

Does the quality of the home environment influence the functional abilities of infants in early childhood?

A qualidade do ambiente domiciliar influencia nas habilidades funcionais de crianças na primeiríssima infância?

¿Influye la calidad del entorno del hogar en las habilidades funcionales de niños en la primera infancia?

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ABSTRACT | The literature associates child development with the quality of the environment stimulation. However, few studies verify if this is associated with the infant's functional abilities. This study aims to assess which opportunities in the home environment are associated with functional mobility skills and social function of infants in early childhood and explain them. This is a cross-sectional and exploratory study with 74 infants aged from six to 18 months. The affordances in the home environment motor development - infant scale instrument was used to evaluate the opportunities in the home environment. The pediatric evaluation of disability inventory was used to assess the infants' functional abilities. We observed that infants' mobility can be explained in 45.6% (Adjusted $R^2=0.45$) and social function in 30% (Adjusted $R^2=0.30$) by the amount of gross motor skills toys, equipment and variety of stimulation in the home environment. We concluded that positions, toys, and materials that keep the infant more restricted and less active have a negative effect. On the other hand, toys that offer greater displacement and interaction favor the functional mobility skills and social function.

Keywords | Children; Functionality; Home.

RESUMO | A literatura extensamente associa o desenvolvimento infantil à qualidade da estimulação ambiental. Entretanto, são escassos os estudos que verificam se tal associação tem relação com as habilidades funcionais da criança. Este estudo tem por objetivo investigar quais oportunidades no ambiente domiciliar estão associadas e explicam às habilidades funcionais de mobilidade e função social de crianças na primeiríssima infância. Trata-se de um estudo transversal e exploratório feito com 74 crianças entre 6 e 18 meses. Para avaliar as oportunidades presentes no ambiente domiciliar, foi utilizado o instrumento *affordances in the home environment motor development - infant scale*. Para avaliar as habilidades funcionais das crianças, foi utilizado o inventário de avaliação pediátrica de incapacidade. Observou-se que a mobilidade das crianças pode ser explicada em 45,6% (R^2 ajustado=0,45) e a função social em 30% (R^2 ajustado=0,30) pela quantidade de brinquedos de motricidade grossa, pelos equipamentos e pela variedade de estimulação presente no ambiente domiciliar. Conclui-se que posições, brinquedos e materiais que mantêm a criança mais restrita e menos ativa exercem influência negativa. Por outro lado, brinquedos que oportunizam um maior

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deslocamento e interação favorecem as habilidades funcionais de mobilidade e função social.

Descritores | Crianças; Funcionalidade; Domicílio.

RESUMEN | La literatura ha asociado ampliamente el desarrollo infantil con la calidad de la estimulación en el entorno. Sin embargo, pocos estudios han verificado si esta asociación está relacionada con las habilidades funcionales del niño. Este estudio tiene como objetivo analizar y explicar qué oportunidades en el entorno del hogar están asociadas con las habilidades funcionales de movilidad y función social de niños en la primera infancia. Se trata de un estudio transversal y exploratorio, realizado con 74 niños de los 6 a los 18 meses de edad. Para evaluar las oportunidades presentes en el entorno del hogar, se

utilizó el instrumento *affordances in the home environment motor development – infant scale*. Para evaluar las habilidades funcionales de los niños, se utilizó el inventario para la evaluación pediátrica de la discapacidad. Se observó que la movilidad de los niños se puede explicar en un 45,6% (R^2 ajustado=0,45) y la función social en un 30% (R^2 ajustado=0,30) por la cantidad de juguetes de motricidad gruesa, equipos y por la variedad de estimulación presente en el entorno del hogar. Se concluye que las posiciones, juguetes y materiales que mantienen al niño más restringido y menos activo ejercen una influencia negativa. Por otro lado, los juguetes que aportan mayor movilidad e interacción favorecen las habilidades funcionales de movilidad y función social del niño.

Palabras clave | Niño; Funcionalidad; Residencia.

INTRODUCTION

Child development is a multidimensional process that consists of acquiring new abilities in different domains: motor, cognitive/linguistic, and social-emotional^{1,2}. This is a complex process influenced by biological, genetic and/or environmental factors and the home environment is the extrinsic factor that influence the most child development³.

A family environment conducive to the infant's development must have the standard characteristics of a home, enable interaction with parents, vary stimuli and have availability of toys⁴. Regarding quality indicators of the family environment, it includes the availability of reading and drawing materials and toys, as well as the engagement of parents in reading activities and games with the infant. Besides, the house and its surroundings are the first environments that infants experience and where they have contact with family members⁵. Therefore, an enriched environment will enable the child to observe and explore the environment, leading to motor action, that is, providing affordances – action opportunities⁶.

The child must develop a set of abilities to meet the daily environmental demands and gradually acquire greater autonomy. Silva et al.⁷ define functional abilities as those that allow to perform daily life activities specific to each age and, as they evolve, offer independence, autonomy, and better exploration of the environment. Examples of functional abilities that children daily perform include those related to eating, dressing, expressing needs, caring for personal

property, interacting with colleagues, controlling their behavior in a structured environment, communicating with others, and practicing safety⁸.

From pregnancy until three years of age, known as “very early childhood,” is considered a more favorable period to develop brain functions. Learning skills and the development of aptitudes and competences occur more easily in this phase, which allow the infant to improve increasingly complex future skills⁹.

Despite the extensive literature on the influence of the home environment in the different areas of development^{3,4}, the literature is scarce on the relationship between home environment and the infant's functional abilities⁵. Valadi et al.⁵, in a study of 254 children aged from 18 to 42 months, show that the opportunities in the family environment affect personal and social behavior, the child's ability to solve problems, and the communication skills, which are essential for them to exercise the social function. However, this study does not assess in detail which elements of the home could have such influence. Therefore, our study aims to assess which opportunities in the home environment are associated with the functional mobility skills and social function of infants in early childhood and to explain them.

METHODOLOGY

This is a quantitative, cross-sectional, and exploratory study. The study included infants of both sexes, aged six to 18 months, who were in the waiting line

for a university extension project that offered aquatic stimulation. Inclusion criteria were: infants aged from six to 18 months whose parents agreed to participate and sign an informed consent form. Those who showed any type of diagnosed disability and reported in the registration form of the project were excluded. A 0.20 effect, 0.05 α , and 0.8 power were considered to estimate the sample size, resulting in 70 participants¹⁰.

A form was structured for data and information collection, such as biological characteristics and family history. Besides, affordances in the home environment motor development - infant scale (AHEMD-IS) and the pediatric evaluation of disability inventory (PEDI) were used.

The AHEMD-IS is a structured interview that must be filled out according to the guardians' report and that assesses the opportunities in the home environment to promote motor development¹¹. This instrument has been translated into and validated for Portuguese and can be useful to evaluate the quantity and quality of opportunities in the home environment¹¹. The version for infants aged from three to 18 months consists of 35 questions divided into four dimensions: (1) physical space (internal and external space); (2) variety of stimulation; (3) fine motor skills toys; (4) gross motor skills toys. The scores were estimated with the aid of a calculator created by Pereira et al.¹⁰. The calculator offers the total classification of stimulation opportunities in the home environment and their dimensions in "inadequate," "moderately adequate," "adequate," and "excellent."

The PEDI aims to evaluate the functional abilities of children age from six months to 7.5 years. It is an evaluation that can be performed by a structured interview with the child's caregivers¹², which was translated into Portuguese and adapted for the sociocultural specificities of Brazil. Only the PEDI's functional mobility skills and social function part was used in this study. Regarding mobility, the child's locomotion in internal and external environments is evaluated; regarding social function, the child's understanding and problem-solving capacity is evaluated. For each item, the infants are assigned one point if they can perform the activity; and zero if they cannot perform it. The sum of the points results

in the raw total score of the functional mobility skills and social function separated. Then, the raw scores are transformed into standardized scores. The continuous standardized score was used in this study, which informs about the child's capacity level and ignores the child's age group. This type of score informs about the child's functional performance over a sequence of items that compose the scale: from the easiest to the most difficult, from zero to 100¹².

After initial contact and consent, data was collected by a pair of examiners in a reserved room, in the premises of the Department of Physical Therapy. The sociodemographic data sheet was applied, followed by the AHEMD-IS and PEDI. The duration of each collection had a mean of 50 minutes and occurred from May to December 2018.

The Statistical Package for Social Sciences version 25.0 was used to elaborate the database and the statistical analysis. The continuous mobility score and social function showed normal distribution.

For the construction of regression models, Spearman's correlation coefficient or chi-square test initially identified probable environmental factors associated with each of the two outcomes of interest. The univariate regression and then multivariate models were used for variables with $p < 0.05$. A $p < 0.05$ significance level was adopted for the regression models. GPower 3.1 software was used to estimate the sample size and effect size.

RESULTS

Initially, 96 parents were approached. Seven children were aged >18 months and $15 < 6$ months, therefore, they were excluded. The 74 infants participating in the study had a mean age of 10 months (± 3.4).

Table 1 shows the biological and sociodemographic characteristics of infants and their families.

We observed a similar distribution between sexes. Most parents have completed high school and most infants had full-term birth and are only children.

Table 2 describes the classification of the level of opportunity in the home environment. Most infants' home environments are "moderately adequate."

Table 1. Characterization of the participants

Variable	Characteristic	N	%
Sex	Male	36	48.6
	Female	38	51.4
Gestational age	Preterm	10	13.5
	Full term	64	86.5
Mother's schooling	Complete elementary school	2	2.7
	Complete high school	35	47.3
	Higher education	37	50
Father's schooling	Complete elementary school	8	10.8
	Complete high school	41	55.4
	Higher education	25	33.8
Number of siblings	None	49	66.2
	One	16	21.6
	Two or more	9	12.2

Table 2. Characteristics of the home environment

AHEMD-IS:	Characteristic	N	%
Physical Space	Inadequate	16	21.6
	Inadequate	16	21.6
	Adequate	27	36.5
	Excellent	15	20.3
Variety of stimulation	Inadequate	33	44.6
	Inadequate	19	25.7
	Adequate	12	16.2
	Excellent	10	13.5
Toys - fine motor skills	Inadequate	22	29.7
	Inadequate	23	31.1
	Adequate	23	31.1
	Excellent	6	8.1
Toys - gross motor skills	Inadequate	6	8.1
	Inadequate	18	24.3
	Adequate	36	48.6
	Excellent	14	18.9
Total	Inadequate	11	14.9
	Inadequate	27	36.5
	Adequate	23	31.1
	Excellent	13	17.6

The mean in the continuous score of functional mobility skills was 33.9 (± 13.3) and 42.3 (± 7.7) for social function.

Table 3 shows the univariate and multivariate regression analyses.

We observed that functional mobility skills can be explained in 45.6% of cases, with 0.67 effect size, by the following variables: (1) the amount of cars or other toys that can be pulled/pushed; (2) the amount of balls; (3) the

amount of rocking chairs and/or activity stations; (4) the infant's time awake and playing lying on the stomach (prone position); (5) the amount of toys suspended above or next to the infant.

Regarding social function, the amount of balls, the amount of rocking chairs and/or activity station and the infant's time awake and playing in prone position were statistically significant and explain 30% of the functional abilities of social function, with 0.43 effect size.

Table 3. Univariate and multivariate regression analysis

Functional Abilities	Univariate			Multivariate		
	B	β	<i>p</i>	B	β	<i>p</i>
Mobility				Adjusted R ² = 0.456 (p<0.001)		
Rocking chairs and activity station for infants	-11.81	-0.44	0.000**	-6.95	-0.26	0.008*
Amount of time awake playing in prone	-4.78	-0.41	0.000**	-4.68	-0.40	0.000**
Amount of time awake in the crib or fenced	-4.27	-0.37	0.001*	2.72	0.21	-
Cars and other toys that can be pulled or pushed	4.81	0.36	0.001*	3.29	0.24	0.027*
Balls of different sizes, textures, colors and shapes	4.28	0.31	0.008*	-3.624	-0.19	0.010*
Toys suspended above or next to the infant	-6.16	-0.33	0.004*	-	-	0.041*
Manipulable toys, such as rattles	-4.07	-0.26	0.025*	-	-	-
Dolls and other characters with accessories	3.05	0.42	0.030*	-	-	-
Social function				Adjusted R ² = 0.30 (p<0.001)		
Balls of different sizes, textures, colors, and shapes.	3.35	0.42	0.000**	3.13	0.39	0.000**
Dolls and other characters with accessories (bottle, helmet, furniture, etc.)	2.96	0.57	0.002*	-	-	-
Rocking chairs for infants, activity station, baby swings	-5.83	-0.38	0.001*	-4.75	-0.31	0.003*
Cars and other toys that can be pulled or pushed	2.41	0.32	0.006*	-	-	-
Amount of time awake playing in prone	-1.58	-3.38	0.040*	-1.52	-0.22	0.026*
Toys suspended above or next to the infant, mobiles and/or crib ornaments	-0.24	-0.31	0.006*	-	-	-

*p<0.05; **p<0.001

DISCUSSION

This study outcomes showed that the opportunities in the home environment—specifically the variety of stimulation and toys—interfere in the acquisition of functional mobility skills and social function of infants in early childhood.

Some positions and toys are recommended for infants in the first months of life, although they do not show advantages for older infants to acquire mobility and social function. For example, one outcome that explained both mobility and social function was the infant's longer period of time playing in prone position. According to Moir et al.¹³, time in prone position is a form of physical activity recommended for infants aged under six months. In our study, the longer the infant played in prone, the worse the mobility and social function indexes were. The infants' age can explain this factor. The mean age was 10 months, that is, most infants no longer remained in this position. Similarly, the analysis of the amount of suspended toys, such as mobiles and/or crib ornaments, showed a negative correlation with the mobility outcome. According to Waksman and Harada¹⁴, this type of toy is recommended for infants in the first months of life because the infant,

in this period, is still unable to grab and handle objects above their head.

Our study showed that rocking chairs and/or activity stations in which the infant is playing standing negatively correlate and may explain the infants' mobility and social function. Pin et al.¹⁵ suggested that the infant can be left in a high chair for a long time without any interaction with toys or people. According to Barros et al.¹⁶, when infants are kept unable to move freely, their learning and the use of feedback and feedforward mechanisms—which are essential to acquire motor skills—can be impaired.

On the other hand, the amount of gross motor skills toys explains these infants' mobility and social function. The infant who plays with different types of balls favors walking from one side to another seeking the toy, which offers movements that express emotions and gestures¹⁷. Besides, playing ball requires contact and interaction with another person, which helps the socialization process. The same occurs when the mobility outcome is associated with the amount of toys such as cars or other toys that the infant can pull or push. From the moment the infants can move on their own, the toy will serve as a stimulus for them to leave their initial position and move. According to Adolph

and Hoch¹⁸, the infants have greater autonomy when they acquire the ability to move around by crawling and walking, which facilitate the interactions with people, places, and objects.

Our study shows a high level of parental schooling, an indicator of adequate care for children¹⁹. In the study by Freitas et al.²⁰, the results indicate that parents with higher schooling levels are better inserted in the labor market, which guarantees them better wages and allows them to invest more in the family's well-being. However, we observed that almost half of the homes were considered "inadequate" for the variety of stimulation. The amount of toys and material resources do not guarantee an adequate home environment²¹.

We emphasize that this study limitation is its methodological design that restrains a cause-effect relationship. However, the results show an association between the quality of the home environment and functional skills, which indicates possibility to conduct longitudinal or experimental studies.

CONCLUSION

The opportunities offered by the home environment can interfere in the acquisition of functional mobility skills and social function of infants in early childhood. Positions, toys, and materials that keep the infant more restricted and less active have a negative influence. On the other hand, toys that offer greater locomotion and interaction favor the functional abilities.

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