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Further development of the Affordances for Motor Behavior of Schoolchildren: standardized version and scoring system

Desenvolvimento adicional do *Affordances for Motor Behavior of Schoolchildren*: versão estandardizada e sistema de pontuação

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ABSTRACT

Mapping and evaluating regular contexts that schoolchildren attend is of great importance to understanding motor behavior. This communication aims to present the scoring system and standardization of the Affordances for Motor Behavior of Schoolchildren (AMBS), recently presented to the scientific and educational community. The AMBS was developed to assess children's interdependent systems, such as home, school, and sports activities, that can influence 6 to 10-year-olds' motor development, motor learning, and motor competence. The questionnaire was completed by 377 Brazilian families. Raw scores of each of the three subscales (home, materials, and school) were transformed into standard scores, ranging from very low to very high. AMBS subscales were classified as very low (1st quartile), low (2nd quartile), good (3rd quartile), and very good (4th quartile). The AMBS total raw score is a result of the sum of the three subscales standard scores and can be classified into three categories, ranging from a low to a high AMBS. Thus, AMBS total scores were classified as low (1st tercile), average (2nd tercile), and high (3rd tercile). We expect that raw and standard scores of the AMBS can be used by researchers, parents, and clinical/education professionals to assess children's affordances for motor behavior.

Keywords: Motor skills; Child; Environment; Health.

RESUMO

Mapear e avaliar os contextos regulares que escolares frequentam é de grande importância para a compreensão do comportamento motor. Esta comunicação tem como objetivo apresentar o sistema de pontuação e padronização do Affordances for Motor Behavior of Schoolchildren (AMBS), recentemente apresentado à comunidade científica e educacional. O AMBS foi desenvolvido para avaliar os sistemas interdependentes das crianças, como casa, escola e atividades esportivas, que podem influenciar o desenvolvimento motor, a aprendizagem motora e a competência motora de crianças de 6 a 10 anos. O questionário foi respondido por 377 famílias brasileiras. As pontuações brutas de cada uma das três subescalas (casa, materiais e escola) foram transformados em pontuações padrão, variando de muito baixo a muito alto. As subescalas AMBS foram classificadas em muito baixo (1º quartil), baixo (2º quartil), bom (3º quartil) e muito bom (4º quartil). A pontuação bruta total do AMBS é resultado da soma das pontuações padrão das três subescalas e pode ser classificada em três categorias, variando de um AMBS baixo a alto. Assim, os escores totais da AMBS foram classificados em baixo (1º tercil), médio (2º tercil) e alto (3º tercil). Esperamos que as pontuações brutas e padrão da AMBS possam ser utilizadas por pesquisadores, pais e profissionais clínicos/educacionais para avaliar as affordances das crianças visando melhor entendimento do comportamento motor.

Palavras-chave: *Habilidades motoras; Criança; Ambiente; Saúde.*

Introduction

Children's environments have been established as crucial factors for the development of motor behavior, motor development, motor learning, and motor competence[1–4]. Thus, children's motor behavior is affected by different levels of environmental influences ranging from proximal (immediate) to distal ones. Exploring the multiple ecological contexts present in children's daily life can have major implications for intervention, education, and research. To Bronfenbrenner[5], children's ecological contexts work as interdependent systems, ranging from a micro (child and family environment) to a macro level (cultural and economic influences of the country). Thus, mapping and evaluating children's settings is challenging, especially as they begin to attend multiple contexts daily. In fact, after entering pri-

mary school, children begin to regularly attend contexts other than home (characterized as a mesosystem).

Based on an extensive literature review that identified the need for an instrument capable of assessing daily affordances for motor behavior of children after three years of age[6], our group developed the Affordances for Motor Behavior of Schoolchildren (AMBS)[7], a parental self-reporting questionnaire designed to assess the quality and quantity of affordances in the child's main microsystems. The term affordances relate to how human beings select information from the environment where they are involved, and how they perceive the world[8]. Gibson also explains that affordances are opportunities for the person's action that are only perceived by the individual to establish a person-environment fit, depending on the person's capabilities. Thus, the AMBS has dichotomous questions, 7-point Likert-type scales, and description-based queries, aiming to map and evaluate children's regular environments, especially when they start to attend other settings than the home (after 6 years of age). The Confirmatory Factor Analysis was used to test the structural validity of the AMBS. The model testing resulted in a Chi-Square of 91.24; $p<0.000$ and showed a very good fit (Chi-Square/df = 2.225, CFI = 0.956; TLI = 0.942 and RMSEA = 0.059). In addition, significant correlation values were found between the subscales (Home and Materials, r = 0.77; Home and School, r = 0.41; and Materials and School, r = 0.56).

Despite being a valid instrument[7], its standardization and scoring system has not yet been published. Thus, our aim with the present communication is to inform the scientific community of the AMBS update, by presenting the standardization and scoring system.

Methods

The AMBS original sample consisted of 259 responses completed by families of 6 to 10-year-old Brazilian children[7]. For this scoring system classification, a broader sample was collected. For the present report, we considered questionnaire responses regarding 377 south Brazilian families and their children (198 boys and 179 girls), between 6 and 10 years of age (M = 7.80; SD = 1.87). Participants were randomly chosen, and children did not have any medical cognitive/physical restriction or associated illness. Families that did not answer all the AMBS questionnaires were excluded from the sample. The invitation to participate in the study was published on social media and the university website.

The AMBS consists of 73 questions grouped in 7 different categories, regarding the materials/spaces available to children: Child Characteristics (7 questions), Extracurricular Activities (6 questions), Family characterization (7 questions), Home characterization (10 questions), House Items (7 questions), Child Play Materials (22 questions), and School (14 questions).

Ethical approval for the survey was granted by the Universidade Federal de Santa Maria Ethics Committee (Protocol: 76336117.0.0000.5346). Written consent was obtained from the participants before beginning the experiment. The study protocol followed the Declaration of Helsinki guidelines.

To create the AMBS scoring system, forty-eight of the 73 questions were grouped according to common content into 11 variables grouped into three subscales that represent the characteristics of the school and home environments that children attend (Home, Materials, and School) (Table 1). The contribution of the original items to the assigned variable was checked for consistency using a correlation (bivariate) matrix[7].

Table 1 – Minimum and Maximum scores of the AMBS variables and subscales.

Subscales	Variables	Minimum	Maximum
Home	Inside space A	0	15
	Inside space B	0	4
	Outside space	0	6
Materials	Sedentary Materials	0	35
	Pretend play toys	0	36
	Educational toys	0	42
	Manipulative materials	0	30
	Stability materials	0	24
	Space for movement	0	24
School	Free space for movement	0	12
	Sedentary space	0	24

After the grouping into common variables, the subscales scoring system was determined using the data quartiles. Additionally, the AMBS total scores were grouped into terciles. Further information regarding the grouping of items according to common content can be seen in Flôres et al.[7]. Descriptive analysis with mean and standard deviation was used to characterize AMBS results according to the proposed scoring systems. The Statistical Package for Social Sciences (SPSS), version 28.0, was used, adopting an alpha level of significance of 5%.

Results

Most children (74.2%) attended school in the afternoon,

21.3% attended it in the morning, and 4.5% attended full-time school. Of the 377 questionnaires answered, 112 (38.5%) were from families with children aged six years, 42 (14.0%) seven years, 45 (17.5%) eight years, 49 (16.5%) nine years, and 43 (13.5%) aged ten years. Regarding housing type, 201 (53%) children lived in houses and 176 (47%) lived in apartments. Considering the monthly income of families, 34 (9.0%) earned R$1.000 or less, 157 (40.0%) earned between R$1.001 and R$4.000, 31 (8.2%) earned between R$4.001 and R$5.000, and 161 (42.7%) had a monthly income over R$5.001.

Table 2 shows the descriptive values of the AMBS responses, regarding child characterization, movement activities, and AMBS scores, by sex and for the total sample. Concerning Child Movement activities, most of the boys participate in team sports (63.6%), while about half of the girls participate in this type of activity (49.2%). Almost three-quarters of children participate in outdoor activities (74.8%). Another interesting finding is that girls practice individual sports more than boys do (55.3% and 39.9%, respectively).

Table 2 – Characterization and descriptive values of the sample.

AMBS categories	Boys (n = 198)		Girls (n = 179)		Total (n = 377)	
	Mean	SD	Mean	SD	Mean	SD
Home Variables						
Inside Space A	6.44	1.47	6.65	1.49	6.54	1.48
Inside Space B	0.35	0.62	0.32	0.55	0.34	0.58
Outside Space	1.17	1.08	1.16	0.97	1.16	1.02
Materials Variables						
Sedentary Materials	12.96	4.28	13.19	4.15	13.07	4.22
Pretend Play Toys	14.40	6.66	13.66	6.32	14.05	6.50
Educational Toys	18.64	10.89	18.17	10.14	18.42	10.53
Manipulative Materials	5.83	3.69	4.49	3.46	5.20	3.64
Stability Materials	2.40	2.24	2.68	1.93	2.53	2.10
School Variables						
Space for Movement	4.65	2.68	4.81	3.00	4.73	2.84
Free Space for Movement	2.58	1.6	2.42	1.64	2.50	1.70
Sedentary Space	3.38	1.89	3.66	2.41	3.51	2.2
AMBS. Subscales and total						
Home	7.96	2.4	8.13	2.18	8.04	2.30
Materials	54.23	22.41	52.20	21.30	53.27	21.89
School	10.61	5.36	10.89	6.17	10.75	5.75
AMBS total	8.79	2.37	8.68	2.33	8.04	2.30

SD = standard deviation; AMBS = Affordances for Motor Behavior of Schoolchildren.

All subscales raw scores are transformed into standard scores, according to quartile cut-off values for each sub-scale, resulting in a classification ranging from 1 (Very Low) to 4 (Very High). The AMBS total raw score is made up of the sum of the three subscales' standard scores. Finally, the AMBS total raw scores are transformed into standardized scores: Low (scores less than 8 points), Average (scores ranging from 8 and 10 points), and High (scores above 10 points). Table 3 shows the quartile cut-off values for the distribution of the subscales to produce the standardized scores. Then, to establish the cutoff value for the AMBS total, the sum of the subscales was computed and tercile values were used.

Table 3 – AMBS subscales standardization and AMBS total scores.

Subscales	AMBS classification			
	Very low	Low	Good	Very good
	1st quartile	2nd quartile	3rd quartile	4th quartile
Home	<6	7	8-9	>9
Materials	<36	36 to 53	54 to 68	>68
School	<7	7 to 8	9 to13	>13
Total	Low	Average		High
	1st tercile	2nd tercile		3rd tercile
AMBS total	<8	8 to 10		>10

AMBS = Affordances for Motor Behavior of Schoolchildren.

Discussion

Our general premise was that the multiple microsystems[9] and their objects, places, surfaces, events, and other people[10] can invite, permit, or inhibit progressively more complex child-environment interactions. These opportunities for action, are intimately tied to the features of the context, but also to the child's action capabilities, which change along with development[7]. Thus, the present communication establishes the scoring and classification system for the AMBS questionnaire, which are of great importance to assess the available affordances in children's environments. Knowledge about the quality and quantity of the existent affordances can help parents and teachers to better shape environments for children. This scoring system can be used to classify, categorize, and compare children's environments, to improve them. Also, professionals can use the AMBS to investigate the relations between the quality of different contexts and to correlate it with other variables, which can be evaluated by other instruments, such as children's motor competence, levels of physical activity, motor development, or motor learning. We expect that children with different AMBS scores, who have different opportunities for motor behavior stimulation during their daily activi-

ties, will also have different motor competence profiles.

Despite the results, our investigation has some limitations. All families participating in this study were from southern Brazil, thus the country's sociodemographic diversity was not completely represented. In addition, being the AMBS a parent self-report, the physical environments were not verified, thus the answers provided reflect the parental perception[7,11]. Finally, AMBS does not allow the assessment of the child's real interaction within the environments, toys, surfaces, etc., since children might not always use the affordances that are available to them.

In summary, our findings provide further AMBS progress to be a tool capable of assessing and measuring motor affordances for schoolchildren. Furthermore, some studies with younger children indicate that there is a relationship between affordances in the child's microsystems and his or her motor competence[1,12], but this relationship has not been fully explored in older children. Exploring the relation between the quality and quantity of the microsystem's affordances and its influence on schoolchildren's motor competence can be fundamental for understanding the complex nature of these factors. The Affordances for Motor Behavior of Schoolchildren questionnaire has the potential to be a useful tool for such a task.

We suggest that using the AMBS scoring and classification system, the strengths and weaknesses in children's microsystems can be identified, classified, and improved. Thus, the AMBS can complement other instruments to promote 6- to 10-year-old children's higher levels of physical activity, motor learning, motor competence, and motor development.

Conflict of interest

The authors declare no conflict of interest.

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Author's contributions

Flôres F, participated in the design of the manuscript, analysis, interpretation of data and writing of the manuscript. Rodrigues LP, participated in the analysis, interpretation of data and critical review of the manuscript. Cordovil R, participated in the design of the manuscript, analysis, interpretation of data and critical review of the content.

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