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ARTIGO ORIGINAL

Motor development of infants exposed to HIV: affordances in the home environment

Desenvolvimento motor de lactentes expostos ao HIV: oportunidades no ambiente domiciliar

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ABSTRACT

The objective of this study was to evaluate whether the environment and the sociodemographic and clinical variables of the family member and the infant vertically exposed to the Human Immunodeficiency Virus (HIV) interfere in the home opportunities for infant motor development. This is a cross-sectional study, in Southern Brazil, carried out between December 2015 and September 2017, with 83 family members and their respective infants vertically exposed to HIV, using two instruments: infant and family questionnaire and the Affordances in the Home Environment for Motor Development - Infant Scale. Analysis was performed with Pearson and Spearman correlation and simple linear regression. Opportunities (affordances) were moderately adequate, with significant positive associations between the variables of age of the family member and infant, education level, and presence of a sibling exposed to HIV and the dimensions of physical space, variety of stimulation, and toys for gross and fine motor skills. We conclude that the sociodemographic variables of the family member and the infant interfered in the opportunities for infant motor development at home.

Descriptors: Infectious Disease Transmission, Vertical; HIV; Infant; Child Development; Environment.

RESUMO

Objetivou-se avaliar se as variáveis do ambiente e as sociodemográficas e clínicas do familiar e do lactente verticalmente exposto ao Vírus da Imunodeficiência Humana (HIV) interferem nas oportunidades no domicílio para o desenvolvimento motor infantil. Estudo transversal, no Sul do Brasil, entre dezembro de 2015 a setembro de 2017, com 83 familiares e seus respectivos lactentes verticalmente expostos ao HIV, utilizando dois instrumentos: questionário do lactente e familiar e o *Affordances in the Home Environment for Motor Development - Infant Scale*. Análise com correlação de *Pearson* e *Spearman* e regressão linear simples. As oportunidades foram moderadamente adequadas, com associações positivas significativas entre as variáveis idade do familiar e do lactente, escolaridade e possuir irmão exposto ao HIV e as dimensões espaço físico, variedade de estimulação, brinquedos de motricidade grossa e fina. Conclui-se que as variáveis sociodemográficas do familiar e do lactente interferiram nas oportunidades para desenvolvimento motor infantil no domicílio.

Descritores: Transmissão Vertical de Doença Infecciosa; HIV; Lactente; Desenvolvimento Infantil; Meio Ambiente.

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How to cite this article: Ferreira T, Ceretta PS, Padoin SMM, Paula CC. Motor development of infants exposed to HIV: affordances in the home environment. Rev. Eletr. Enferm. [Internet]. 2021 [cited _____];23:59961. Available from: https://doi.org/10.5216/ree.v23.59961.

Received: 08/15/2019. Approved: 11/11/2020. Published: 02/03/2021.

INTRODUCTION

Infant motor development comprises a sequential process of acquiring simple, organized, and complex movement skills, according to the child's age. This process is influenced by biological and environmental factors, such as health, nutrition, safety, care, and stimulation conditions[1], especially in the first 1,000 days, from conception to the end of the second year of life[2].

During this period, the family is primarily responsible for promoting care and stimuli for motor development[1]. Therefore, home is the first environment of opportunities to promote child development, whether through physical space, interaction with family members and other children, games, or encouragement of fine and gross motor skills[3]. Studies show that opportunities in the home environment promote infant motor development[4-5] in different cultures, such as Japan[6], Lebanon, United States[7], Portugal[8], and Brazil[9].

The evaluation of home opportunities has also been developed in investigations that compared children of adults and adolescents[10] with and without the presence of the grandmother[11], in different socioeconomic conditions[9], or clinical conditions such as prematurity[12] and impaired visual acuity[13]. These results indicate the need to assess opportunities at home considering chronic conditions and other clinical specificities.

Among the biological factors and considering chronic conditions, we highlight vertical exposure to the Human Immunodeficiency Virus (HIV), which can happen during pregnancy, childbirth, and breastfeeding, as it may have an infection outcome if prophylactic measures are not adopted[14]. In cases of HIV infection, there is a risk for adequate child development, as pointed out in a study conducted with 195 children under two years of age who, even after viral suppression, maintained risks for developmental delay, social interaction, and problem solving[15].

As for environmental factors, we highlight that the environment of infants exposed to HIV is influenced by stigma and prejudice, which favors the concealment of the diagnosis, sometimes social isolation, and restricts the support network[16]. The evaluation of the motor development of 40 infants exposed to HIV, aged from zero to 18 months, has shown that, among those with suspected motor development, the majority did not receive adequate stimuli at home[17].

It was clear the scarcity of scientific evidence and the knowledge gap regarding the sociodemographic and clinical issues of the family member and infant when we found only one study on home opportunities and the condition of HIV infection[18]. This research was developed in a specialized service in the Southeast region of Brazil with a population of 49 infants divided into those exposed and not exposed to HIV. There were no differences between the groups in relation to the mother-child bond, motor, cognitive, and language development, and the affordances of the environment, which justifies this investigation in other national scenarios. Thus, the objective of this study was to evaluate whether the environment and the sociodemographic and clinical variables of the family member and the infant vertically exposed to HIV interfere in the home opportunities for infant motor development.

METHOD

This is a cross-sectional study carried out from December 2015 to September 2017, in the municipality of Santa Maria, Rio Grande do Sul (RS), Brazil. The municipality is in the 60th position in the ranking of the 100 Brazilian municipalities with the highest HIV composite index, which is calculated from the rates of detection, mortality, and first CD4 count, in the last five years.

Study participants were family members of infants vertically exposed to HIV, aged between three and eighteen months who were being monitored in a health service. The inclusion criterion was the following one: the family member should follow the daily routine of the infant exposed to HIV. On the other hand, the exclusion criteria were the following: hospitalization, loss of outpatient follow-up (≥ 1 year without access), and/or no telephone contact (after 10 attempts on different days and shifts). The sample was non-probabilistic and intentional.

Access to participants occurred on consultation days at the specialized service. For those without an appointment scheduled during the data collection period, we sought a telephone contact provided by the health service.

The population of infants vertically exposed to HIV assisted in the referred service was 134, according to notifications from June 2014 to June 2017. Of these, seven infants were institutionalized and twenty-six lost outpatient follow-up and/or no telephone contact was registered. In addition, fifteen family members refused to participate and three dropped out. The researched population consisted of 83 infants.

For data collection, two instruments were applied through an interview by a team (three master students and six undergraduate students) duly trained by the project coordinator, who also supervised the collection, with weekly meetings.

The first instrument was a questionnaire designed to characterize the profile of the family member and the exposed infant, composed of sociodemographic variables of the family member: gender (male or female), age (17 to 26 years, 27 to 36, 37 to 46), marital status (partner, divorced, single, widowed), education level (no education, complete elementary school, incomplete elementary school, high school, university), municipality of residence, area

(urban, rural, peri-urban), employment status (unemployed, employee with a formal contract, employee without a formal contract), monthly family income considering the minimum wage in the amount of BRL 879.00 (no income, one salary, from one to two, three or more), number of persons living with the income (≤ two to five people), relationship with the infant (mother, father, adoptive parents), presence of another child in their care (yes or no), and number of children (one child, between two to four children, more than five children). The clinical variables, also collected in the interview, were the following: diagnosis of HIV (yes or no), route of infection (unknown, sexual, ignored), time of diagnosis (<1 year, 1 to 5, 6 to 10, >11), undergoing treatment for HIV (yes or no), any health problem (yes or no), alcohol consumption (yes or no), and drug use (yes or no).

The following sociodemographic variables of the exposed infant were also collected in the interview: age and presence of siblings exposed vertically to HIV (none, one to two, ≥ three siblings). In addition, the following clinical variables of the infant were collected: premature birth (yes or no), health problems (yes or no), which health problem (respiratory system disease, genitourinary system disease, some infectious and/or parasitic disease, other), health surveillance (hard, more or less, easy), and use of medication.

The second instrument was the Affordances in the Home Environment for Motor Development - Infant Scale (AHEMD-IS), in which the term affordances is used to express the opportunities for action offered by the environment to the individual[3]. It is an instrument validated in Brazil, consisting of a characterization of the environment: type of residence (house, apartment), number of bedrooms (one to two, three or more), number of adults (one to two, three or more), number of children (one to two, three or more), time living at the residence (<3 months, 3 to 6, 7 to 12, >12 months), and if the infant attends day care (never, <3 months, 3 to 6, 7 to 12, >12 months). The instrument also has 35 items that allow the assessment for the age group of 3 to 11 months and 12 to 18 months of age. It has dichotomous questions (yes and no), of the Likert type (never, sometimes, almost always, always), and questions regarding the amount of toys (none, one or two, three or more). Opportunities are classified according to age and dimension (physical space, variety of stimulation, toys for fine motor skills, toys for gross motor skills).

The assessment is ended by the sum of the scores by dimension and total, which classifies the environment as less than adequate (0 to 18 points for those aged 3 to 11 months and 0 to 27 points for those aged 12 to 18 months), moderately adequate (19 to 23 points for those aged 3 to 11 months and 28 to 33 points for those aged 12 to 18 months), adequate (24 to 27 points for those aged 3 to 11 months and 34 to 40 points for those aged 12 to 18 months), and excellent (28 to 49 points for those aged 3 to 11 months and 41 to 67 points for those aged 12 to 18 months)[3].

Data insertion was performed using the Epi-info® program, version 7.2, with independent double entry to ensure the accuracy of the data. After correcting errors and inconsistencies, the data were exported to the statistical program R. The variables were described by absolute and relative frequencies. Independent variables were those belonging to the characterization of the environment and the sociodemographic and clinical conditions of the family member and infant. The dependent variable was the AHEMD-IS scores by dimension and total.

The association of variables was performed using the Pearson and Spearman correlation tests. The use of more than one correlation indicator is justified because of the greater precision in the relationship between variables. They are used to confirm another association indicator that is less sensitive to the lack of adherence of the data to a normal distribution (or small samples). For simple linear regression, the Ordinary Least Squares Method was used for the characterization variables with the total score of the instrument; the Bootstrap Resampling Method was later applied to it. The level of significance was 5% ($p \leq 0.05$).

This study was approved by the Research Ethics Committee of the Federal University of Santa Maria (CAAE No. 50609615.1.0000.5346), and it had an Informed Consent.

RESULTS

The family member responsible for the care of the infant was mainly a woman (97.6%), aged 27 to 36 years (50.6%), in a common-law marriage (71.1%), with two to four children (60.2%), high school education (53.0%), residing in the municipality of Santa Maria (73.5%), in an urban area (84.3%), unemployed (65.1%), with monthly family income between one and two minimum wages (42.2%), with three to five people living with this income (72.3%). As for the bond, most were mothers (95.2%), who also have other children in their care (66.3%); however, infants with no siblings vertically exposed to HIV (60.2%) were the majority, and the infant's health surveillance was considered easy (61.4%).

In the clinical characterization of family members, most have a positive diagnosis of HIV (95.2%), as sexual infection (54.2%), with knowledge of the diagnosis between one and five years (38.6%), undergoing antiretroviral treatment (88.0%), without health problems (85.5%), without the consumption of alcohol (65.1%) and other drugs (96.4%).

As for the characteristics of the environment, most live in houses (94%), with up to two bedrooms (72.3%), living with one to two adults (74.7%) and one to two children (65.1%), with residence time over 12 months (66.3%) with the infant

living only in it, and the majority never attended day care (84.3%). The outdoor physical space was considered safe and adequate (88.0%), with different types of floors (60.2%) and the presence of support furniture (65.1%). Inside, there was the absence of more than one type of floor (62.7%) and steps or stairs (74.7%).

For stimulation, many infants play with other children (79.5%) and are encouraged to learn body parts (91.6%), are free to move around the house (60.2%), without the need for equipment to stand (65.1%). Many infants have toys for gross motor skills, such as plush animals (72.3%), musical toys (44.6%), or toys that stimulate movement (55.4%), and toys for fine motor skills, such as rattles (53.0%), play figures (41.8%), or toys that imitate household objects (36.4%).

Table 1 shows the frequency of responses for each dimension of the AHEMD-IS instrument, and we highlight that the questions of physical space and variety of stimulation apply to all infants (n = 83) while those related to toys followed the indication of age group, <1 year old (n = 28, 33.7%) and ≥ 1 year old (n = 55, 66.3%).

Table 2 presents the results of the sum of the questions obtained in each dimension of the instrument and by the age group of the infant, with a moderately adequate assessment of the opportunities in the total score for both < 1 year old (23.11) and ≥ 1 year old (31.45). When assessed by dimension, it remained moderately adequate, regardless of age, except for the variety of stimulation for infants aged <1 year, which was adequate to provide opportunities for infant motor development (12,14).

Statistical tests were applied only to data from infants aged ≥ 1 year because of the greater number in this stratified group and statistical precepts. The association between the characterization variables and the results obtained in each of the dimensions of the AHEMD-IS was considered significant only when present in both tests (Table 3).

Table 1. Frequency of responses per question of the Affordances in the Home Environment for Motor Development - Infant Scale, Santa Maria, RS, Brazil, 2017 (n = 83).

Questions		n (%)			
		Yes			
Dimension - Physical Space	Outside your home is there a safe, adequate, and large space for your child to play and move freely?	73 (88.0%)			
	More than one type of ground texture in the outside space.	50 (60.2%)			
	One or more sloped surfaces.	25 (30.1%)			
	Any type of equipment in which your child can pull herself/himself up to a standing position and/or walk?	54 (65.1%)			
	Steps or stairs in the outside space.	38 (45.8%)			
	More than one type of floor texture in the inside space.	31 (37.3%)			
	Steps or stairs in the inside space.	21 (25.3%)			
Dimension - Variety of Stimulation	My/our child regularly plays with other children.	66 (79.5%)			
	I/we regularly play games with my/our child to practice learning about body parts.	76 (91.6%)			
		Always	**Almost always**	**Sometimes**	**Never**
	Carried in adult arms, attached to caregiver's body, or in some carrying device.	18 (21.7%)	9 (10.8%)	43 (51.8%)	13 (15.7%)
	In a seating device that keeps the child seated.	15 (18.1%)	19 (22.9%)	40 (48.2%)	9 (10.8%)
	In a walking device.	6 (7.2%)	8 (9.6%)	15 (18.1%)	54 (65.1%)
	In a playpen, crib, or other similar place, which the child cannot leave without help.	10 (12.0%)	16 (19.3%)	26 (31.3%)	31 (37.3%)
	In tummy time play.	19 (22.9%)	13 (15.7%)	27 (32.5%)	24 (28.9%)
	Free to move around the house.	50 (60.2%)	10 (12.0%)	10 (12.0%)	13 (15.7%)

Table 1. Frequency of responses per question of the Affordances in the Home Environment for Motor Development - Infant Scale, Santa Maria, RS, Brazil, 2017 (n = 83). (sequel)

Questions		n (%)		
		Zero	**One to two**	**Three or more**
Dimension - Toys for Gross Motor Skills	Toys suspended above or to the side of the baby, mobiles, ornaments.	40 (48.2%)	35 (42.2%)	8 (9.6%)
	Plush animals, rubber toys, fabric, or other soft materials, to play in the water.	9 (10.8%)	14 (16.9%)	60 (72.3%)
	Infant swings, exersaucers, johnny jumpers.	51 (61.4%)	32 (38.6%)	-
	Balls of different sizes, textures, colors and shapes.	34 (41.0%)	28 (33.7%)	21 (25.3%)
	Materials that stimulate locomotion (walkers, mats, climbing equipment).	36 (43.4%)	46 (55.4%)	1 (1.2%)
	Musical materials: instruments, music boxes hand-cranked by the child.	22 (26.5%)	37 (44.6%)	24 (28.9%)
	Objects or toys that encourage the child to get up and walk with support*. (n = 55)	23 (41.8%)	25 (45.5%)	7 (12.7%)
	Activity tables where the baby can play standing up*. (n = 55)	38 (69.1%)	17 (30.9%)	-
	Outdoor type baby swings, rocking toys, baby tricycles*. (n = 55)	18 (32.7%)	34 (61.8%)	3 (5.5%)
Dimension - Toys for Fine Motor Skills	Graspable toys: rattles, teethers, toys with different textures and/or mirrors.	9 (10.8%)	44 (53.0%)	30 (36.1%)
	Trains, cars, animals, or other toys that can be pulled and pushed.	43 (51.8%)	22 (26.5%)	18 (21.7%)
	Roly-poly, pop-up, spinning toys.	45 (54.2%)	23 (27.7%)	15 (18.1%)
	Blocks (plastic, sponge, cloth, cardboard, wooden, rubber).	59 (71.1%)	22 (26.5%)	2 (2.4%)
	Books for babies (cloth, cardboard, or plastic).	43 (51.8%)	18 (21.7%)	22 (26.5%)
	Shape sorters*. (n = 55)	25 (45.5%)	22 (40.0%)	8 (14.5%)
	Soft hand or finger puppets*. (n = 55)	41 (74.5%)	9 (16.4%)	5 (9.1%)
	Dolls and other play figures with accessories*. (n = 55)	15 (27.3%)	17 (30.9%)	23 (41.8%)
	Home activity toys: telephone, kitchen utensil sets, tool sets*. (n = 55)	18 (32.7%)	17 (30.9%)	20 (36.4%)
	Stacking toys*. (n = 55)	34 (61.8%)	17 (30.9%)	4 (7.3%)
	Puzzles for babies (2-6 pieces)*. (n = 55)	45 (81.8%)	9 (16.4%)	1 (1.8%)

* Toys recommended only for children older than one year.

Source: Designed for this study..

Thus, the statistically significant variable for physical space opportunities was income (p = 0.007 and p = 0.011) with a positive influence. Variety of stimulation showed a positive association with having a sibling exposed vertically to HIV (p = 0.006 and p = 0.009), and the older the family member (p = 0.019 and p = 0.049) and the infant (p < 0.001 and p = 0.001) the greater this opportunity. As income (p = 0.008 and p = 0.005) and the age of the infant (p = 0.014 and p = 0.005) increase, the opportunity for toys for gross motor skills also increases, while toys for fine motor skills maintained an association only with the age of the infant (p = 0.050 and p = 0.032). Correlations were low, except for the variety of stimulation X age of the infant, which was moderate.

Table 2. Description and descriptive classification by dimension of the assessment of infants vertically exposed to HIV according to Affordances in the Home Environment for Motor Development - Infant Scale, Santa Maria, RS, Brazil 2017 (n = 83).

Dimension	< 1 year old (n = 28)			≥ 1 year old (n = 55)		
	Média ± DP	Mín-Máx	Categoria	Média ± DP	Mín-Máx	Categoria
Physical Space	3.39 ± 1.499	0-7	Moderately adequate	3.58 ± 1.652	0-7	Moderately adequate
Variety of Stimulation	12.14 ± 2.353	9-19	Adequate	12.96 ± 2.981	8-20	Moderately adequate
Toys for gross motor skills	4.50 ± 2.269	1-9	Moderately adequate	7.09 ± 2.737	0-13	Moderately adequate
Toys for fine motor skills	3.07 ± 1.999	0-7	Moderately adequate	7.82 ± 4.037	1-18	Moderately adequate
Total score	23.11 ± 4.848	14-31	Moderately adequate	31.45 ± 7.972	14-50	Moderately adequate

SD: Standard deviation; Min-Max: minimum and maximum.

Source: Designed for this study.

Table 3. Spearman and Pearson correlations for the characterization variables with the results of the dimensions of the Affordances in the Home Environment for Motor Development - Infant Scale, Santa Maria, RS, Brazil, 2017 (n = 55).

Variable	Space Physical		Variety of Stimulation		Toys for gross motor skills		Toys for fine motor skills	
	r	P	r	p	r	p	r	P
Age of the family member (n = 55)								
Spearman	0.267*	0.049	0.315*	0.019	0.248	0.068	0.176	0.198
Pearson	0.219	0.109	0.266*	0.049	0.259	0.056	0.176	0.199
Income (n = 54)								
Spearman	0.362**	0.007	0.204	0.140	0.357**	0.008	0.174	0.209
Pearson	0.342*	0.011	0.211	0.126	0.375**	0.005	0.185	0.181
Age of the infant (n = 55)								
Spearman	#CAMPO!	0.340	0.511**	< 0.001	0.331*	0.014	0.265	0.050
Pearson	#CAMPO!	0.566	0.428**	0.001	0.372**	0.005	0.289*	0.032
Sibling exposed vertically to HIV (n = 55)								
Spearman	0.018	0.898	0.364**	0.006	0.082	0.552	0.195	0.154
Pearson	0.052	0.708	0.347**	0.009	0.080	0.561	0.148	0.279

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Source: Designed for this study.

The characterization variables of age of the family member (p = 0.004) and the infant (p = 0.003), education level (p = 0.000), and presence of a brother vertically exposed to HIV (p = 0.026) had an influence on the total score of the AHEMD-IS for infants aged ≥ 1 year, by regression, according to the Ordinary Least Squares Method, with similar results after the Bootstrap Resampling Method (Table 4). At the time of the analysis, we observed an absence or incomplete response, thus leaving data on 54 infants.

DISCUSSION

The characteristics of the environment of infants vertically exposed to HIV in this study were similar to that described

Table 4. Ordinary Least Squares Method for association between characterization variables and total score of the Affordances in the Home Environment for Motor Development - Infant Scale, and Bootstrap Resampling, of infants vertically exposed to HIV older than one year, Santa Maria, RS, Brazil, 2017 (n = 54).

	Coefficient (OLS)	Standard error	P value	*Bootstrap[a] Resampling*	*CI 95% Bootstrap*
Constant	Bootstrap				
6.612	0.362				
Age of the family member	0.418	0.141	0.004	0.423	(0.189 – 0.684)
Education level	2.572	0.836	0.003	2.536	(0.710 – 4.425)
Age of the infant	0.774	0.196	0.000	0.780	(0.436 – 1.142)
Sibling exposed vertically to HIV	3.206	1.405	0.026	3.384	(0.087 – 5.712)

[a]1000 Bootstrap replicates. CI - confidence interval.

Dependent variable average 31.48148; standard deviation 8.044078; Residual Sum of Squares 1985,142; SD of regression 6.364991; R-squared 0.421154; Adjusted R-squared 0.373901; F(4,49) 8.912788; P-value (F) 0.000017; Log-likelihood -173.9432; Akaike Information Criterion 357.8863; Schwarz Criterion 367.8312; Hannan-Quinn Information Criterion 361.7217.

RESET test for specification: null hypothesis: the specification is adequate; test statistic: F(2,47) = 0.100627 with p-value = P(F(2, 47) > 0.100627) = 0.904465.

Breusch-Pagan test for heteroskedasticity: null hypothesis: no heteroskedasticity; test statistic: LM = 1.61182 with p-value = P (Chi-square (4) > 1.61182) = 0.806667.

Residual normality test: null hypothesis: the error has a normal distribution; Shapiro-Wilk W = 0.980122, with p-value 0.5056; and Lilliefors Test = 0.0816073, with p-value = 0.480.

in other works, regarding the main type of residence being a house[8,10], presence of one to two adults and one to two children in the residence[9], and not attending day care[9-10,12]. This indicates that the home of infants vertically exposed and not exposed to HIV may present opportunities for promoting development, especially as the main place for so.

It is expected that the environment of infants exposed to HIV presents an opportunity for physical space, variety of stimulation, and availability of safe and appropriate toys for their motor development. A study in the southern region of Brazil with 561 infants pointed out that motor development was significantly related to environmental opportunities, such as physical space at home to move freely, stimulation with body play, interaction with other children, and number of toys for fine and gross motor skills[4]. Thus, the presence of opportunities in the environment favored the motor development of the exposed infants in the study, which was moderately adequate, except for the variety of stimulation in children under one year, which was adequate.

In the state of Rio Grande do Sul, Brazil, a study with 17 infants of adolescent mothers showed that the opportunities were classified as low and all dimensions of the AHEMD-IS had very weak scores[11]. Another study carried out in Paraná, Brazil, with 72 children showed that opportunities were classified as weak for boys and very weak for girls[19]. Regional differences in home environments show the importance of using the instrument in different contexts to assess discrepancies in opportunities and the possible long-term impact on motor development.

In an international panorama, studies referring to the assessment of opportunities at home in different cultures with 225 children from Lebanon, 367 from the United States[7] and 97 from Portugal[8], using the version of AHEMD validated for the age group of 18 and 42 months, presented higher scores in the dimensions of outside space and variety of stimulation for American and Portuguese children. For Lebanese children, there was greater availability of opportunities regarding the inside physical space and toys for fine and gross motor skills[7]. Furthermore, the opportunities of Portuguese children were classified as of insufficient quantity and quality compared to those offered by the day care, classified as good[8]. This reinforces the need to assess opportunities also in different cultures, considering the inside and outside environment, especially when we consider the scarcity of evidence on the specificity of the population of infants vertically exposed to HIV.

In view of the significant variables with a positive correlation, we point out that the older the family member, the better the result for the variety of stimulation. We assume that this is due to the experience acquired over time regarding care and stimuli, since the majority (97.6%) of the family members were women with more than one child. A study in southern Brazil, with 40 infants of adolescent and adult mothers, has found that adolescent mothers have less

knowledge of child development and their children have greater deprivation of stimulation[10].

The greater the age, from the first year of life, the greater the variety of stimulation and availability of toys. A study of 300 children in the Southeast of Brazil has found that older children (13-18 months) were more stimulated and had more toys than younger children (3-6 and 7-12 months)[9]. Another study with 66 infants in the same region has found a positive correlation between age and availability of toys, and the age group of 12-18 months allows the infants to explore toys with both fine and gross motor skills, which is consistent with the advancement of locomotion skills[20]. The increase in age triggers the acquisition of skills and improves interactions, which converges with the development process.

The presence of a brother vertically exposed to HIV also influenced the variety of stimulation and availability of toys. A study in the Northern region of Brazil with 300 children not exposed to HIV showed that the number of siblings present in the family environment (environmental factor) can influence the child's motor development, and the presence of one or two children increased the possibility of delay when compared to the presence of three to four children at home[21]. We believe that the presence of a sibling exposed to HIV indicates that the family member has prior knowledge of the clinical condition, which favors interaction with other children and provides a variety of stimulation and use of toys for motor skills.

For infants vertically exposed to HIV, there was a significant positive correlation of income with physical space and toys for gross motor skills, and as income increases, opportunities also increase. One study carried out in the Northern region of Brazil with 300 children (36 to 42 months), belonging to families with monthly income between BRL 1,500.00 to BRL 2,499.00, has shown that these children were more likely to have a developmental delay[22]. Another study considered that motor and cognitive development was adequate in babies of adult mothers and correlated positively with higher education of parents, higher frequency of mothers working outside the home, and, consequently, higher family income[10], which indicates that the spatial dimension is influenced by family socio-economic class and income[9]. Thus, the higher family income provides infants and children with better living conditions, with wide and safe spaces to move and play, as well the acquisition of toys in great variety and quantity.

In the regression, the variables of age of the family member and infant, education level, and presence of a brother vertically exposed to HIV, together, explained 37% of the result obtained for the instrument's total score, that is, they moderately determine the total score. Among them, education level stands out, being in this study specifically represented by maternal education. This means that the higher the level of education, the greater the possibilities of access to information and different opportunities for child development. There is evidence of positive and significant associations for maternal education[4,21], and families where both parents had an undergraduate degree provided significantly more toys than families with high school education[9]. Thus, connections are evident between socioeconomic variables and better opportunities for stimulating infant motor development.

The results of this study showed that the opportunities offered by the environment for the motor development of the infant vertically exposed to HIV in Santa Maria are influenced by the variables of age of the family member and the infant, education level, and presence of a brother exposed to HIV. A longitudinal investigation in the State of Rio Grande do Sul, Brazil, with 49 babies not exposed to HIV has shown that environmental and cognitive factors explained most of the variability in motor development at the expense of biological factors[23]. On the other hand, another longitudinal study in Africa with 989 children exposed to HIV related depression, hospitalization, treatment, and the death of the family member resulted in negative results in the development of the child[24]. We highlight that, in the social insertion of this home space, there is the presence of stigma and prejudice related to the HIV epidemic. They limit social interaction by restricting the child to playing in the house, only with siblings under the supervision of the family member[25].

Therefore, the assessment of the opportunities in the home environment of the infant vertically exposed to HIV provides subsidies to reinforce opportunities in the physical space, variety of stimulation, and toys. It can thus continue to perpetuate in the face of a positive diagnosis, so that exposed infants can continue to play with other children and explore different physical spaces and toys.

The availability of opportunities for child development reinforces the importance of considering dimensions related to biological and environmental factors. As for biological factors, the unprecedented nature of this investigation is in the population evaluated with the clinical condition of vertical exposure to HIV. As for the environmental factor, we recognize the limitation of this assessment without observation at home. The results should help other longitudinal research studies, considering infant motor development as continuous and multifactorial.

We recommend the use of AHEMD-IS in the professional practice as an instrument to assess the quantity and quality of opportunities at home and to guide conducts to promote development and prevent accidents, guiding on alternatives for expanding the physical space and on safe and age-appropriate stimuli.

CONCLUSION

We conclude that the characteristics of the family member (age, education level, and income), the infant (age and presence of a brother exposed vertically to HIV), and the environment (physical space, variety of stimulation, and toys) interfere in the home opportunities for the motor development of infants vertically exposed to HIV in Santa Maria (RS/Brazil).

ACKNOWLEDGMENTS

Our gratitude to the students of the Scientific Initiation Scholarship Program, that worked in the data collection: Fernanda Severo da Silva, Thayla Rafaella Pasa Toebe, Marina de Oliveira Pereira, Thomaz da Cunha Figueiredo, Vitoria Montiel, Helena Rocha Machado, Daiane Ferreira Langendorf and Rose Löbell. And to the teachers Dr. Stela Maris de Mello Padoin and Dr. Tassiane Ferreira Langendorf, researchers of the GP-PEFAS, for the contributions in the project's workshops.

RESEARCH SUPPORTED BY

National Council of Scientific and Technological Development (CNPq), Brazil, Universal notification nº 01/2016 (course A) process number 408710/2016-0.PPSUS of the Foundation of Assistance on Research of Rio Grande do Sul (FAPERGS), Brazil, Research Program to the SUS: shared administration in health nº 03/2017 (course 02) process number 17/25510001452-9.

REFERENCES

1. Black MM, Walker SP, Fernald LCH, Andersen CT, DiGirolamo AM, Lu C, et al. Early childhood development coming of age: science through the life course. Lancet [Internet]. 2017 [cited 2021 jan 22];389(10064):77-90. Available from: https://doi.org/10.1016/S0140-6736(16)31389-7.
2. Cunha AJLA, Leite ÁJM, Almeida IS. The pediatrician's role in the first thousand days of the child: the pursuit of healthy nutrition and development. J Pediatr (Rio J) [Internet]. 2015 [cited 2021 jan 22];91(6):S44-51. Available from: https://doi.org/10.1016/j.jped.2015.07.002.
3. Caçola PM, Gabbard C, Montebelo MIL, Santos DCC. Further development and validation of the affordances in the home environment for motor development-infant scale (AHEMD-IS). Phys Ther [Internet]. 2015 [cited 2021 jan 22];95(6):901-23. Available from: https://doi.org/10.2522/ptj.20140011.
4. Saccani R, Valentini NC, Pereira KR, Müller AB, Gabbard C. Associations of biological factors and affordances in the home with infant motor development. Pediatr Int [Internet]. 2013 [cited 2021 jan 22];55(2):197-203. Available from: https://doi.org/10.1111/ped.12042.
5. Miquelote AF, Santos DCC, Caçola PM, Montebelo MIL, Gabbard C. Effect of the home environment on motor and cognitive behavior of infants. Infant Behav Dev [Internet]. 2012 [cited 2021 jan 22];35:329-34. Available from: https://doi.org/10.1016/j.infbeh.2012.02.002.
6. Mori S, Nakamoto H, Mizuochi H, Ikudome S, Gabbard C. Influence of Affordances in the Home Environment on Motor Development of Young Children in Japan. Child Dev Res [Internet]. 2013 [cited 2021 jan 22];2013:898406. Available from: https://doi.org/10.1155/2013/898406.
7. Ammar D, Acevedo GA, Cordova A. Affordances in the home environment for motor development: a cross-cultural study between american and lebanese children. Child Child Dev Res [Internet]. 2013 [cited 2021 jan 22];2013:152094. Available from: https://doi.org/10.1155/2013/152094.
8. Pedrosa C, Caçola P, Carvalhal MIMM. Fatores preditores do perfil sensorial de lactentes dos 4 aos 18 meses de idade. Rev. Paul. Pediatr. [Internet]. 2015 [cited 2021 jan 22];33:160-6. Available from: https://doi.org/10.1016/j.rpped.2014.11.016.
9. Freitas TCB, Gabbard C, Caçola P, Montebelo MIL, Santos DCC. Family socioeconomic status and the provision of motor affordances in the home. Braz J Phys Ther [Internet]. 2013 [cited 2021 jan 22];17(4):319-27. Available from: https://doi.org/10.1590/S1413-35552013005000096.
10. Borba LS, Pereira KRG, Valentini NC. Motor and cognitive development predictors of infants of adolescents and adults mothers. J Phys Educ [Internet]. 2017 [cited 2021 jan 22];28(1). Available from: https://doi.org/10.4025/jphyseduc.v28i1.2811.
11. Oliveira AS, Chiquetti EMS, Santos H. Caracterização do desenvolvimento motor de lactentes de mães adolescentes. Fisioter. Pesqui. [Internet] . 2013 [cited 2021 jan 22];20(4):349-54. Available from: https://doi.org/10.1590/S1809-29502013000400008.
12. Bueno EA, Castro AAM, Chiquetti EMS. Influência do Ambiente Domiciliar no Desenvolvimento Motor de Lactentes Nascidos Pré-Termo. Rev Neurocienc [Internet]. 2014 [cited 2021 jan 22];22:45-52. Available from: https://doi.org/10.34024/rnc.2014.v22.8118.
13. Lage JB, Nascentes GAN, Pereira K. Influência dos estímulos ambientais domiciliares na mobilidade de crianças com baixa visão: habilidade funcional e assistência do cuidador. Rev. Bras. Oftalmol. [Internet].

2016 [cited 2021 jan 22];75(4):290-5. Available from: https://doi.org/10.5935/0034-7280.20160058.

14. Ministério da Saúde, Secretaria de Vigilância em Saúde, Departamento de Vigilância, Prevenção e Controle das Infecções Sexualmente Transmissíveis do HIV/Aids e das Hepatites Virais. Protocolo clínico e diretrizes terapêuticas para manejo da infecção pelo HIV em crianças e adolescentes [Internet]. Brasília: Ministério da Saúde; 2018 [cited 2021 jan 22]. 218 p. Available from: http://www.aids.gov.br/pt-br/pub/2017/protocolo-clinico-e-diretrizes-terapeuticas-para-manejo-da-infeccao-pelo-hiv-em-criancas-e.
15. Strehlau R, Kuhn L, Abrams EJ, Coovadia A. HIV-associated neurodevelopmental delay: prevalence, predictors and persistence in relation to antiretroviral therapy initiation and viral suppression. Child Care Health Dev [Internet]. 2016 [cited 2021 jan 22];42(6):881-9. Available from: https://doi.org/10.1111/cch.12399.
16. Alvarenga WA, Galvão MTG, Nascimento LC, Beretta MIR, Dupas G. Weakened social network: the experience of caregivers of the HIV-exposed infant. Texto Context - Enferm [Internet]. 2015 [cited 2021 jan 22];24(3):775-83. Available from: https://doi.org/10.1590/0104-07072015011160014.
17. Sá CSC, Lima FCN, Carvalho RP. Acompanhamento do desenvolvimento neuromotor de crianças expostas ao HIV. Temas desenvolv. 2014;20:8-12.
18. Pádua RF, Ruivo CO, Sá CSC. Ambiente domiciliar, vínculo mãe-filho e o desenvolvimento de lactentes expostos e não expostos ao Vírus da Imunodeficiência Humana. Temas em Saúde [Internet]. 2020 [cited 2021 jan 22];20 (2):267-85. Available from: https://doi.org/10.29327/213319.20.2-15.
19. Silva WR, Lisboa T, Ferrari EP, Freitas KTD, Cardoso FL, NFA Motta, et al. Oportunidades de estimulação motora no ambiente domiciliar de crianças. J Hum Growth Dev [Internet]. 2017 [cited 2021 jan 22];27(1):84-90. Available from: https://doi.org/10.7322/jhgd.127659.
20. Correr MT, Ouro MPC, Caçola PM, Almeida TGA, Santos DCC. A disponibilidade de brinquedos no ambiente domiciliar representa oportunidades para o desenvolvimento motor de lactentes? Temas desenvolv. 2014;20:25-9.
21. Giordani LG, Almeida CS, Pacheco AM. Avaliação das oportunidades de desenvolvimento motor na habitação familiar de crianças entre 18 e 42 meses. Motricidade [Internet]. 2013 [cited 2021 jan 22];9(3):96-104. Available from: http://www.scielo.mec.pt/scielo.php?script=sci_arttext&pid=S1646-107X2013000300011.
22. Duarte MG, Duarte GSD, Nobre GC, Bandeira PFR, Santos JOL, Barros JLC. Desenvolvimento motor e fatores associados de crianças entre 36 e 42 meses em um contexto do baixo Amazonas. J Phys Educ [Internet]. 2016 [cited 2021 jan 22];27(1):e2751. Available from: https://doi.org/10.4025/jphyseduc.v27i1.2751.
23. Pereira KRG, Saccani R, Valentini NC. Cognição e ambiente são preditores do desenvolvimento motor de bebês ao longo do tempo. Fisioter. Pesqui. [Internet]. 2016 [cited 2021 jan 22];23(1):59-67. Available from: https://doi.org/10.1590/1809-2950/14685223012016.
24. Sherr L, Skeen S, Hensels IS, Tomlinson M, Macedo A. The effects of caregiver and household HIV on child development: a community-based longitudinal study of young children. Child Care Health Dev [Internet]. 2016 [cited 2021 jan 22];42(6):890-9. Available from: https://doi.org/10.1111/cch.12387.
25. Pacheco BP, Gomes GC, Xavier DM, Nobre CMG, Aquino DR. Difficulties and facilities of the family to care for children with HIV/Aids. Esc Anna Nery [Internet]. 2016 [cited 2021 jan 22];20(2):378-83. Available from: https://doi.org/10.5935/1414-8145.20160052.