 0.25¹⁴.

Phase 3 - Determination of the weight of each selected criterion

Weight is the numerical measure that measures the relative importance of each criterion. If the decision-maker understands that some criteria are more important than others (based on literature or expert opinion), they will have greater weights. For the present study, we chose to consider equal weights for the different criteria, assuming that for the child is important the variety of environmental opportunities, in other words, each parental practice is important for child motor development⁹.

Phase 4 - Multicriterion index calculation

For each participant, the multicriterion index was calculated. This multi-criterion index refers to the weighted sum of the evaluations of the different selected criteria. As in this study the weights considered for each criterion were the same (phase 3), to calculate the multi-criterion index, we performed a mean of the evaluations of all the selected criteria. In equation 1 it can be observed how this calculation was performed (n being the number of criterion evaluated):

$$\text{Multicriterion Index}_{\text{child } i} = \text{evaluation}_{\text{criterion } 1} \text{child } i \text{ weight}_{\text{criterion } 1} + \dots + \text{evaluation}_{\text{criterion } n} \text{child } i \text{ peso}_{\text{criterion } n}$$

{Equation 1}

It is a question of verifying if the multicriterion methodology performed actually serves the proposed objective¹⁰. In the present study, we tried to analyze if those children that obtained a higher index of multicriterion evaluation are those that reached the milestones of motor development before. To achieve this goal, a Spearman Correlation analysis was performed between the value of the multicriterion index and the different motor development milestones. At this stage, statistical significance ($p < 0.05$), direction and magnitude of correlations were verified¹⁴.

Characterization of subjects

Thirty-five caregivers of children aged 12-24 months, mean age 18 (SD \pm 3.8) months and 37 days participated in this study. Most of the interviewees were the mother herself who also spent most of the time with the children. The majority of the children was girls (60%), did not attend day care centers (54.2%) and almost half was the only child (48.6%). Table 1 shows the sociodemographic characteristics of the families. It was observed that the majority, both mothers and fathers, were of the adult age group and had at least a high school diploma. Most families were biparental, medium and high level.

Table 1. Sociodemographic characteristics

Characteristics		N (%)
Who answered		
Mother		25(71,4)
Father		7(20,0)
Others*		3(8,6)
Mothers		
Age (n=35)	Under 20 years	0(0,0)
	Above or equal to 20 years	35(100)
Schooling (n=35)	Under or equal to 4 years	0(0,0)
	Between 4 and 8 years	8(22,8)
	12 years	27(77,1)
	> 12 years	2(5,7)
Fathers		
Age (n=35)	Under 20 years	0(0,0)
	Above or equal to 20 years	35(100)
Schooling (n=35)	Under or equal to 4 years	0(0,0)
	Between 4 and 8 years	6(17,1)
	12 years	26(74,2)
	> 12 years	3(8,6)
Families (n=35)		
Type	Female single-parent	3(8,6)
	Expanded Female single-parent ¹	4(11,4)
	Two parents	21(60,0)
	Expanded Two parents ²	7(20,0)
Economic level		
	Class A2	6(17,1)
	Class B1 e B2	17(48,5)
	Class C1 E C2	11(31,4)
	Class D	1(2,9)

¹ Expanded single-parent: mother, children and other relatives; ² Expanded two parents: couple, children and other relatives; * An aunt and two nannies.

Parental Practices and Motor Development

After analysis of correlation of each parental practice with motor development milestones, those practices that correlated with more development milestones, with a mean correlation ≥ 0.25 , were included in the multicriterion by age range. Frame 2 shows the parental practices included.

Frame 2. Parenting practices that remained in the multicriterion

0 a 3 months	4 a 6 months	More than 6 months
- Leaving in stroller	- Leaving in the cradle *	- Leaving in the cradle *
- Playing with smiles and faces	- Putting on the floor	- Putting on stand up with support
- Putting rattles in child's hands	- Putting on stand up with support	- Stimulating firsts steps
	- Giving assorted toys	

* Practices scored as negative.

After this step, a multicriterion index was established for each child. Then, a Spearman Correlation was performed between the multi-criterion indices and the developmental milestones, the results can be visualized in Table 2.

Table 2. Correlation between parental practices and developmental milestones

Motor Milestones	Multicriterion 0 a 3 months		Multicriterion 4 a 6 months		Multicriterion 6 a 12 months	
	r	p	r	p	r	p
Raising the head	-0,256	0,151	-0,231	0,197	-0,131	0,466
Rolling to prone	0,103	0,554	-0,173	0,322	-0,227	0,191
Sitting	0,034	0,844	-0,051	0,772	-0,368	0,030*
Sitting without support	-0,026	0,884	-0,224	0,196	-0,388	0,021*
Staying in four supports	-0,008	0,966	-0,440	0,010*	-0,278	0,117
Crawling	0,198	0,225	-0,418	0,013*	-0,326	0,056
Standing up	-0,103	0,556	-0,287	0,094	-0,407	0,015*
Taking steps	-0,185	0,286	-0,397	0,018*	-0,373	0,027*

Multicriterion 0 to 3 months: leaving in the stroller; playing with smiles and faces, putting rattles on children's hands; Multicriterion 4 to 6 months: leaving in the cradle, putting on stand up with support, putting on the floor, giving varied toys; Multicriterion more than 6 months: leaving the cradle, putting on stand up with support, stimulating firsts steps; r: correlation coefficient p *: significant <0.05.

It is observed that for the parental practices that compose the multicriterion from zero to three months, there was no statistically significant correlation with any of the motor milestones. The parental practices that compose the multicriterion from 4 to 6 months had a moderate, inverse and significant correlation with the milestones: staying in four supports, crawling and taking steps. The parental practices that make up the multicriterion for more than 6 months had a moderate, inverse and significant correlation with milestones: sitting, sitting without support, standing up and to taking steps (table 2). It is important to emphasize that the correlations were negative because the higher the scores of the children in the multicriterion, the earlier the children reached the milestones.

Discussion

The present study sought to verify the relationship between parental practices and motor development milestones in the first year of life, as it is during this period that the central nervous system is in constant transformation reaching the apex at 24 months, favoring the learning process³. Therefore, it is in the interest of parents, health professionals, and educators to recognize practices that favor the motor milestones of infants.

In this study it was observed that most of the children did not attend day care centers and spent most of their time with their mothers. Chiang et al.¹⁶ sought to verify, through a cohort study using systematic stratified sampling, the effect of parent-child interactions. We evaluated 1718 children at 6 months and 1600 at 18 months. These authors stated that the interaction of parents with their children has a significant effect on child motor development, even for a short period of time.

In addition, it was possible to verify that the families presented socio-demographic and economic characteristics compatible with more favored socioeconomic classes. Findings suggest that indicators such as higher education and socioeconomic status benefit the higher quality of care and promote a more favorable environment for child development^{17,18,19,20}. A study by Martins et al.¹⁷, which compared the beliefs and care practices of 307 mothers from small cities and 299 from Brazilian capitals, found that the higher the level of schooling, the greater the achievement and valorization of mothers on the practices of stimulation.

In the study by Miloquete et al.¹⁸ investigating the influence of home affordances on motor and cognitive ability in 32 infants during their first 18 months of life, they found an interrelationship between resources in the domestic environment, and cognitive and motor development (principally in the fine motor). Thus, it is believed that the majority of the children in the present study were living in a favorable environment for their development, considering schooling and higher family income. Macarini et al.⁶ carried out a study whose main objective was to provide an overview of studies published in Brazil regarding parental practices. The authors concluded that

although the study of parental practices has been of interest to the researchers for a long time, in Brazil, only in recent years there is a significant growth of the literature in the area. Although the importance of maternal practices for child development is acknowledged, studies on motor development are scarce. Thus, the present study brings its contribution to verify the relationship between parental practices and the motor development of children in early childhood.

In the present study it was observed that from 0 to 3 months there was no significant correlation of the practices with the frames. It is possible that this result has been found considering that although the baby is born with perceptual systems that capture the information of the environment, therefore with the ability to perceive the environmental affordances, its possibilities of performing the action are minimal when still very young²¹. This is a period of spontaneous movement of the infant, only, at around 4 months, the child has motor action, that is, voluntary movements with an intention of environmental interaction²².

It was found in this study that practices such as not letting the child in the cradle, putting the child on the floor, giving varied toys, putting the child standing with support favored the emergence of motor landmarks such as four supports, crawl and take steps. Freedom of movement and material for the stimulation of the child are practices recognized in the literature as important for child development^{9,20,23}. Silva et al.²³ sought to verify, through a longitudinal study, whether parental practices related to the way of loading, place and position would influence the gross motor development of 14 infants from 6 to 12 months of age born in the interior of São Paulo. These authors affirm that from the six months the practice of placing the child on the floor influenced positively in their motor performance, because it allows greater freedom of movement.

For the age from 6 months, it was observed in the present study that practices such as not letting in the cradle, standing up and encouraging steps favored the earlier reaching of landmarks such as sitting without supported, standing up and taking steps. Important items for the child to reach these milestones mentioned above, obtained a significant correlation, for example, the item steps, it can be

said that parents favor the motor development of their children according to their practices.

Some practices, however, may lead to delays in some motor development milestones. Bartlett et al.¹² in their study, which aimed to determine the relationship between the use of children's equipment and play positions and the motor development of preterm infants. They identified that the longer use of a swing was associated with lower scores on the AIMS and lower scores on the prone and seated subscales. They also found that the greater use of transport throughout the day was associated with lower scores of the sit subscale and that greater overall equipment use was associated with lower sit-and-standing subscale scores.

The present study presents as a possible limitation a memory bias, since the participants needed to remember their practices and the development of their children's milestones. Thus, in order to minimize this influence, the children's age range was restricted to up to 24 months only. In addition, the sample was of convenience and therefore, it is believed that future studies can be developed with a larger and more representative sample of Brazilian children in the first year of life, considering the potential of the findings of this study.

Conclusion

It was possible to verify that there is a relation between the parental practices and the emergence of motor development milestones in the first year of life, from 4 months of age. Those practices related to the supply of learning material and freedom of movement were the most favorable.

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Authors contributions

Ribeiro FR participated in the collect/analysis of data and preparation of the manuscript; Gomes AM participated in the collect / analysis of data and revision of the manuscript; Vinolas Prat B participated in

the data analysis and orientation in the multicriterion methodology; Morais RLS participated in the drafting of the project, revision of the manuscript and guided the work.

Conflicts of interest

No financial, legal or political conflict involving third parties (government, business and private foundations, etc.) was declared for any aspect of the work submitted (including but not limited to grants and funding, advisory board, study design, manuscript preparation, statistical analysis, etc.).

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