

Influence of the home environmental affordances in the mobility of children with low vision mobility: functional skills and caregiver assistance

Influência dos estímulos ambientais domiciliares na mobilidade de crianças com baixa visão: habilidade funcional e assistência do cuidador

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ABSTRACT

Objective: TO analyse and correlate the influence of the present affordances in the home environment in the functional skills and the level of caregiver assistance for the mobility of children with low vision and normal vision. **Methods:** Participated seven children with low vision diagnosis (32.29 ± 7.09 months) and seven with normal vision (31.57 ± 6.90 months). The instruments used were Affordances in the Home Environment for Motor Development - Self Report (AHEMD-SR) and Pediatric Evaluation of Disability Inventory (PEDI) relative to the parties I (functional skills) and II (caregiver assistance) for the mobility area. **Results:** According to PEDI, there was no significant difference between children with low vision and normal vision in functional skills ($U=13.5$; $p=0.076$) and caregiver assistance ($U=13.0$; $p=0.083$) in the mobility area, however there was moderate correlation ($r=+0.756$; $p=0.049$) between the parties I and II for children with low vision. In AHEMD-SR, children with low vision showed significant differences in the subscales: fine-motor ($U=7.5$; $p=0.024$), gross-motor ($U=7.5$; $p=0.024$), and AHEMD total ($U=8.0$; $p=0.035$). However, both children received classification "average" for the affordances in the home environment. **Conclusion:** Children with low vision showed no differences in functional skills and caregiver assistance in the mobility. And the home environment offered reasonable affordances, which favored the functional skills and caregiver's assistance in the mobility.

Keywords: Low vision; Motor skill; Mobility; Environment; Child

RESUMO

Objetivo: Analisar e correlacionar a influência dos estímulos presentes no ambiente domiciliar nas habilidades funcionais e no nível de assistência do cuidador na mobilidade de crianças com baixa visão e visão normal. **Métodos:** Participaram sete crianças com diagnóstico de baixa visão ($32,29 \pm 7,09$ meses) e sete com visão normal ($31,57 \pm 6,90$ meses). Os instrumentos utilizados foram *Affordances in the Home Environment for Motor Development - Self Report* (AHEMD-SR) e *Inventário de Avaliação Pediátrica de Incapacidade* (PEDI) referente à parte I (habilidades funcionais) e II (assistência do cuidador) da área de mobilidade. **Resultados:** De acordo com o PEDI, não houve diferença significativa entre crianças com baixa visão e visão normal nas habilidades funcionais ($U=13,5$; $p=0,076$) e na assistência do cuidador ($U=13,0$; $p=0,083$) na área de mobilidade, porém houve correlação moderada ($r=+0,756$; $p=0,049$) entre as partes I e II para crianças com baixa visão. No AHEMD-SR, crianças com baixa visão apresentaram diferenças significativas nas subescalas: motricidade fina ($U=7,5$; $p=0,024$), motricidade grossa ($U=7,5$; $p=0,024$) e AHEMD total ($U=8,0$; $p=0,035$). Porém ambas receberam a classificação "média" para as oportunidades de estimulação do ambiente domiciliar. **Conclusão:** O ambiente domiciliar das crianças com baixa visão apresentou razoáveis oportunidades de estímulos, no entanto seu desempenho estava dentro dos padrões de normalidade para as habilidades funcionais e assistência do cuidador em mobilidade.

Descritores: Baixa visão; Habilidade motora; Mobilidade; Ambiente; Criança

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INTRODUCTION

In Brazil, visual impairment is among the impairments of higher incidence, with a representability around 35 million⁽¹⁾. According to the World Health Organization, the visual impairment is defined as the total (blindness) or partial (low vision) loss, always considering the best eye. It is estimated that the number of children with low vision is three times higher than the child blindness⁽²⁾.

Children with visual impairment are deprived of extrinsic information due to the lack of motivation from vision to explore the environment and objects⁽³⁻⁵⁾. This way, low vision can compromise children's motor development⁽⁶⁻⁸⁾, the acquisition of functional skills, and the level of independence of the child in daily tasks^(9,10).

Studies show that the functional abilities of children with low vision occur at a slower pace when compared to those with healthy visual system⁽⁹⁾. This can be explained by the fact that children with visual impairment are more dependent on the caregiver to perform everyday tasks, which leads to a low functional performance compared to those who do not have vision impairment^(9,10).

According to the authors, parents or legal guardians of children with low vision have difficulties when dealing with strategies and/or adaptation features on the limitations of their children^(4,11,12), which can lead to the self-protection syndrome, generating greater reliance by the caregivers⁽¹¹⁾. Therefore, the way parents organize the physical environment and interact with their children is of important influence on their development⁽¹³⁻¹⁵⁾.

However, observing how children with low vision develop in the home environment can be an important parameter to modify and stimulate their independence. Studies involving the home have been the focus of some research with typical and atypical children because it is considered an important influence environment for the functional performance of daily activities⁽¹⁶⁻²³⁾.

When considering playing as a spontaneous activity fundamental for child's development^(24,25), children with low vision must be stimulated in a playful way with toys that provide a variety of features, whether physical (object format) or sensory (high contrast, bright, transparent and black), which promotes exploration, acquisition and improvement of skills⁽²⁶⁾.

The aim of this study was to analyze and correlate the influence of stimuli present in the home environment with functional skills and the level of assistance by the caregiver in the mobility of children with low vision and normal vision.

METHODS

The present study characterized as being cross-sectional and analytical was approved by the Research Ethics Committee (CEP) of Universidade Federal do Triângulo Mineiro, according to Opinion No. 2760/2013.

Fourteen children of both genders aged from 24 to 42 months took part in this study, seven of which diagnosed with low vision (32.29 ± 7.09 months), and seven with normal vision (31.57 ± 6.09 months), whose parents or legal guardians have agreed to participate in the research by signing the informed consent (TFCC). For both groups formed, the convenience criteria was adopted, selecting initially the group with low vision, and later the group with normal vision.

To calculate the sample size, the software Diman 1.0 was used. In this context, considering the functional ability of mobility as the observation of the smallest difference between the two groups, we used the average of the control group (m_1) as 51.00, with a standard deviation (s_1) of 3.46; the average of group with low vision (m_2) as 39.71, with a standard deviation (s_2) of 11.22, besides considering a confidence interval (α) of 95%, $Z = 1.96$ and power of the test ($1-b$) of 80%, resulting in a sample with seven children on each group.

As inclusion criteria, children with low vision should present a diagnostic of low vision made by an ophthalmologist and obtained from the medical records belonging to the partner research institutions, and who are enrolled for visual stimulation care for more than six months. On the other hand, the criterion adopted for the children with normal vision was the absence of visual impairment, determined by the negative result of the eye test. For standardization of both groups, the children should present independent march.

Children who presented clinical diagnosis of neurological disorders, congenital malformations or genetic syndromes, hearing deficit, or even another change that could influence or impair child development were not included in this research.

The participants included in the low vision group were selected in institutions designated to children with visual impairment located in the cities of Uberaba and Uberlândia, Minas Gerais, and three children from the city of Uberaba and four from Uberlândia. For the group with normal vision, the selections took place in a kindergarten school in the city of Uberaba, after the process of selection of the group with low vision.

For this study, we used two standardized and validated scales for the Brazilian conditions: Affordances in the Home Environment for Motor Development - Self Report (AHEMD-SR) and the Pediatric Evaluation of Disability Inventory (PEDI)^(27,28). For the use of these scales, the evaluator responsible was trained in order to clear possible doubts, improve and adapt the application time.

AHEMD-SR is an instrument to evaluate the quality and quantity of stimuli (affordances) offered in the home environment of children aged between 18 and 42 months⁽²⁷⁾. The instrument consists of four dimensions: family characteristics, physical space, daily activities and materials (toys) at home. For each dimension, the answers vary, being from the type dichotomous (yes/no), Likert scale (several levels of response) and numerical according to their questions. AHEMD-MR scores are generated by the program (AHEMD Calculator VPbeta 1.5.xls), which determines by AHEMD the full classification of stimulating opportunities in the home environment at three levels: "low", environment offering little opportunity (total AHEMD ≤ 9); "medium", reasonable environment (total AHEMD ≥ 10 and ≤ 16) or "high", excellent environment (total AHEMD ≥ 17 and ≤ 20).

PEDI is an instrument for evaluating the functional performance of children aged from six months to seven years and six months, involving three areas: self-care, mobility and social function, and each area is divided into three parts, part I (functional skills), part II (caregiver assistance), part III (environmental modifications). However, this study used only parts I and II in the area of mobility. In part I, 1 point was given when the child was able to perform a given item, and 0 (zero) when they were not able. In part II, the score was given by an ordinal scale from zero to five, being (0) the total dependence of the child, (1) maximum assistance, (2) medium assistance, (3) minimum assistance, (4), supervision, and (5) independence for

functional activities. However, the higher the score, the greater the level of independence of the child. The score established for this study was the normative score. The normative score values between 30 and 70 were considered normal standards for Brazilian children, 50 being the average value of the normative score⁽²⁸⁾.

All the collection procedure was conducted by a single researcher, with an average duration of 40 minutes. As standard, both questionnaires were applied on the same day, and PEDI was answered before AHMED-SR. In order to ensure the reliability of the data, the interviews were recorded using an audio recorder (COBY®).

The independent variables in mobility area of PEDI in this study were low vision and normal vision, and the dependent ones were normative scores of functional skills and caregiver assistance. The subscales examined in AHMED-SR (family income, total AHMED, external space, internal space, variety of stimulation, materials for fine and gross motricity), and the types of materials for fine motricity (pretend toys, puzzles, games, construction materials, educational toys and others) and gross (musical, manipulation, locomotor materials and for global exploitation) of AHMED-SR.

The numerical data was submitted to the Shapiro-Wilk test for verification of normality, and to the Levene test for homogeneity. The data showed normal distribution and homogeneous variances (internal space, materials for fine and gross motricity, dolls, puzzles, educational toys, musical materials) was compared by means of a parametric t-Student test, while the nonparametric data (functional skills, caregiver assistance, total AHMED, external space, variety of stimulation, games, construction materials, other manipulation, locomotor and for global exploration materials) was assessed by the Mann-Whitney test. In addition, the relation between the results obtained from the questionnaires were analyzed by the Spearman's correlation coefficient (functional skills, caregiver assistance and total AHMED). The categorical data was compared between children with low vision and normal vision by the Chi-square test with Yates correction. The statistical analyses were performed using the software Statistica 10.0, and the results showing significance level (p) less than 0.05 were considered significant.

For all the following analysis, the numerical data was expressed as average and standard deviation, and the categorical data as absolute and relative values (%) as standardization.

RESULTS

The average age of the children with low vision was 32.29 months (± 7.09), and with normal vision was 31.57 months (± 6.90).

As shown in figure 1, the analysis of mobility of PEDI did not show any significant difference ($U=13.5$; $p=0.076$) in the functional abilities of children with low vision (32.23 ± 15.29) nor normal vision (44.36 ± 6.30), as well as in the caregiver assistance ($U=13.0$; $p=0.083$) for children with low vision (38.79 ± 11.61) and normal vision (47.53 ± 3.82).

Figure 2 illustrates that there was moderate and positive correlation in the group of low vision between the functional skills and the caregiver assistance ($r=+0.756$; $p=0.049$) on mobility. In the group with normal vision, by contrast, there was no correlation ($r = -0.756$; $p = 0.871$) and a negative correlation was also observed, showing that the higher the functional ability, the greater the need for caregiver assistance.

Table 1 shows the familiar features from data obtained by the questionnaire AHMED-SR.

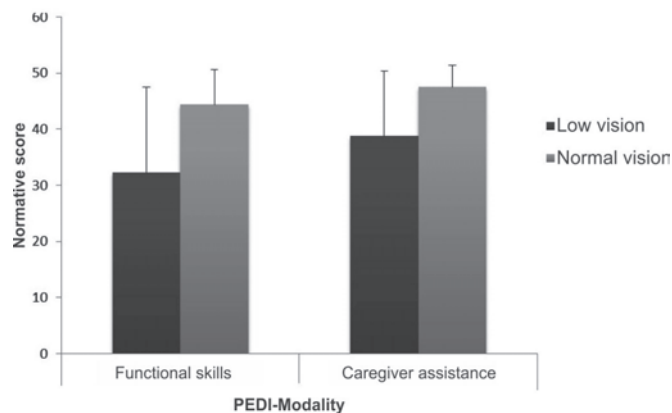


Figure 1: Comparison of functional skills and caregiver assistance in mobility the (PEDI) between children with low vision and normal vision.

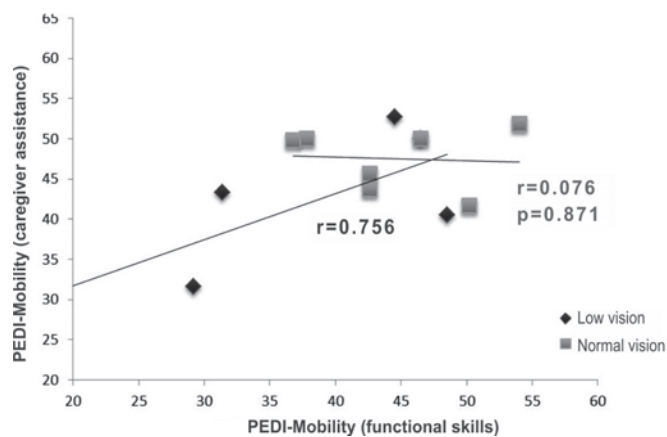


Figure 2: Comparison of functional skills and caregiver assistance in mobility the (PEDI). (r = correlation; p = significance level). * Significant p value ($p < 0.05$).

Figure 3 presents the subscales and the total AHMED. In this analysis, there was a significant difference between children with low vision and normal vision in fine ($U = 7.5$, $p = 0.024$) and gross ($U = 7.5$; $p = 0.024$) motricity, and in total AHMED ($U = 8.0$, $p = 0.035$). Despite the significant difference in the total AHMED among children with low vision (11.43 ± 0.79) and normal vision (14.14 ± 2.41), both received a “medium” rate for the stimulation opportunities in the home environment.

Table 2 shows no significant difference between children with low vision and normal vision regarding the fine motricity materials: dolls ($t = 2.836$, $p = 0.015$) and educational toys ($t = 2.411$, $p = 0.033$); and in gross motricity: musical ($t=3.238$; $p=0.007$) and manipulation ($U=7.5$; $p=0.027$) materials.

Table 3 shows that there is no correlation between PEDI in the area of mobility (functional skills and caregiver assistance) and total AHMED for children with low vision and normal vision.

DISCUSSION

The assessment of functional skills and the level of caregiver assistance in the area of mobility of children with low vision is of great importance for the knowledge of their development, as well as the analysis of the home environment as a favorable stimulus factor to the performance of children.

Table 1
Family characteristics of children with low vision and normal vision

Family characteristics	Low vision n(%)	Normal Vision n(%)
Type of home		
House	5 (71.43)	5 (71.43)
Apartment	2 (28.57)	2 (28.57)
Amount of adults at home		
1	0 (0.00)	0 (0.00)
2	6 (85.2)	7 (100)
3	1 (14.29)	0 (0.00)
4	0 (0.00)	0 (0.00)
5 or more	0 (0.00)	0 (0.00)
Amount of children at home		
1	3 (42.86)	1 (14.29)
2	2 (28.57)	6 (85.72)
3	0 (0.00)	0 (0.00)
4	1 (14.29)	0 (0.00)
5 or more	1 (14.29)	0 (0.00)
Education degree – Father		
1st to 4th year	1 (14.29)	0 (0.00)
5th to 8th year	3 (42.86)	2 (28.57)
High school	2 (28.57)	1 (14.29)
Graduation	1 (14.29)	3 (42.86)
Master's degree or doctorate	0 (0.00)	1 (14.29)
Education degree – Mother		
1st to 4th year	2 (28.57)	0 (0.00)
5th to 8th year	1 (14.29)	1 (14.29)
High school	3 (42.86)	0 (0.00)
Graduation	1 (14.29)	3 (42.86)
Master's degree or doctorate	0 (0.00)	3 (42.86)
Monthly income (Brazilian reais)		
1000 a 1500	5 (71.43)	0 (0.00)
2500 a 3500	0 (0.00)	3 (42.86)
3500 a 5000	0 (0.00)	1 (14.29)
≥ 5000	2 (28.57)	3 (42.86)

The results obtained by PEDI showed that the hypothesis of the study in focus was not accepted, considering that there was no significant difference in the area of mobility among children in functional skills and caregiver assistance. Therefore, the findings of this research oppose the studies found in the literature observing that children with low vision at ages two and six had smaller functional skills and level of independence in mobility than children with normal vision^(9,10).

However, it is worth mentioning that the average scores of children with low vision and normal vision are within the standards (between 30 and 70) as patterns of normality for Brazilian children, but below the average, i.e. less than 50⁽²⁸⁾. This may be a reflection of a society in which parents have a protectionist profile with their children, especially parents of

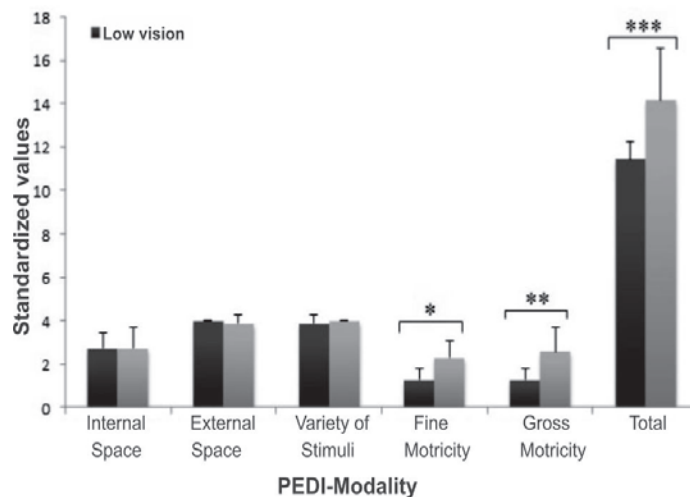


Figure 3: Comparison between children with low vision and normal vision in the subscales and total AHEMD (AHEMD-SR). *p=0.035. **p=0.024. ***p=0.024.

Table 2
Description of fine and gross motricity materials (AHEMD-SR)

Materials	AHEMD-SR	Children Low vision	Children Normal vision	P-value
Fine Motricity	Bonecos de faz de conta	12.86 ± 7.20	21.57 ± 3.78	0.015*
	Puzzles	3.86 ± 3.08	6.86 ± 3.53	0.116
	Games	1.00 ± 0.82	3.00 ± 2.38	0.148
	Construction materials	1.29 ± 1.80	3.14 ± 2.12	0.131
Gross Motricity	Educational toys	8.43 ± 4.79	13.14 ± 1.95	0.033*
	Others	2.00 ± 2.65	3.71 ± 3.30	0.265
	Materiais musicais	3.43 ± 2.57	7.86 ± 2.54	0.007*
	Manipulation materials	2.57 ± 1.72	4.57 ± 0.79	0.027*
	Materiais	2.71 ± 1.89	4.57 ± 1.99	0.080
	Locomotor Global	0.14 ± 0.38	0.43 ± 0.53	0.290
	exploration materials			

* Significant p value (p<0.05).

Table 3
Correlations between PEDI (mobility) and total AHEMD for children with low vision and normal vision

CHILDREN	PEDI (Mobility)	TOTAL AHEMD
LOW VISION	Functional skills	r=-0.223 p=0.631
	Caregiver assistance	r=-0.134 p=0.775
NORMAL VISION	Functional skills	r=0.093 p=0.843
	Caregiver assistance	r=-0.750 p=0.052

r = correlation; p = significance level.

children with visual impairment, who end up performing certain activities in order to reduce “unnecessary” efforts^(4,11). For some authors, visual impairment can be a factor that limits the autonomy and independence of individuals with visual impairment^(30,31). However, for the children with low vision in the present study, this protectionist profile was not a limiting factor, because there was less assistance from the caregiver in the performance of functional mobility skills.

The characteristics of the home environment can influence the functional performance of the child, and consequently they favor or compromise their independence⁽²³⁾. The family low income of children with low vision may be related to the educational level of fathers and mothers, and consequently to a lower acquisition of fine and gross motricity materials. This result corroborates the studies highlighting that the low family income generates less favorable conditions of household stimuli^(15,16,18). According to some authors, socioeconomic status has great relation with child welfare^(19,20,32). The home environment showed that children with low vision had less fine and gross motricity materials than children with normal vision, and this can be related to the socioeconomic status of the families. The specific results regarding the difference in certain types of toys indicate that the monthly family income and the lack of guidance of parents or legal guardians may have influenced the acquisition of fine and gross motricity materials (toys).

The fine motricity toys “dolls” and “educational toys” have hardly been identified in the group with low vision. These toys are important to stimulate creativity and skills⁽³³⁾. Gross motricity “musical materials” and “manipulative materials” were also restricted in this group. The absence of musical materials was a surprising result, since for some authors hearing is recognized as being an important sensory system of recognition of the environment by the child with visual impairment⁽³⁴⁾. As well as hearing, touch is also considered an important sense for children with low vision, because it contributes to the cognitive processes involved in the appropriation of knowledge by the capture of the physical characteristics and the spatial relation of the objects⁽³⁵⁾. By observing children with low vision during the play, some authors⁽²⁶⁾ identified a variety of motor actions by exploring objects with different visual stimuli (colors, high contrast and light) than children with normal vision.

For some authors, a stimulating environment and with strong contextual support can have a positive impact on the child’s development^(18,20). However, this study did not show the correlation among home, functional skills and caregiver assistance in the mobility of children with low vision, even with the environment providing reasonable opportunities for the child’s development.

CONCLUSION

This study demonstrated that children presented a home environment with reasonable stimulus opportunities for the child’s development, and they were able to learn and perform their activities in daily routine in an independent and autonomous way, because their performance was within the normal standards for functional skills and caregiver assistance in mobility.

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