

ORIGINAL ARTICLE

Opportunities in child motor development at home: bibliometric and scientometric review

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Abstract

Introduction: Child development comprises a complex and dynamic transformation process due to continuous and progressive interactions, which begins at conception. It involves aspects that permeate the child's physical growth, neurological, behavioral, cognitive, social, and affective maturation.

Objective: Analyze the characteristics of scientific literature about the use of the instrument Affordances in the home environment for motor development (AHMED).

Methods: It is a bibliometric and scientometric review performed in January 2018, including primary studies in English, Portuguese, and Spanish. By searching the electronic databases Publisher Medline (PubMed), Latin American and Caribbean Literature in Health Sciences (LILACS), Elsevier SciVerse Scopus (SCOPUS), Web of Science Main Collection, Clarivate Analytics (WoS), and at Scientific Electronic Library Online (SciELO).

Results: 38 studies applied AHMED to assess opportunities for motor development at home, of them 39.5% (n=15) with children aged 3 to 18 months and 60.5% (n = 23) with children aged 18 to 42 months. The majority (76.4%- n=29) of them from Brazil, 47.4% (n = 18) were cross-sectional studies, 50% in the period between 2014 and 2017 and 50% (n = 19) with multi-professional authorship. The evaluation was done with children of different characteristics, scenarios, and social contexts with scores of dimensions and overall classified from very weak to sufficient.

Conclusion: The analysis of the studies concerning the application of AHMED instrument shows a gap in longitudinal research in populations with clinical conditions, consistent with the notification issues of the information systems that indicate public health problems in the child population.

Keywords: child development, environment, play and playthings, family, evaluation.

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Authors summary

Why was this study done?

This study was developed considering the history of a decade of application of the instruments Affordances in the Home Environment for Motor Development - Self-Report (AHEMD-SR) and Affordances in the Home Environment for Motor Development - Infant Scale (AHEMD-IS) in health research. The results produced from the creation and validation of the scale to the application in different contexts indicate that the trend of the use of AHEMD in the national and international context makes it possible to point out the evolution of knowledge in the thematic field of child motor development. This mapping was motivated by the relevance of organizing information, in an objective and quantitative manner, of the use of this self-applicable questionnaire both in research and in care practice, so that professionals can access clinical decision-making subsidies consistent with the opportunities available at home.

What did the researchers do and find?

This is a bibliometric and scientometric review to answer the question: "What are the characteristics of the production of scientific production on the use of the AHEMD instrument?". The mapped terms were combined as search strategies and appropriate to the fields and filters available in electronic databases in the health area. Identification, selection, eligibility and inclusion followed the PRISMA check list for quality and transparency. The methodological development of this review resulted in the inclusion of 38 articles, of a cross-sectional design followed by validation studies, with chronology of the use from 2005 to 2017, most authors physical educators or physiotherapists, published in international journals and with impact factor, among the controlled descriptors, the most frequent were environment and infant. The population was mainly of healthy children.

What do these findings mean?

In the period of 12 years of production of the use of AHEMD there was a 100% increase in production in the last four years (2014-2017). This, added to the authors' profile, indicates that theme of child motor development is multifaceted and that it arouses the interest of researchers from different areas of knowledge. The validation of the instrument in six countries indicates its application in different cultural and social contexts. It was evidenced in most articles evaluating the correlation of the dimensions of AHEMD-IS and AHEMD-SR with the sociodemographic variables of the families investigated, in which the income and socioeconomic conditions better and the higher schooling of parents have a significant positive correlation for the development of children.

INTRODUCTION

Child development comprises a complex and dynamic transformation process due to continuous and progressive interactions, which begins at conception. It involves aspects that permeate the child's physical growth, neurological, behavioral, cognitive, social, and affective maturation¹. It also includes motor development resulting from a succession of events influenced by the environment, the task required, and the biology of the individual^{2,3}.

The relationship between the environment and the individual is present in the ecological theory that highlights the relationship between perception and action⁴. In this theory, the affordances concept describes the opportunities offered by the environment to a particular agent that influences the child's motor development according to their quality and quantity. They can be toys, materials, appliances, space availability, and stimulation provided by parents and family members present in the environment where the child lives in⁵.

The family environment is the first context where the child is inserted, and the home configures the space where he can explore and obtain opportunities for stimuli. There are two instruments to measure the quantity and quality of these opportunities in the home environment and their influence on motor stimulation: Affordances in the Home Environment for Motor Development - Self-Report (AHEMD-SR) and Affordances in the Home Environment for Motor Development - Infant Scale (AHEMD-IS). The first was developed and validated for children aged 18 to 42 months⁶, and the second, for infants aged 3 to 18 months^{7,8}.

The AHEMD-SR, created by a partnership between the Polytechnic Institute Vianna do Castelo and Texas A&M University, it exposes features of the child and the family's character and 67 questions that address opportunities in the home environment, physical space,

daily activities, and toys. It comprises five subscales: outdoor space, indoor space, variety of stimulation, fine motor material, and gross motor material, with their results classified as very weak, weak, good, or very good^{6,9}.

The AHEMD-IS was developed by the University of Texas and the Universidade Metodista de Piracicaba (Methodist University of Piracicaba/UNIMEP), which characterizes the family and the child, in addition to analyzing the opportunities for stimulation in the infant's motor development. Initially built with 56 items⁶, after review and validation, it was reduced, with its new version consisting of 35 items, which contemplate the dimensions of the physical space of the house, variety of stimulation, and toys in the home. According to the score, there are four classifications for affordances in the domestic environment: less than adequate, moderately adequate, adequate, or excellent⁷.

After a decade of application of these instruments in health research, it is more than justified the trend of using them. Thus, the objectives of this review are: a) to show the chronology of the use of Affordances in the home environment for motor development (AHEMD); b) identify the journals, descriptors, authors, and countries of scientific production; c) characterize the origin, design, promotion and impact factor of the research instrument Affordances in the Home Environment for Motor Development (AHEMD) in the national and international context. The results achieved from its creation and validation of the scale to the application in different contexts makes it possible to point out the evolution of knowledge in the field of child motor development.

This study intends to contribute to the organization of information, objectively and quantitatively, from the use of this self-administered questionnaire both in research and healthcare practice, so that professionals access accurate data for clinical decision making

consistent with the opportunities available at home. Thus, the objectives of this study are: a) to show the chronology of the use of Affordances in the home environment for motor development (AHMED); b) identify the journals, descriptors, authors, and countries of scientific production; c) characterize the origin, design, promotion and impact factor of the research.

METHODS

It is a Bibliometric and Scientometry review. Bibliometrics allows us to plan and find several journals to answer the research question and critically analyze the available studies in the databases¹⁰. Scientometry analyzes the production, consumption, and circulation of scientific publications. By using both technics, it is possible to qualify, verify, and give meaning to the data and a broad study about the productions of the subject in question¹⁰.

The review question was: “What are the characteristics of scientific production about the use of the AHMED instrument?”. Primary research articles that applied the AHMED, available in full and in English,

Portuguese or Spanish, were included without a time frame for selecting studies.

The bibliographic search was developed in the electronic databases Publisher Medline (PubMed), Latin American and Caribbean Literature in Health Sciences (LILACS), Elsevier SciVerse Scopus (SCOPUS), Web of Science Main Collection Clarivate Analytics (WoS), and at Scientific Electronic Library Online (SciELO) in January 2018. The search strategy was: AHMED or “Affordances in the home environment for motor development” (keywords or keywords or topic or title/abstract/keyword or all indexes, according to each base or library). Another source for identification was the list of references of the articles included through the databases. Figure 1 shows the path taken for the selection of publications.

The studies duplicated were considered only once. The retrieval of not open access articles was carried out through the Portal of Journals of the Coordination for the Improvement of Higher Education Personnel (Capes), on the journal’s website, or at the request of the manuscript to the primary author.

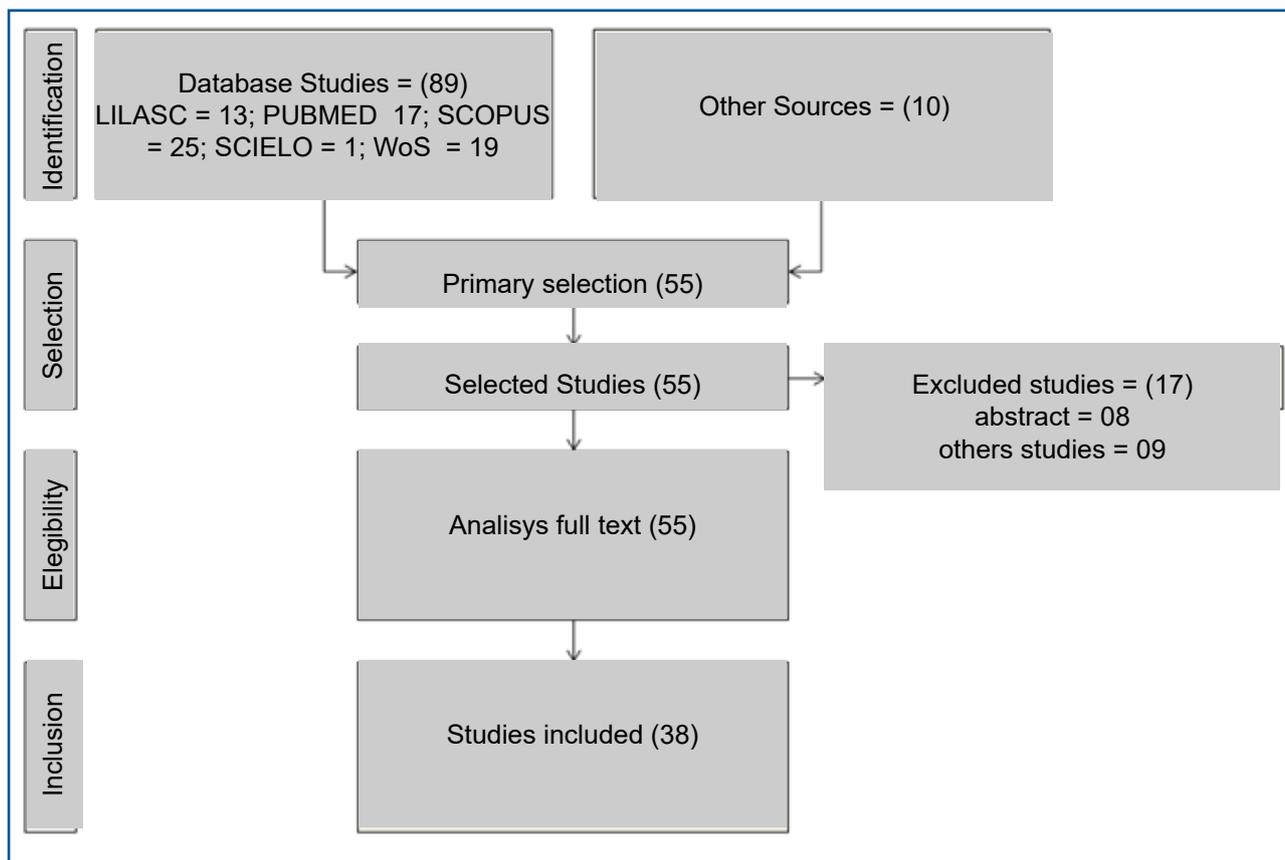


Figure 1: Flowchart of articles’ selection for bibliographic review, based on the PRISMA model. Santa Maria, Rio Grande do Sul, Brazil, 2018.

Source: the PRISMA statement. DOI: 10.1371/journal.pmed.1000097

A total of 38 articles were analyzed, from them the following information was extracted: reference, year of publication, journal, journal impact factor, controlled and uncontrolled descriptors, support for promotion, area of knowledge, academic level, qualification of authors, institutions linked to authors, the origin of the study, objectives, study design and main results.

The data were analyzed according to the year of publication, respecting the highest professional degree and journal impact factor, corresponding to this period. The impact factor was taken according to the Journal Citation Reports, provided by Clarivate Analytics. The authors’ formation and qualification were collected from the articles and on the online page of their institution.

For articles with authors from different professional backgrounds (example: medicine, physiotherapy, physical education, among others), it was adopted as a multi-professional knowledge area. For those authors present in more than one publication with different degrees, the highest academic degree was considered.

The extraction of information was according to ethical principles, presented faithfully, and cited and described the ideas, definitions, and concepts used by the authors of the articles.

■ RESULTS

Of the articles selected (n = 38), the year of

publication was distributed every four years, with significant growth in recent years, 50% (n = 19) between 2014 and 2017. Regarding the origin of the studies, 76.4% (n = 29) were from Brazil. Concerning the knowledge area, 50% (n = 19) of the productions was multi-professional (table 1).

As for the academic degree of the authors, 34.3% (n = 44) are physical educators and 26.5% (n = 34) physiotherapists. For 28.1% (n = 36) the professional qualification prevailed, followed by a doctorate 27.3% (n = 35). There were 19 authors in more than one publication when the professional qualification attributed to it was different; only the highest level was counted (table 1).

Table 1: Characterization as to the year of production, origin, area of knowledge, graduation, professional qualification of the productions. LILACS, SCOPUS, PubMed, WoS, and Scielo. Santa Maria, Rio Grande do Sul, Brazil, 2018.

Description	n	%
Year of production (n = 38)		
2005 – 2009	03	7.9
2010 – 2013	16	42.1
2014 – 2017	19	50.0
Origin (n = 38)		
Brazil	29	76.4
Iran	03	8.0
Japan	02	5.2
Portugal	01	2.6
US	01	2.6
Lebanon	01	2.6
Spain	01	2.6
Area of knowledge (n = 38)		
Multiprofessional	19	50.0
Physical Education	09	23.7
Physiotherapy	04	10.5
Not found	06	15.8
Graduation (n = 128)		
Biomedicine	01	0.8
Economics	02	1.6
Physical Education	44	34.3
Civil Engineering	02	1.6
Physiotherapy	34	26.5
Mathematics	02	1.6
Medical School	02	1.6
Dentistry	01	0.8
Psychology	01	0.8
Chemistry	01	0.8
Occupational therapy	02	1.6
Student	07	5.4
Not informed	29	22.6
Professional qualification (n = 128)		
PhD	02	1.6
Doctorate	35	27.3
Master degree	36	28.1

Continuation - Table 1: Characterization as to the year of production, origin, area of knowledge, graduation, professional qualification of the productions. LILACS, SCOPUS, PubMed, WoS, and Scielo. Santa Maria, Rio Grande do Sul, Brazil, 2018.

Specialist	09	7.0
University graduate	11	8.6
Academic	07	5.5
Not informed	28	21.9
Authorship in publications (n = 173)		
Caçola P	09	5.2
Gabbard C	09	5.2
Valentini NC	07	4.0
Santos DCC	05	2.9
Montebello MIL	03	1.7
Nobre GC	03	1.7
Frônio JS	03	1.7
Pereira KRG	03	1.7
Costa CLA	02	1.2
Nobre FSS	02	1.2
Ribeiro LC	02	1.2
Chiquetti ES	02	1.2
Saccani R	02	1.2
Copetti F	02	1.2
Pizzo GC	02	1.2
Caruzzo NM	02	1.2
Nazario PF	02	1.2
Bandeira PFR	02	1.2
Vieira JLL	02	1.2
Other authors (n = 109)	01 (each)	0.6

Source: Authors.

The 128 authors are linked to 44 institutions: Universidade Federal do Rio Grande do Sul/Federal University of Rio Grande do Sul 12.7% (n = 15), Fundação Universidade do Estado de Santa Catarina/Santa Catarina State University Foundation 10.2% (n = 12), Universidade Estadual de Maringá/State University of Maringá 9.3 % (n = 11), University of Texas 8.5% (n = 10), Texas A&M University 6.8% (n = 8), Universidade Federal de Santa Maria/Federal University of Santa Maria 5.1% (n = 6), Universidade Metodista de Piracicaba/Methodist University Piracicaba 4.2% (n = 5). With 2.5% (n = 3) participation, there is the Universidade do Vale do Rio dos Sinos/University of Vale do Rio dos Sinos, Universidade Federal do Amazonas/Federal University of Amazonas, Universidade Federal de Juiz de Fora/Federal University of Juiz de Fora, National Institute of Fitness and Sports in Kanoya, Azad University of Ahvaz and Islamic Azad University. And, with 1.7% (n = 2) of participation: Universidade Federal do Ceará/Federal University of Ceará, Universidade Federal do Pampa/Federal University of Pampa, Pontificia Universidade Católica/Pontifical Catholic University, University of Nebraska. Other institutions were present only once each.

The articles were published in 27 journals, 59.3% (n = 16) Brazilian and 40.7% (n = 11) foreign. Among the

Brazilian ones: Revista Fisioterapia e Pesquisa, Brazilian Magazine of Human Growth and Development, Magazine of Physical Education, Magazine of Public Health, Thinking Practice, Revista Paulista de Pediatria, Brazilian Magazine of Physical Education and Sport, Brazilian Journal of Physical Therapy, Neuroscience Magazine, Brazilian Journal of Ophthalmology, Physiotherapy and Movement, Brazilian Journal of Health Sciences, Physical Education and Sports Notebook, Themes on Human Development, Health and Journal of Physical Education.

The foreign journals were: Pediatrics International, Disability and Rehabilitation, International Journal of Mental Health and Addiction, Physical Therapy, Infant Behavior & Development, Research Quarterly for Exercise and Sport, Early Child Development and Care, Child Development Research, Journal of Social Sciences, Motricity and EFdeportes.com. The first six international journals cited had an impact factor; however, only the Brazilian Journal of Physical Therapy had an impact factor among the Brazilian journals.

Of the 38 articles, 26.3% (n = 10) received funding for the research from: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Coordination for the Improvement of Higher Education Personnel/Capes) 60% (n = 6) and the Conselho Nacional de Desenvolvimento

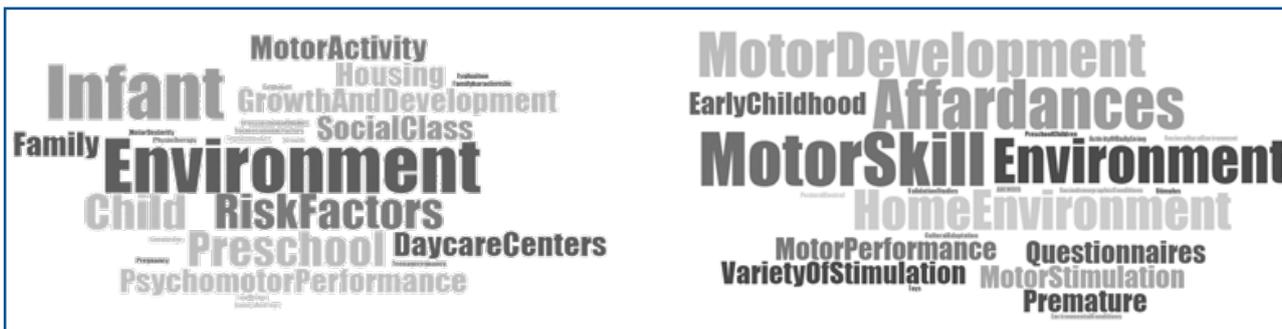


Figure 2: Representation of controlled and uncontrolled descriptors regarding their indication of use in the 38 analyzed publications.

Source: Made using the free Word Cloud Generator plugin.

Científico e Tecnológico (National Council for Scientific Development and Technological/CNPq) 50% (n = 5). The publications were supported by The National Science Council of Taiwan ROC 10% (n = 1) and National Institute of General Medical Sciences of the National Institutes of Health 10% (n = 10).

Figure 2 presents the 66 controlled and uncontrolled descriptors found in the publications.

Most of the studies were cross-sectional 47.4% (n = 18), followed by 26.3% (n = 10), concerning the creation, validation, or analysis of the instrument's properties AHEMD, longitudinal 10.5% (n = 4) of longitudinal design, 7.9% (n = 3) quantitative descriptive and other four studies.

The AHEMD-IS instrument was analyzed in 39.5% of the productions (n = 15) and the AHEMD-SR in 60.5% (n = 23) of them. Sometimes, these instruments were associated with the use of other tools, the most frequent being: Alberta Infant Motor Scale (AIMS) 23.5%

(n = 8), the Questionnaire of the Brazilian Association of Research Companies (ABEP) 17.6% (n = 6), Test of Gross Motor Development 2 (TGM-2) 8.8% (n = 3), Pediatric Dysfunction Assessment Inventory (PEDI) 8.8% (n = 3), Movement Assessment Battery for Children - 2 (MABC-2) 5.9% (n = 2), Bayley Scales of Infant Development - Second edition (BSDI-II) 5.9% (n = 2), Daily Activities Scale of Infants (DAIS) 5, 9% (n = 2), Knowledge of Infant Development Inventory (KIDI) 5.9% (n = 2). The others only once.

Figure 3 shows the dimensions of the instruments, AHEMD-IS, or AHEMD-SR of the studies selected, except for those studies related to translation, adaptation, or validation.

Most of the children studied had a good health condition. Those with some clinical involvement, situations of prematurity are mentioned^{16,23,39}, low birth weigh²³, developmental delay¹¹, and impaired visual acuity^{28,41} (board 1).

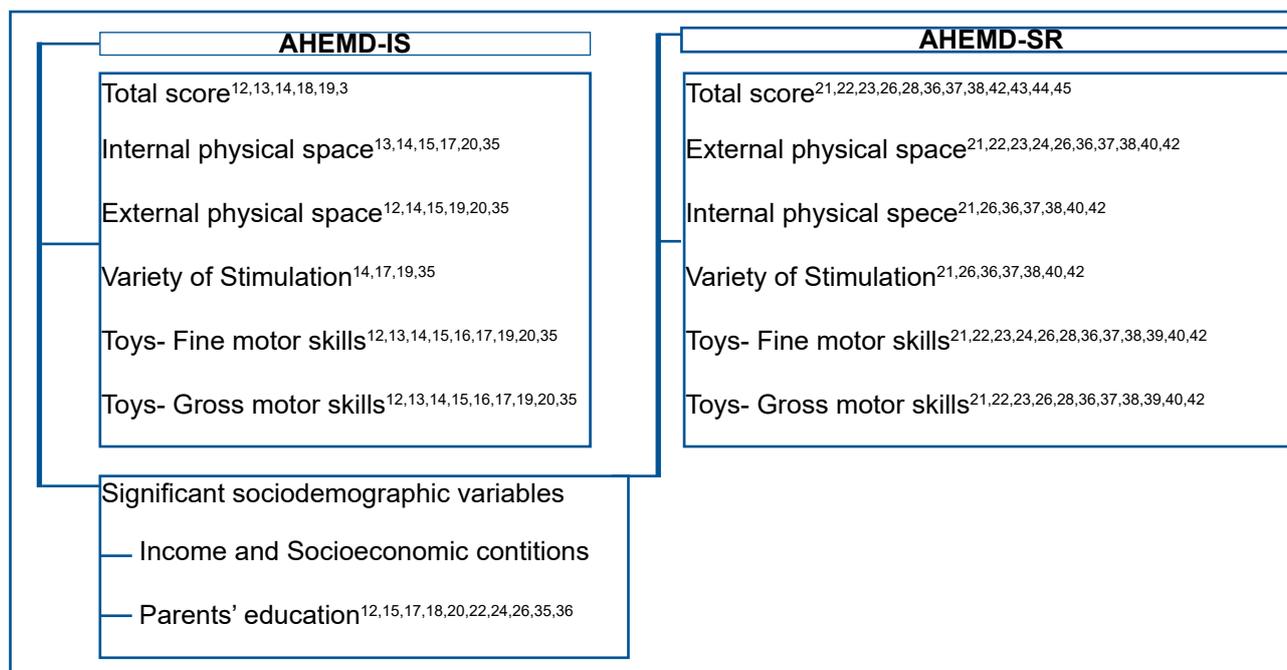


Figure 3: Dimensions of AHEMD-IS and AHEMD-SR highlighted in the publications found in LILACS, SCOPUS, PubMed, Scielo, and WoS. Santa Maria, Rio Grande do Sul, Brazil, 2018.

Source: Authors.

Board 1: Presentation of the 38 articles included in the research corpus.

Author/year	Objective	Conclusion	The novelty of the study
Rodrigues LP, Saraiva L, Gabbard C, 2005 ⁶ .	Creating a parental self-report instrument to assess the quality and quantity of factors (affordances and events) at home is favorable to the reinforcement of the motor development of children aged 18-42 months.	The AHEMD-SR scale, version Portugal, obtained a reliability coefficient of 0.85.	The instrument was valid and reliable to assess how well home environments can enhance and promote motor development.
Haydari A, Askari P, Nezhad MZ, 2009 ³¹ .	Investigate the validity and reliability of AHEMD-SR in Iran and the relationship between affordances and level of motor development.	AHEMD-SR was considered a valid value equal to 0.75, and reliability equal to 0.89.	For the first time in Iran, AHEMD-SR is a valid and reliable instrument for assessing how home environments can promote motor development.
Nobre FSS, Costa CLA, Oliveira DL, Cabral DA, Nobre GC, Caçola P, 2009 ²⁶ .	To analyze opportunities for motor development in domestic environments of different socioeconomic levels in the State of Ceará, Brazil.	Regardless of the economic level, the outer space was classified as weak and very weak, and the interior as good and very good; however, there was a better classification for the group with better purchasing power in both variables. Also, regardless of the economic level, the materials that stimulate motor skills development were classified as weak and very weak.	Despite the socioeconomic level having a positive influence on opportunities, the outdoor space and toys were inefficient to promote children's motor development.
Caçola P, Gabbard C, Santos DC, Batistela AC, 2011 ⁷ .	To describe the development and initial psychometric tests of the AHEMD-IS, designed to assess the homes of children aged 3 to 18 months.	The AHEMD-IS Brazil version scale obtained an inter and intra examiner reliability coefficient of 1.0 and 0.94.	The instrument has sufficient reliability and validity to assess Affordances in the home environment, with clinical and research applications.

Continuation - Board 1: Presentation of the 38 articles included in the research corpus.

Author/year	Objective	Conclusion	The novelty of the study
Hsieh YH, Hwang AW, Liao HF, Chen PC, Hsieh WS, Chu PY, 2011 ¹¹ .	To examine the psychometric properties of the Chinese version of Affordances in the Home Environment for Motor Development - Toddler version (AHEMD-Toddler-C) for children who typically develop or have motor delays.	The Chinese version AHEMD-Toddler-C scale obtained a reliability coefficient between 0.46 and 0.93. The correlation coefficients between total AHEMD and total HOME were 0.44 ($p = 0.003$ and $p = 0.0001$) for both groups.	AHEMD-Toddler-C is a new measurement option to explore the relationship between the domestic environment and engine development in Chinese-speaking countries. However, the stimulation variety and physical space subscales should be used with caution. For children who typically develop, only the AHEMD subscale correlated significantly with the mothers' educational level, the parents' educational level, and family income. For children with motor delays, the total AHEMD correlated moderately with all four family background variables.
Peres LW, Prestes DB, Coelho R, Nazário PF, Ramalho MH, Domenech SC, 2011 ⁴¹ .	To analyze the quality and quantity of child motor stimulation opportunities present in the family and student environment attended by the congenital visually impaired child and its relationship with the structuring of motor development and postural control, as well as their correlations.	Total AHEMD classification categorized as average in opportunities for motor development in the presence of visual impairment and low in normal visual conditions.	The environmental structure does not favor the motor development of children, concluding the importance of the mediating agent's intervention in the home microsystem.
Pilatti I, Haas T, Sachetti A, Fontana C, Oliveira SG, Schiavinato JCC, 2011 ⁴⁰ .	To analyze how much and how stimulation occurs in the homes of developing children.	External physical space was classified as good and internal as very good, as the materials for motor skills were very weak.	There is a need to further stimulate early motor development through the use of various materials in homes.
Defilipo EC, Fronio JS, Teixeira MTB, Leite ICG, Bastos RR, Vieira MT, <i>et al</i> , 2012 ¹⁸ .	To assess the opportunities present in the domestic environment for the motor development of infants.	For the age group of 03-09 months, an association was found between opportunities for environmental stimulation and socioeconomic classification. And for 10-18 months: maternal marital status, maternal and paternal education.	Domestic environment opportunities for motor development in childhood are influenced by the family's socioeconomic status and the mother's marital status.

Continuation - Board 1: Presentation of the 38 articles included in the research corpus.

Author/year	Objective	Conclusion	The novelty of the study
Miquelote AF, Santos DCC, Caçola PM, Montebelo MIDL, Gabbard C, 2012 ⁹ .	To assess the association between affordances at home for motor development and children's cognitive behavior.	Significant positive correlations between daily home activities and play materials and motor performance. Regarding cognitive performance, there was a positive association with fine motor performance.	There is an interrelation between opportunities in the home environment, motor skills (especially fine motor skills), and cognitive development.
Nobre FSS, Pontes ALFN, Costa CLA, Caçola P, Nobre GC, Valentini NC, 2012 ²¹ .	To verify the correlation between motor stimulation opportunities in the home environment and the level of motor development (DM) in 12 preschoolers from 36 to 42 months of age.	Outdoor space classified as weak or very weak and good or very good interior space. There was a variety of stimulation with low opportunities and toys for fine and gross motor skills with unsatisfactory values.	The results demonstrate a significant deficiency in promoting opportunities for children's motor development in the domestic environment, without, however, negatively influencing the result of the broad motor coefficient.
Oliveira SMS, Almeida CS, Valentini NC, 2012 ²⁵ .	Evaluate the motor development changes of babies based on guidance to parents or caregivers in an interventional physical therapy program in the family context.	Opportunities in a variety of stimulation, toys, and physical space resulted in better results (space to play and fine motor toys) in the intervention group.	Babies, when properly stimulated in a family environment, develop greater quality in their motor learning.
Ammar D, Acevedo AG, Cordova A, 2013 ³⁰ .	To compare a sample of Middle Eastern children with the standard sample that was used to validate AHMED.	The five factors for the Lebanese sample and the US sample and the Portuguese sample obtained different scores, which can be attributed to the differences in opportunity based on the groups' socioeconomic variables.	The Lebanese group showed higher scores for indoor affordances, toys, and games.
Freitas TCB, Gabbard C, Cacola P, Montebelo MIL, Santos, DCC, 2013 ¹⁵ .	To assess the availability of affordances at home to promote child motor development and family socioeconomic status.	Family economic conditions significantly influence the opportunities provided by the environment (physical space and toys). Any of the socioeconomic status indicators did not influence daily activities.	Daily activities are independent of family socioeconomic status.

Continuation - Board 1: Presentation of the 38 articles included in the research corpus.

Author/year	Objective	Conclusion	The novelty of the study
Giordani LG, Almeida CS, Pacheco AM, 2013 ³⁶ .	To assess motor development opportunities in the family home of children between 18 and 42 months, comparing age groups, genders, living with other children, and socioeconomic conditions.	The indoor space score was significantly associated with the number of adults and family income. The lace was also associated with outer space, materials with fine and thick motricity. Parents' education was associated with the best offer of toys and fine motor skills. The number of children with the best range of stimulation. The child who presented daily social interaction obtained a better variety of stimuli.	Social interaction obtained a relevant association with the variety of stimulation offered.
Mori S, Nakamoto H, Mizuochi H, Ikudome S, Gabbard C, 2013 ²⁹ .	To create a Japanese version of AHEND-SR and examine the relationship with children's motor development and parents' experience with physical activities.	Cronbach's alpha confirmed the instrument's reliability with a value of 0.78.	The scale was validated for the Japanese version. The physical environment (access to toys with fine and gross motor skills) and the psychological-social environments of the home (parents' experience and view of physical activity) influenced children's motor development.
Oliveira AS, Chiquetti EMS, Santos H, 2013 ¹⁴ .	To characterize the motor development and environmental opportunities of infants of adolescent mothers and compare the motor development of infants who live with grandmothers with the development of those who live only with fathers.	All residences presented low opportunities for motor development.	There was better motor performance when the grandmother is part of the family nucleus.
Pizzo GC, Amaro GFN, Silva PN, Caruzzo NM, Vieira JLL, Nazario PF, 2013 ⁴⁴ .	To analyze the relationship between the home environment and the motor performance of children aged 36 to 42 months.	The results showed low opportunities and incentives for child development that provided by the home environment.	The home environment did not directly influence children's motor performance.
Saccani R, Valentini NC, Pereira KR, Müller AB, Gabbard C, 2013 ¹⁷ .	To examine the relationship between selected biological risk factors and environmental affordances for motor development among newborns aged up to 18 months.	The variables positively associated with the infant's motor development outcome were: physical space inside the home, parental involvement in games about body parts; and family income.	Domestic environmental factors were associated with the motor development of children, as much as or even more than some high-risk biological factors.

Continuation - Board 1: Presentation of the 38 articles included in the research corpus.

Author/year	Objective	Conclusion	The novelty of the study
Soares ES, Flores FS, Piovesan AC, Corazza ST, Copetti F, 2013 ³⁷ .	To assess the affordances present in different types of homes to promote child motor development.	Of the five subscales, only the external space scored higher in the houses.	Apartments provide children with more opportunities for motor stimulation than homes.
Bueno EA, Castro AAM, Chiquetti EMS, 2014 ¹⁶ .	To evaluate the influence of the family environment on the motor development of preterm infants.	The comparison between the variables Alberta Infant Motor Scale (AIMS) and AHMED-IS showed a statistically significant difference in the dimension toys.	In addition to biological risk factors, environmental disadvantages can negatively influence the developmental progress of premature children.
Nascimento Junior JRA; Ferreira L, Vissoci JRN, Silva PN, Caruzzo NM, Vieira JLL, 2014 ²⁴ .	To analyze the impact of socioeconomic status on motor performance mediated by the affordances of the home environment of children with an average age of 42 months.	Upper-middle-class children have more affordances than lower-middle-class children; however, there was no significant difference in motor performance between groups.	A better socioeconomic level alone is not enough to structure a home environment that allows children's motor performance in basic motor tasks. The existence of household toys does not seem to adequately stimulate children's motor repertoire, pointing out that regardless of family income, homes are "poor" in opportunities to improve children's motor performance.
Padilha JF, Seidl EJ, Copetti F, 2014 ⁴³ .	To analyze motor development and the quality of the home environment of children aged 18 to 42 months who attend Early Childhood Education Institutions in the city of Santa Maria, Rio Grande do Sul, Brazil.	Homes provide sufficient motor development opportunities, with a better motor performance for fine handling and worse for mobility.	The higher income was reflected in, the greater opportunities for stimulation. However, these greater opportunities offered do not seem to impact children's motor performance directly.
Almeida TGA, Caçola PM, Gabbard C, Correr MT, Vilela Junior GB, Santos DCC, 2015 ¹² .	To compare the relationships between motor performance and characteristics of the family environment (physical space, daily activities, toys) of infants living in two regions of Brazil, North (Marabá, Pará), and Southeast (Piracicaba, São Paulo).	The group of infants in the North region had lower scores (fewer affordances) than those in the Southeast region.	Different regions of Brazil do not generate immediate impacts on the motorbike performance of infants. However, the home environments compared show discrepancies in motor performance opportunities, specifically about the internal physical space and quantity and variety of toys available.
Caçola PM, Gabbard C, Montebelo MIL, Santos DCC, 2015 ⁸ .	Develop and validate Affordances in the Home Environment for Motor Development – Infant Scale (AHMED-IS), an inventory that measures the quantity and quality of affordances in the home environment.	The AHMED-IS Brazil version scale obtained an inter and intra examiner reliability coefficient of 0.990 and 0.949.	Need to reduce the total number of items (41 to 35) and the combination of spatial dimensions. The general assessment categories were created as less than adequate. Moderately adequate, adequate, and excellent.

Continuation - Board 1: Presentation of the 38 articles included in the research corpus.

Author/year	Objective	Conclusion	The novelty of the study
Pedrosa C, Caçola P, Carvalhal MIMM, 2015 ¹³ .	To identify the environmental factors that predict infants' sensory profiles from four to 18 months of age.	Opportunities for stimulation in housing were rated as sufficient, and in daycare centers were rated as good.	Daily hours in daycare and outdoor space in daycare were predictors of the sensory profile in oculomotor control of infants.
Pizzo GC, Contreira AR, Rocha FF, Andrade JR, Vieira LF, 2015 ³⁹ .	Investigate the affordances of children from 36 to 42 months of age, seeking to compare the affordances of children's home environment according to the family income (low, medium, and high level).	Children with low family income have greater motor stimulation when compared to children with medium family income. High-income children have more affordances for the development of fine motor skills when compared to low-income children. In the gross motor dimension, middle-income children had a more favorable environment for developing such skills to the detriment of low-income children.	Family income can be an intervening element for affordances related to the development of gross and fine motor skills, with children belonging to families with better purchasing power having greater development opportunities. On the other hand, low-income children have more affordances related to motor stimulation.
Silva J, Fronio JS, Lemos RA, Ribeiro LC, Aguiar TS, Silva DT, <i>et al.</i> , 2015 ²³ .	To verify the association between functional mobility ability and opportunity of home stimuli of children with risk factors, and if this is affected by biological and socioeconomic factors.	The variable health problem (prematurity and low birth weight) was associated when considering the interaction between the environment, the control variables (socioeconomic level, maternal education, health problem, and attending or not attending daycare), and the outcome (the functional ability of mobility).	The presence of a health problem on functional abilities strongly impacts the outcome resulting from the interaction of the environment with the individual.

Continuation - Board 1: Presentation of the 38 articles included in the research corpus.

Author/year	Objective	Conclusion	The novelty of the study
Soares, ES, Flores FS, Katzer JI, Valentini NC, Corazza ST, Copetti F, 2015 ²² .	To analyze the quality of home environments in the central region of Rio Grande do Sul for the occurrence of motor stimulation opportunities.	Families with lower incomes and whose parents are less educated have homes that promote fewer opportunities for motor stimulation for children. The least satisfactory results were concerning the provision of materials that stimulate the development of children's motor skills in the external space of homes.	The study gives strong evidence that these restrictions may be due to the low socioeconomic level and educational level of the families surveyed.
Duarte MG, Duarte GSD, Nobre GC, Bandeira PFR, Santos JOR, Barros JLC, 2016 ⁴⁵ .	Evaluate the relationship between child motor development, socio-demographic conditions, and family environment of children between 36 and 42 months in the lower Amazon, Brazil.	Opportunities were classified as low.	Motor stimulation opportunities in the home environment classified as moderate impacts the outcome delayed development.
Lage JB, Nascentes GAN, Pereira K, 2016 ²⁸ .	To analyze and correlate the influence of stimuli present in the home environment on functional skills and caregiver assistance in the mobility of children with low vision and normal vision.	In AHMED-SR, children with low vision showed significant differences in the subscales' fine motor skills, gross motor skills, and total AHMED. However, both groups received an average rating for opportunities to stimulate the environment.	The home environment of children with the low vision presented reasonable opportunities for stimulation. However, their performance was within the normal range for functional skills and mobility caregiver assistance.
Pereira KRG, Valentini NC, Saccani R, 2016 ²⁰ .	Investigate the effects of maternal knowledge and practices, the home environment, and biological factors on the motor and cognitive outcomes of infants.	Associations between household affordances, parents' practices, and knowledge and motor and cognitive development have been observed over time.	Variability in motor and cognitive development is best explained by the environment and the parents' knowledge and practice compared to biological factors.

Continuation - Board 1: Presentation of the 38 articles included in the research corpus.

Author/year	Objective	Conclusion	The novelty of the study
Zoghi A, Shojaei M, Ghasemi A, 2016 ²⁷ .	To assess the impact of motor intervention on the motor and cognitive development.	The intervention (environment enriched with motor development opportunities with 36 sessions over three months) had a positive effect on the general score of the AHEMSD-IS and the thin and thick motor.	A motor opportunity intervention positively impacts the development of children aged 24-42 months.
Borba LS, Pereira KRG, Valentini NC, 2017 ³⁵ .	Identify associations and main predictors of motor and cognitive development of babies born to adolescent and adult mothers.	For both groups: there was a positive association between motor and cognitive development, and parental practices and parents' knowledge were predictors of motor development. There was a strong correlation of motor development with distinct variables in the group of babies of adolescent mothers (father's age, external and internal home space, mother working outside the home - in an inverse relationship - the parents' education, and the number of toys and adults in residence) and in the group of babies of adult mothers (cesarean section, parents living together and the number of rooms in residence).	The interdependence between cognition and motor skills, the characteristics of the family and residence, and the parents' practices were the main determinants of the evolution of children's development.
Dinkel D, Snyder K, Caçola P, 2017 ³⁴ .	To systematically translate and validate a Spanish equivalent of AHEMD-IS.	In the content equivalence testing stage, mothers reported that the instrument was clear and easy to complete.	It is a validated instrument that can help assess the home environment with Spanish-speaking populations, particularly those of Mexican descent.
Muller AB, Valentini NC, Bandeira PFR, 2017 ³³ .	To investigate the validity of the criteria, content, construction, and reliability of the AHEMD-IS scale, version 3-18 months, for use in daycare settings.	The results indicate the adequacy of the AHEMD-IS adapted for a Brazilian daycare center, with 15 items being removed. Regarding pertinence, all items obtained CVI of 1.	The instrument can be used by professionals in collectives and can contribute to increased opportunities that the collective context offers to the developing child.

Continuation - Board 1: Presentation of the 38 articles included in the research corpus.

Author/year	Objective	Conclusion	The novelty of the study
Silva WR, Lisboa T, Ferrari EP, Freitas KTD, Cardoso FL, Motta NFA, et al., 2017 ⁴² .	To analyze the relationship between motor stimulation opportunities in the family environment and the motor development of children of both sexes.	There was a significant correlation for fine motor skills and coarse motor skills for boys, and stimulation variety, fine motor skills, coarse motor skills, and motor stimulation for girls.	Households presented low opportunities for motor stimulation, and for households with boys, the score is higher.
Valadia S, Gabbard C, Arabameri E, Kashi A, Ghasemi A, 2017 ³² .	To determine whether the translated questionnaire meets the appropriate and necessary standards for measuring the quantity and quality of motor performance in the domestic environment of Iranian children between 18 and 42 months.	The results showed that the content-related validity was 0.92. Analysis of the confirmatory factor of data revealed an acceptable fit to the first five factors.	AHEMD translation is acceptable for use in Iranian children aged 18 to 42 months.
Vieira MT, Silva J, Frônio JS, 2017. ³⁸	To check and compare the functional capacity, independence, and stimulation present in the home environment of premature infants between 18 and 42 months, attending and not attending daycare.	The variety of stimulation was higher for the group that does not attend daycare, while toys with gross motor skills for the group (daycare).	The group of premature children aged 18-42 months who do not attend daycare receives more variety of stimulation at home.

Legend: AHEMD-IS: Affordances in the Home Environment for Motor Development– Infant Scale; AHEMD-SR: Affordances in the Home Environment for Motor Development– Self Report; AIMS: Alberta Infant Motor Scale; ABEP: Associação Brasileira de Empresas de Pesquisa’s questionnaire; HOME: Home observation for measurement of the environment; TSFI: Test of Sensory Functions in Infants; DAIS: Daily Activities Scale of Infants; KIDI: Knowledge of Infant Development Inventory; TGMD2: Test of Gross Motor Development 2; PEDI: Pediatric Dysfunction Assessment Inventory; MABC -2: Movement Assessment Battery for Children – 2; DDST: Denver Developmental Screening Test; PDMS-2: Peabody Developmental Motor Scales - 2 edition; BSID-II: Bayley Scales of Infant Development – Second edition.

DISCUSSION

When analyzing the characteristics of the productions that used the instruments AHEMD-SR and AHEMD-IS, an increase in publications was noticed as of 2010, which can be related to the studies on creation, validation, and adaptation of instruments^{6-8,11,29-34} which instigate the scientific community interest to apply them and publish the results.

The studies were linked to high education institutions and those who created the instruments. In the majority with studies developed in Brazil, however, those in other countries, Portugal^{13,30}, USA⁶, Japan^{11,29}, Iran^{27,31,32} and Spain³⁴, signal the use and dissemination of these tools for evaluation, enabling the assessment of opportunities in the home environment of children from different cultural and social contexts.

The authors were physical educators, physiotherapists, or professions focused on motor

development. On the other hand, the multi-professional knowledge area was predominant, pointing out the interest and involvement of other professionals in child development assessment research. Other health professionals such as nurses, nutritionists, and speech therapists were not found as authors, which suggests the need for inclusion according to their professional expertise in child health. For nursing, their role in monitoring child growth and development in different healthcare settings is pointed out, including home visits. Nutrition due to the influence of adequate and safe dietary conditions consistent with the child’s clinical condition and caloric expenditure to explore the home environment. Speech therapy due to the need for speech for verbal communication and success in a variety of stimulation.

The meaningful participation of authors with master’s and doctoral degrees highlights the implication in answering questions related to the theme, pointing out the

reference names, both of those validated the instruments and are consolidating their use. The lack of information regarding graduation and qualification in the articles, due to incompleteness or lack of standardized curriculum vitae, represented an obstacle to bibliometrics. It is estimated that a lack of authors' data of 20%, it reinforces the importance and needs to include complete information in journals indexed in the databases.

The articles are linked to journals that were meticulously evaluated by Thomson Reuters Journal Citation Reports (JCR) through the average number of times that the journal's articles were cited by others in subsequent publications during a period of two years⁴⁶, configuring a higher probability of reading the findings of these studies internationally.

The fact of having the support of funding agencies to promote this theme reinforces the relevance of it. It raises the need for investment of public resources of further studies that address the opportunities of the home environment for motor development. It also converges with the Sustainable Development Goals⁴⁷, which guides national and international policies on different topics, including child health.

The studies were characterized according to a variety of controlled and uncontrolled descriptors; such heterogeneity can be related to the publication rules of each journal. Some journals allow us to insert keywords; that is, they are not yet indexed. It is suggested to standardize the use of controlled descriptors, enhancing the evidence-based practice to optimize the recovery of the documents from the database⁴⁸. The standardization of controlled descriptors increases the potential of evidence-based practices.

The use of AHMED to assess the opportunities of the environment for motor development obtained different ratings: low^{14,21,26,38,42,44,45}, averages^{21-23,26,28} and sufficient^{13,43}. These results suggest that the evaluated children present opportunities in the domestic environment; however, in quantity and variability below what is considered excellent. On the other hand, the assessment of opportunities in the school setting showed excellent ratings for stimulating child motor development¹³, possibly because it is a safe place where the child can play, eat and interact with other children⁴⁹.

The dimension physical indoor environment obtained a very good classification in several studies^{21-23,25,26,36,39,40,43,44}. It is the most punctuated dimension in a study that evaluated the opportunities present at home and daycare centers¹³. In the outdoor environment dimension, regardless of gender²¹ and economic level²⁶, the classification was weak and very weak. Another study evaluated the opportunities for stimulation in children of adolescent mothers who lives or not with their grandmother. The physical space was also classified as very weak¹⁴. Another research considered considering income; the better the financial condition, the better the classification for internal and external physical space³⁶.

Concerning the variety of stimulation, research that compared the relationships between motor performance and the characteristics of the family environment of

infants in two regions of Brazil did not identify significant differences for the dimension of daily activities¹². A study in Brazil, which evaluated the domestic environment opportunities of different socioeconomic levels, obtained 65.9% of households with good and very good ratings for the dimension²⁶. The result converges with the findings of other studies^{36,40}, which found a "very good" classification for the variety of stimulation.

In contrast, other studies^{14,21,40} reported weak and very weak results for this dimension, revealing low opportunities, which can be improved by adding to the routine of the child, putting him to play in the supine position or games that stimulate parts of the body, for example⁵⁰. According to the findings of a study conducted at the home of 88 Brazilian families, the existence of a higher number of children at home was associated with a better result in the variety of stimulation³⁶.

The dimensions of toys for both fine motor skills and gross motor skills also varied as the results with very weak ratings^{14,16,21-23,26,38,40}, weak^{23,26,38}, and good^{13,43} for children of different groups, age groups, and scenarios. Thus, for those with a classification "very weak," regardless of the group, both infants who lived with their grandmothers and those who lived with their parents, the classification was the same¹⁴. An assessment of preschoolers in Rio Grande do Sul, Brazil, 91.7% of homes showed unsatisfactory values for fine motor skills development and 83.3% with impairments for the development of gross motor skills²¹. When comparing infants living in municipalities in two regions of Brazil, children in the North region had lower scores in toys for fine and gross motor skills than children living in the Southeast region¹². In the comparison between scenarios, both in daycare centers and in residences, the toys for motor skills showed the lowest average score in the study, even so, included in the classification of good opportunities¹³.

Certain variables can influence the results obtained through AHMED, especially socioeconomic level and income^{15,17,18,20,22,24,26,36,39,43}, maternal education^{15,17,18,22,26} and paternal^{12,15,18,20,22,36}. A study with infants in a city in Minas Gerais State, Brazil, revealed that the parents' stable union, maternal and paternal with high educational level, and high economic income were the factors associated with the best opportunities for motor stimulation at home¹⁸.

Another study also pointed out that families from higher social classes provided more significant physical space and availability of toys, and those where both parents had an undergraduate course provided significantly more toys than families with high school education¹⁵; such findings corroborate the results of a research carried out with children from the northern region of Brazil, with significant differences in the dimensions of indoor space and fine motor skills, indicating that upper-middle-class children have more motor opportunities at home, in addition to having more toys related to fine motor skills²⁴.

The use of these instruments proved to be valid, with perspectives of dimensions that promote child motor development, signaling that opportunities in the home environment are as significant as biological factors¹⁷ and can even generate a positive impact on children's motor and cognitive behavior in short and long term¹⁹.

The limitation of this study was concerning the reading and interpretation of the results when described by the instrument's dimension and the total score. The studies used different terms in some of them; the score was described as weak and very weak, good and very good, in others dichotomized as good or bad, inadequate or adequate, or even low, medium, or high. This implies a difficulty in comparing the results. Furthermore, the lack of information regarding the formation and qualification of the authors represent a barrier for bibliometrics.

It should be highlighted that in the analyzed period (12 years), there was an increase of 100% of the scientific publications during the last four years (2014-2017). This fact added to the authors' profile indicates that the theme of child motor development is multifaceted and arouses the interest of researchers in different areas of knowledge. The validation of the instruments in 6 countries indicates that this has been applied in different cultural and social contexts. The evidence found in most articles that evaluated

the correlation of the dimensions of the AHEND-IS and AHEND-SR with the socio-demographic variables of the investigated families showed that the income and better socioeconomic conditions and the higher education of the parents have a significant positive correlation for children's development.

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Conflicts of interest:

Nothing to declare.

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Resumo

Introdução: O desenvolvimento infantil compreende um processo de transformação complexo, dinâmico devido a interações passíveis de transformações, além de contínuo e progressivo, o qual inicia na concepção, envolvendo aspectos que permeiam o crescimento físico, maturação neurológica, comportamental, cognitiva, social e afetiva da criança.

Objetivo: Analisar as características da literatura científica sobre a utilização do instrumento Affordances no ambiente domiciliar para o desenvolvimento motor (AHEMD).

Método: Revisão bibliométrica e cientométrica nas bases de dados Publisher Medline (PubMed), Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS), Elsevier SciVerse Scopus (SCOPUS), Web of Science Coleção Principal Clarivate Analytcs (WoS), e na Scientific Electronic Library Online (SciELO) no mês de janeiro de 2018, incluiu estudos primários em inglês, português ou espanhol.

Resultados: 38 produções aplicaram o AHEMD para avaliação das oportunidades do ambiente, sendo que 39,5% das produções (n = 15) para crianças de 3 a 18 meses e 60,5% (n = 23) produções para crianças de 18 a 42 meses, com maior frequência 47,4% (n = 18) para estudos transversais, 76,4% (n = 29) procedentes do Brasil, 50% (n = 19) no período entre 2014 a 2017 e 50% (n = 19) com autoria multiprofissional. Observou-se que a avaliação das oportunidades presentes no ambiente domiciliar utilizando as versões do AHEMD fez-se com crianças de diferentes características, cenários e contextos sociais com pontuações de dimensões e total classificadas desde muito fracas a suficientes.

Conclusões: Resultados de maior renda e escolaridade dos pais têm associação positiva para o desenvolvimento infantil.

Palavras-chave: desenvolvimento infantil, meio ambiente, jogos e brinquedos, família, avaliação.

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