

ICF domains in motor development assessment tools: an integrative review

Domínios da CIF em instrumentos de avaliação do desenvolvimento motor: uma revisão integrativa

Dominios de la CIF en instrumentos de evaluación del desarrollo motor: una revisión integradora

Ana Caroline Belo Alencar¹, José Davi Nunes Martins²,
Marcela de Castro Ferracioli Gama³, Shamyry Sulyvan de Castro⁴,
Kátia Virginia Viana Cardoso⁵

1. Physical therapist, Post-Graduated student, Physical Therapy Department, Universidade Federal do Ceará. Fortaleza-CE, Brazil. Orcid: <https://orcid.org/0000-0001-9920-326X>

2. Physical therapist, Post-Graduated student, Physical Therapy Department, Universidade Federal do Ceará. Fortaleza-CE, Brazil. Orcid: <https://orcid.org/0000-0003-3723-1315>

3. Physical Educator, PhD, Professor, Physical Therapy Department, Universidade Federal do Ceará. Fortaleza-CE, Brazil. Orcid: <https://orcid.org/0000-0003-1782-691X>

4. Physical therapist, PhD, Professor. Physical Therapy Department, Universidade Federal do Ceará. Fortaleza-CE, Brazil. Orcid: <https://orcid.org/0000-0002-2661-7899>

5. Physical therapist, PhD, Professor. Physical Therapy Department, Universidade Federal do Ceará. Fortaleza-CE, Brazil. Orcid: <https://orcid.org/0000-0002-6552-7124>

Resumo

Introdução. O desenvolvimento motor é um processo também influenciado pelo contexto em que a criança está inserida. O serviço de saúde acompanha crianças para triagem do desenvolvimento utilizando diferentes instrumentos de avaliação. Com a criação da Classificação Internacional de Funcionalidade, Incapacidade e Saúde (CIF), uma nova abordagem baseada no modelo biopsicossocial foi estabelecida, possibilitando a avaliação com foco nos aspectos funcionais e/ou incapacitantes. **Objetivo.** Identificar os domínios da CIF em instrumentos de avaliação do desenvolvimento motor validados para crianças brasileiras.

Método. Revisão integrativa realizada com consulta nas bases de dados PubMed, CINAHL e Embase (Elsevier), utilizando descritores “funcionalidade” e “desenvolvimento motor” combinados com seus sinônimos, incluindo apenas coortes observacionais e estudos transversais publicados em português, inglês ou espanhol, com indivíduos na primeira infância, sem demarcador temporal. Os instrumentos dos estudos foram coletados, sendo registrados apenas aqueles com validação no Brasil. Esses instrumentos passaram por uma análise que relacionou seus conceitos aos componentes contidos na CIF através de estatística descritiva com apresentação da frequência absoluta (n) e frequência relativa (%). **Resultados.** Após a elegibilidade dos estudos e instrumentos encontrados, sete instrumentos foram validados no Brasil e disponibilizados para acesso. A extração de conceitos da CIF gerou conceitos divididos nos seguintes componentes: Funções do Corpo (22,6%), Atividades e Participação (75,2%) e Não Coberto (2,2%). **Conclusão.** Poucos instrumentos destinados à avaliação do desenvolvimento motor na primeira infância são validados para o Brasil, e nenhum dos instrumentos abordou todos os componentes propostos pela CIF, sendo necessário complementá-los com outras ferramentas.

Unitermos. Desenvolvimento Infantil; Classificação Internacional de Funcionalidade, Incapacidade e Saúde; Avaliação em Saúde

Abstract

Introduction. Motor development is also influenced by the context the child is inserted. The health service follows up children for developmental screening, using different assessment instruments. Through the creation of the International Classification of Functioning, Disability and Health (ICF), a new approach based on the biopsychosocial model was brought, which made possible the evaluation focusing on functional and/or disabling aspects. **Objective.** To

identify the presence of ICF components in motor development assessment instruments validated for Brazilian children. **Method.** This is an integrative review carried out in PubMed, CINAHL, and, Embase (Elsevier) databases, using descriptors "functioning" and "motor development" combined with their synonyms, including only observational cohort and cross-sectional studies published in Portuguese, English, or Spanish with individuals in early childhood, without temporal demarcation. The instruments in the studies were collected, and only those with validation in Brazil were registered. These instruments underwent an analysis that related their concepts to the components contained in the ICF through descriptive statistics with the presentation of absolute frequency (n) and relative frequency (%). **Results.** After the eligibility of the studies and instruments found, seven were validated in Brazil and available for access. The process of extracting concepts from the ICF generated concepts divided into the following components: Body Functions (22.6%), Activities and Participation (75.2%), and Not Covered (2.2%). **Conclusions.** Few instruments intended for the evaluation of early childhood motor development are validated for Brazil, and none of the instruments addressed all the components proposed by the ICF, being necessary to complement them with other tools.

Keywords. Child Development; International Classification of Functioning, Disability and Health; Assessment Instruments

Resumen

Introducción. El desarrollo motor es un proceso influenciado también por el contexto en el que se inserta el niño. El servicio de salud monitorea a los niños para la evaluación del desarrollo utilizando diferentes instrumentos de evaluación. Con la creación de la Clasificación Internacional del Funcionamiento, la Discapacidad y la Salud (CIF), se estableció un nuevo enfoque basado en el modelo biopsicosocial, que permitió una evaluación centrada en aspectos funcionales y/o discapacitantes. **Objetivo.** Identificar los dominios de la ICF en instrumentos de evaluación del desarrollo motor validados para niños brasileños. **Método.** Esta es una revisión integradora realizada utilizando las bases de datos PubMed, CINAHL y Embase (Elsevier), utilizando los descriptores "funcionalidad" y el "desarrollo motor" combinados con su sinónimos, incluyendo solo cohortes observacionales y estudios transversales publicados en portugués, inglés o español, con individuos en la primera infancia, sin demarcación temporal. Se recogieron los instrumentos de los estudios, y sólo se registraron aquellos con validación en Brasil. Estos instrumentos fueron sometidos a un análisis que relacionó sus conceptos con los componentes contenidos en la CIF a través de estadística descriptiva con presentación de frecuencia absoluta (n) y frecuencia relativa (%). **Resultados.** Después de la elegibilidad de los estudios e instrumentos encontrados, siete instrumentos fueron validados en Brasil y puestos a disposición para el acceso. La extracción de conceptos de la CIF generó conceptos divididos en los siguientes componentes: Funciones Corporales (22,6%), Actividades y Participación (75,2%) y No Cubierto (2,2%). **Conclusión.** Pocos instrumentos destinados a la evaluación del desarrollo motor en la primera infancia están validados para Brasil, y ninguno de los instrumentos abordó todos los componentes propuestos por la ICF, siendo necesario complementarlos con otras herramientas.

Palabras clave. Desarrollo infantil; Clasificación Internacional de Funcionamiento, Discapacidad y Salud; Valoración de Salud

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Corresponding author: Ana Caroline Belo Alencar. R. Major Weyne 1440. Campus do Porangabussu, Rodolfo Teófilo, Pshysical Therapy Department. CEP 60430-160, Fortaleza-CE, Brazil. E-mail: carol.belo5@gmail.com

INTRODUCTION

Among the stages of human development, childhood is considered a period of intense neuroplasticity, being crucial

for future acquisitions, especially in the first years of life¹. Child development begins in the intrauterine phase and is followed by the years of life after birth. From these, it is possible to perceive the child's progress of neurological maturation, acquisition of motor, cognitive, social and emotional skills, in addition to physical growth, which are subjected to be influenced by biological and environmental factors².

Specifically, motor development is a commonly perceptible process, where changes occur gradually and ordered, with one change leading to another according to the chronological age, but not only dependent on it. This process is also influenced by the context in which the child is inserted, such as home or school, and the relationship between them, which assumes here a marked importance³.

Since motor development is influenced by different factors, including environmental ones³, several studies around the world seek to identify delays in development using validated instruments for this purpose. Using the Ages and Stages Questionnaire, 3rd edition (ASQ-3), it was identified 12.1% of a sample of Australian children aged 3 to 5 years showed risk of developmental delay⁴, while in a Brazilian sample, using this same instrument, 16.1% of children were found to be at risk of delay⁵.

Specifically assessing delay in motor skills, 77% of American children aged 3 to 6 years were at risk of delay, according to the Test of Gross Motor Development, second edition (TGMD-2)⁶, while in Brazil, 25.8% were at risk of

delay in motor skills, when assessed by the Movement Assessment Battery for Children, second edition, (MABC-2)⁷. The assessment of aspects of child development for the early identification of possible delays requires the use of standardized instruments and should take place periodically, as recommended by the American Academy of Pediatrics (AAP)⁸.

In this context, unlike what is disseminated by the World Health Organization (WHO) today, the biomedical model is still predominant in the West. This model explains issues related to human incapacity based on the idea of the disabled body, which excludes important aspects from the understanding of the health-disease process, such as the psychological and the social⁹. In the mid '70s, Engel¹⁰ awakened the gaze on a new understanding of health, approaching the idea that behavioral and psychosocial aspects are important factors in the perception of what is functional.

Through the creation of the International Classification of Functioning, Disability and Health (ICF), the WHO brought a new approach based on the biopsychosocial model, which made possible the internationally common language among professionals who turn their gaze to individuals in a particular and comprehensive way, focusing on its functional and/or disabling aspects¹¹.

In this classification, different components represent functioning: body functions, body structures, activities and participation, environmental, and personal factors. The

health condition involves a dynamic interaction between these environmental and personal factors¹².

The ICF describes functionality and disability related to health conditions, identifying what a person "can or cannot do in their daily life", in view of the functions and structures of the body, covering the components of health at the bodily and social levels, where each one of them acts and suffers the action of the others, opposing an antecedent linear model and admitting the multidirectionality of health. This factor allows one to understand that the disease is the result of changes in functionality and not the cause of them. It also allows the understanding of different situations of disability in which people with the same disease may have different dysfunctions, since they are influenced by different contexts¹³.

In the pediatric scenario, the ICF allows guiding the view of professionals involved in the health and well-being of this population, facilitating the understanding of functional issues, as well as the identification of their potentials and weaknesses and, thus, making care more precise and bringing this process closer to aspects related to the ecological model¹⁴.

The health service usually followed up children for developmental screening, using several questionnaires and scales in which the most common used in clinical practice and in Brazilian researches are Denver Test II, Peabody Developmental Motor Scale, Gross Motor Function Measure (GMFM), Infant Motor Scale of Alberta (AIMS), Bayley Scale

Of Infant Development – Bayley III, Pediatric Evaluation of Disability Inventory (PEDI), and Child Behavior Development Scale¹⁵.

However, although some of these instruments have their standardized and validated versions for Brazilian children, it has yet to be discovered whether they fully address functioning or just some isolated aspects. The incorporation of the ICF in Brazilian health services is still precarious, even with the WHO suggesting that health assessment instruments should not be limited to addressing issues of body function and structure but should consider including questions about contextual factors (environmental and personal)¹⁶.

In this scenario, studying ways to establish a link between the ICF and the instruments commonly used to assess the motor development of Brazilian children helps to understand how the vision of functioning is directed in the evaluation stages of this population. To guide the elaboration of this study, the following question was established: “How are the instruments that assess the motor development of children in early childhood related to the components of the International Classification of Functioning, Disability and Health (ICF)?”

Therefore, the research aims to identify the ICF components presence in the motor development assessment instruments validated for Brazilian children.

METHOD

The present study consists of an integrative review that followed the following steps: (1) elaboration of the guiding question; (2) search or sampling in the literature; (3) data collection; (4) critique of included studies; (5) discussion of the results and (6) presentation of the results of the integrative review¹⁷.

This review followed the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist. It was also registered with The Open Science Framework (OSF).

Searches using the descriptors extracted by the research question were performed in the following databases: PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and, Embase (Elsevier). Descriptors registered in DeCS, MeSH, and Emtree were selected, as well as the appropriate combinations with synonyms and Boolean operators, in order to form the following strategies:

PUBMED ("International Classification of Functioning, Disability and Health" OR ICF OR Functioning OR disability) AND ("Motor Development" OR "Motor Performance" OR "Mobility Development" OR "Motor ability" OR "Motor function" OR "Motor Skill" OR "Motor activity") AND (child OR "child development") NOT "Down Syndrome" NOT "Cerebral Palsy" NOT Autism NOT "Attention-Deficit/Hyperactivity

Disorder" NOT HDAD NOT myelomeningocele NOT dystrophy NOT syndrome NOT cancer NOT atrophy NOT prematurity.

EMBASE ("International Classification of Functioning, Disability and Health" OR ICF OR Functioning OR disability) AND (Motor, development OR Ability, motor OR Function, motor OR Motor Skills OR Performance, motor OR Skill, motor) AND (child OR "child development") NOT "Down Syndrome" NOT "Cerebral Palsy" NOT Autism NOT "Attention-Deficit/Hyperactivity Disorder" NOT HDAD NOT myelomeningocele NOT dystrophy NOT syndrome NOT cancer NOT atrophy NOT prematurity.

CINAHL ("International Classification of Functioning, Disability and Health" OR ICF OR Functioning OR disability) AND (Motor, development OR Ability, motor OR Function, motor OR Motor Skills OR Performance, motor OR Skill, motor) AND (child OR "child development") NOT "Down Syndrome" NOT "Cerebral Palsy" NOT Autism NOT "Attention-Deficit/Hyperactivity Disorder" NOT HDAD NOT myelomeningocele NOT dystrophy NOT syndrome NOT cancer NOT atrophy NOT prematurity.

Due to the specific characteristics of accessing the selected databases, the strategies used to locate the articles were adapted for each database.

The selection of studies followed the following inclusion criteria: observational cohort and cross-sectional studies, published in Portuguese, English or Spanish; that included only individuals in early childhood, that is, children aged zero to six years, age established by referenced international

studies of treatment in early intervention¹⁸. Furthermore, the following exclusion criteria were adopted: studies that addressed premature children or pathologies associated with the sample, such as cerebral palsy, syndromes, mental retardation, or similar conditions; studies that did not have the full text available for reading. There was no determination of the year of publication of the studies in order to include different instruments used over the years.

After the search, the following phases selected the studies: 1- Disposal of duplicate articles, 2- Title and abstract reading, 3- Full-text reading, 4- Extraction of the instruments used in the studies. The search and eligibility processes took place from September to October 2022 and were independently carried out blindly by two reviewers. Disagreements were discussed and determined by a third reviewer.

After preparing the list of instruments, it was verified whether their most recent versions had validation studies for the Brazilian population; those confirmed were considered included and underwent an analysis that related their concepts to the components contained in the ICF. Some instruments are presented in more than one version. Therefore, in these cases, only their most recent versions were considered for the analysis.

The process of analysis and relationship of concepts was carried out based on the protocol proposed by Cieza, Fayed, Bickenbach and Prodinger which defined that first, all screened instruments went through a concept extraction

process. After, each item of each instrument generated a significant concept, and these summarize the main idea of each item presented by each instrument. When the most appropriate concept was chosen, it was analyzed among the items presented by the ICF according to their respective definitions. The ICF component chosen for a given concept was defined based on the item that best suits it. More than one component may have been related to a single concept. When the significant concept wasn't found in the ICF, it was considered not covered (NC)¹⁹.

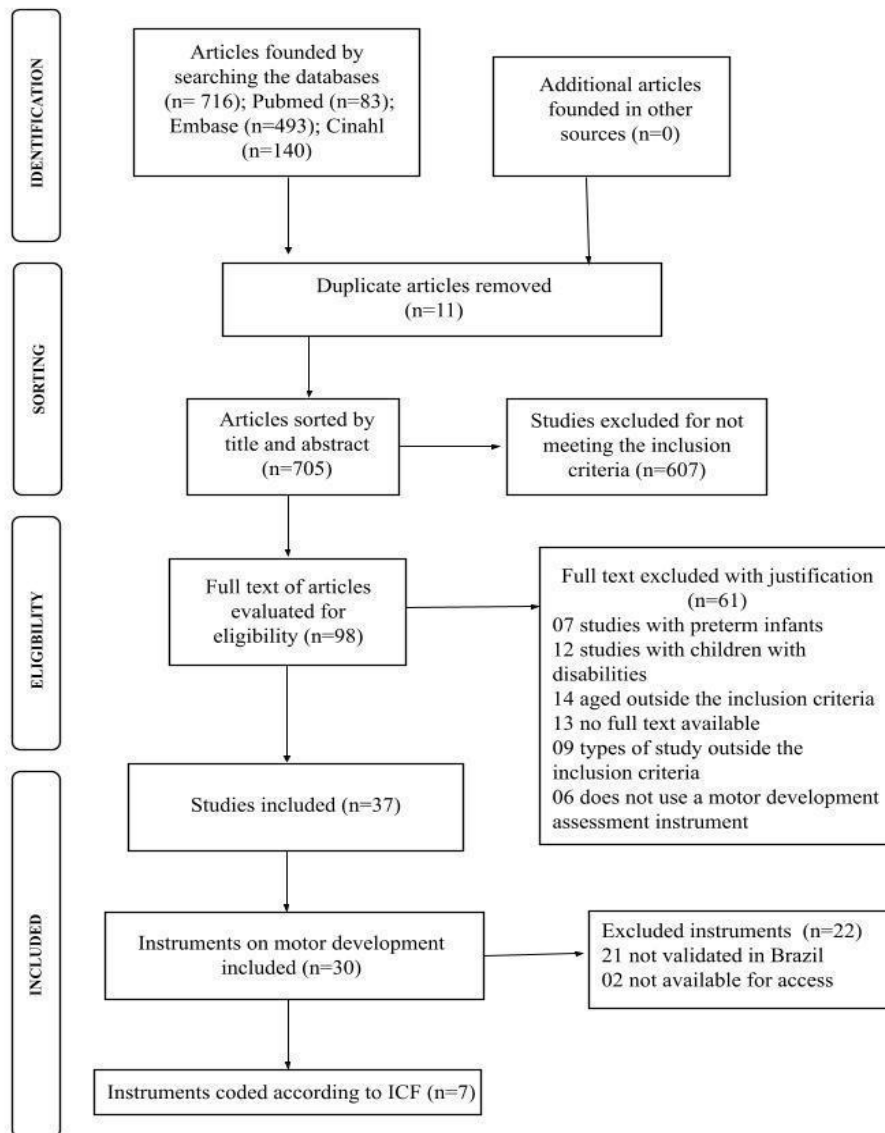
Data analysis was performed using descriptive statistics with the presentation of the absolute frequency (n) and relative frequency (%) of the ICF domains found in the selected assessment instruments, these data being exposed through tables.

RESULTS

A total of 716 articles were found in the databases mentioned above with the respective search strategies, resulting in 37 studies. Of these, 30 instruments were extracted, but only seven²⁰⁻²⁶ were validated for the Brazilian population and available for access. Figure 1 describes the eligibility of these articles.

The description of instruments chosen is presented in Table 1, containing the information on each assessment instrument, the age at which it is intended, year of creation, and year of validation for the Brazilian population.

Figure 1. Flowchart of identification and selection of studies for integrative review.



The process of extracting concepts from the seven instruments included generated a total of 597 concepts divided into the following components: Body functions (22.61%), Activities and Participation (75.2%), and Not Covered (2.19%). None of the evaluated concepts was classified as belonging to the other domains of the ICF (Table 2).

Table 1. General information on the instruments included in the integrative review.

Instrument	Evaluation object	Age group	Authors and year of validation in Brazil	Year of first version
Bayley Scales of Infant and Toddler Development BAYLEY III (2012)	Child development in the cognitive, linguistic, motor, socio-emotional and adaptive behavior domains.	1 to 42 months	Madaschi 2012 ²⁰	1969
Alberta Infant Motor Scale AIMS (2009)	Maturation of gross motor development; identification of delays.	0 to 18 months	Saccani 2009 ²¹	1992
Movement Assessment Battery for Children MABC-2(2015) (3 to 6 years)	Motor skills through manual dexterity, ball skills and balance.	3 to 16 years	Pinheiro 2015 ²²	1992
Pediatric Evaluation of Disability Caregiver Mobility Scale PEDI-2 (2005)	Child functioning in daily routine activities.	6 months to 7,5 years	Mancini 2005 ²³	1992
Test of Gross Motor Development TGMD-2 (2008)	Gross motor skills.	3 to 10 years	Valentini 2008 ²⁴	2000
Ages and Stages Questionnaire ASQ-3 (2013)	Screening instrument applied with parents/caregivers. Areas of communication, gross and fine motor coordination, problem solving and personal/social development.	1 month to 5 years	Filgueiras 2013 ²⁵	1980
Denver Developmental Screening Test DENVER-II (2017)	Identify developmental delay in the areas: Gross Motor, Fine-Adaptive Motor, Social Personnel and Language.	0 to 6 years	Frankenburg 2017 ²⁶	1967

Table 2. Absolute and relative frequency [n(%)] of the ICF domains contained in the concepts extracted from the motor development assessment instruments.

Instrument	Body functions (b)	Body structures (s)	Activity and participation (d)	Environmental factors (e)	Personal factors (pf)	Not covered	Total
BAYLEY-III	45 (33.1)	0	86 (63.2)	0	0	5 (3.6)	136 (100)
AIMS	17 (27.87)	0	44 (72.1)	0	0	0	61 (100)*
MABC-2	1 (12.5)	0	7(87.5)	0	0	0	8 (100)
PEDI-2	21 (9.63)	0	189 (86.7)	0	0	8 (3.6)	218 (100)
TGMD- 2	0	0	12 (100)	0	0	0	12 (100)
ASQ -3	8 (25.81)	0	23 (74.1)	0	0	0	31 (100)*
DENVER-II	43 (32.82)	0	88 (67.1)	0	0	0	131 (100)*
TOTAL	135 (22.61)	0	449 (75.2)	0	0	13 (2.1)	567 (100)

*Some concepts contained in the instruments fit into more than one component, thus increasing the total number of items in the instruments for the frequency parameters. Actual number of total items: **AIMS**: 58 items; **ASQ-3**: 30 items; **DENVER-II**: 125 items.

DISCUSSION

This study aimed to identify the components of the ICF in the motor development assessment instruments validated for Brazilian children. As a main result, among the seven instruments eligible for this review, more than 70% of the concepts extracted from them were related to the functioning aspects corresponding to the Activities and Participation component.

It was already stated that the classic outcomes related to child development corresponded better with the Activities and Participation components²⁷. Although this has been confirmed in this study, there was no further analysis to distinguish which concepts are closer to activity (conceptualized as "execution of a task or action by an individual") or participation (conceptualized as "act of getting involved in a vital situation"), because they are presented together, even though they are different concepts¹⁴.

Some of the more specific terms of the children's context are not present in the ICF. However, several of the analyzed instruments presented typical childhood tasks as a form of evaluation and some of the concepts raised were summarized in concepts such as "play" (for example, the item "continuous play with objects" from the Bayley-III scales) which was classified as not covered by the ICF.

Other concepts, despite not being fully covered, however, could be fitted into similar definitions that were present in the ICF, as happened with the concept "roll over" (item "supine to prone roll without rotation" of the Alberta

Infant Motor Scale), in which it was possible to perceive a correlation with the Mobility chapter, even though it was categorized as “other specified” (ICF category used when the functioning aspect is not included in any of the other specified categories)¹⁴.

Most of the concepts corresponding to the Activities and Participation component were close to the chapters on Communication, Mobility and Personal Care. In contrast, chapters on Interpersonal Relationships and Interactions, Main Areas of Life and Community, Social and Civic Life were little explored. Also, chapters corresponding to Mental Functions, Voice and Speech Functions, and Neuromusculoskeletal and Movement-related Functions were extensively explored among the concepts classified within the Body Function component, which corresponded to about 22% of those evaluated in this study.

Although motor development is broad and involves several factors, including environmental²⁸, instruments aimed at its evaluation do not seem to direct their questions to these aspects since components of Environmental Factors did not approach the main concepts presented in this study, as well as those of Body Structures.

Certain instruments include environmental factors in complementary tools, such as the Affordances in the Home Environment for Motor Development – Infant Scale (AHEMD-IS), frequently used as a complementary instrument to the AIMS, which is aimed at evaluating opportunities in the home environment, with a focus on the understanding of the

internal and external space of daily activities and toys that are available to infants between 3 and 18 months of age. Studies using this instrument already indicate that opportunities in the home environment are as important for motor development as biological factors²⁹.

Among the instruments included for analysis, MABC-2 and TGMD had questions more related to the assessment of motor skills than to motor development itself. These skills are part of a refinement of motor development and are seen as motor skills that allow the individual to perform common activities of daily life that require motor coordination³⁰, thus, consequently, it could be expected that their concepts were closer to the Activities and Participation component.

Among the various instruments surveyed in this review, most of them did not have validation for application in the Brazilian population. This amount reflects the scarcity of normative data and standardized and validated assessment tools for the early diagnosis of changes in children's motor development in Brazil, contributing to damages in early intervention processes and developmental screening³¹.

All instruments analyzed were developed (first version) before the creation of the ICF in 2001. However, the biopsychosocial model was already in the process of dissemination due to the International Classification of Impairments, Disabilities and Limitations - ICIDH (1980)³². Despite this, the instruments were still developed from biomedical perspective, segregating aspects that today summarize functioning.

Is also important to highlight that the environment can have a positive or negative influence on the child's ability to perform actions or tasks and also on the function and structure of their body, which also influences their participation and quality of life. Through the evaluation of environmental factors, it is possible to identify factors that can act as barriers, hindering the development process, or facilitators, helping this process. For this reason, more and more studies have investigated the role of home, school, and community in the participation of children and adolescents³³.

According to the WHO, in order to have a complete approach to functioning and disability from the perspective of the ICF, all its aspects must be observed in the material being proposed, corroborating with an expanded view of health that meets current theories of child development, which follow the contextual/ecological theoretical model³⁴. In the validated instruments for the assessment of motor development that were found in this study, it was not possible to perceive this complete approach because, among the seven instruments analyzed, none addressed all the components of the ICF.

Although commonly used as tools in studies aimed at assessing the status and development of children, some weaknesses can still be found, such as the need to use other complementary tools for a closer assessment of the reality of the child and their family, as well as the environment in which they are inserted, since these are very specific factors. Additionally, despite updates to new versions, even after the

creation of the ICF, none of these tools have been able to fully address a functional perspective.

This fact makes initiatives need to develop instruments that bring a complete perspective, encompassing the scopes of functioning. Although there are complementary tools for the assessment of issues do not present in some instruments, the development of a tool that considers all the components of the functioning proposed by the ICF would make the assessment stage complete and more practical, contributing to a better professional conduct.

At the moment, according to other studies, there is no scale or instrument for monitoring, detecting and planning intervention in children that contemplates all ICF domains. But, the use of low-cost succinct evaluation scales of development, systematized according to the biopsychosocial model of the ICF and directed to the reality of the environment would facilitate the professional accession and reduce the time to observe the categories that require the most attention and subsidizes early intervention actions, impacting in the progress of these children³⁴.

The Survey of Well-Being of Young Children (SWYC), an instrument created to screen the development of children aged up to 65 months, by asking parents and caregivers about motor and behavioral aspects, concerns about the child, as well as questions of environmental factors and their risks (such as signs of maternal depression and parental relationship), is, perhaps, an instrument with a more complete approach for understanding the different contexts

associated with motor development, since it addresses issues that involve several of the aspects of functioning presented by the ICF³⁵.

In addition, it has good psychometric properties, is freely accessible, application and interpretation manuals are available online, and has its versions validated for Brazilian children³⁵. The analysis carried out in this study offered an overview of the components addressed in the instruments raised in this integrative review. However, this analysis was not carried out in-depth, so specific codes for their certain concepts were presented, which is considered one of the limitations of this study. The low number of instruments included can also be considered a limiting factor since most of those found in this review were excluded due to the lack of validation studies for Brazilian children.

Although the agreement between the evaluators in the analysis was satisfactory, it was noticeable, during the process, the need for familiarity and practice with the ICF codes so that the identification of the relationship of the concepts is made more safely. The ICF offers a vast list of codes with different definitions, and the appropriate adequacy of each concept must be done with care.

CONCLUSION

Few instruments intended to assess early childhood motor development are validated for the Brazilian scenario. When their concepts were related to the ICF, most pointed to a greater relationship with the Activities and Participation

component, while a small portion corresponded to the Body functions component. None of the instruments addressed all the components proposed by the classification.

But, even though none of the instruments were completely satisfactory, in ICF perspective, analyzing the items and the characteristics investigated in this review, the most satisfactory instrument to analyze the development of children was PEDI-2, because it involves the participation of family to answer the questions, has some items related to social function and the environment, being closer to create a biopsychosocial approach.

Therefore, valid motor development assessment tools for Brazil, available in the literature, do not present all the components of the ICF, and it is necessary to complement them with other tools for a comprehensive assessment. From this, the view of professionals working in this area tends to be focused on the development of motor skills, without giving due consideration to the other aspects of functioning, contemplated in the biopsychosocial model, a fact that can be seen as a barrier in the comprehensive care and monitoring of child development. It would be interesting for further research to focus on the development of a tool that satisfactorily contemplates the model proposed by the ICF. Another line of research could also investigate possible combinations of existing instruments with the same objective.

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