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RESEARCH PAPER

Identification of core functioning features for assessment and intervention in Autism Spectrum Disorders

Susana Castro & Ana Isabel Pinto

Faculty of Psychology and Educational Sciences, Porto University, Porto, Portugal

***Purpose*: Framed within a biopsychosocial approach, this study aimed to identify the main functionality dimensions that experts in the field of child development and child psychopathology considered as essential in the assessment-intervention process with young children with Autism Spectrum Disorders (ASD), using the International Classification of Functionality, Disability and Health for Children and Youth. *Method*: The Delphi method was used to obtain consensus among experts regarding the essential functionality features for the rehabilitation of young children with ASD. Therefore, web-based three-round survey was developed. *Results:* There are more functionality features identified as more essential for the age group 3–6 than from the group birth-2 years of age. 49.4% of activities and participation dimensions were regarded as essential by experts, while only 13.9% of body functions were selected. 39.9% of environmental factors were also marked by experts as essential. *Conclusions:* Pervasive Developmental Disorders (PDD) are classified in diagnostic manuals-DSM-IV-TR and ICD-10. These classifications are valuable to detect signs/symptoms of health conditions; however, they are often not sufficient to develop individualized interventions. More functional information is needed to complement diagnostic data. The identified functionality dimensions of the ICF-CY complement diagnosis by differentiating relevant functioning aspects in all life domains, according to the biopsychosocial model and should always be addressed in the process of rehabilitation of young children with ASD.**

Keywords: Autism, biopsychosocial, core-set, functionality, ICF-CY

Implications for Rehabilitation

- The biopsychosocial approach is the most complete way of conceptualizing human development and disability; combining medical, social and functional perspectives.
- The ICF-CY specifies strengths and areas for improvement in the functionality of each individual, according to the biopsychosocial model of disability.
- This paper identifies core functioning features for the rehabilitation of young children with Autism Spectrum Disorders, in all dimensions of life, according to the biopsychosocial approach to disability.

This study aims to identify the core functioning features (core-sets) in the assessment-intervention process of young children with ASD, using the International Classification of Functionality, Disability and Health for Children and Youth (IFC-CY [1]), within a biopsychosocial approach to disability.

The ICF-CY [1] is part of the "family of classifications" of the World Health Organization, and together with its predecessor, the adult version – the ICF [2] – published in 2001, enables the assumption of a biopsychosocial model in approaching disability. Previously, two classifications based on a biomedical approach to disability were most widely used, the Diagnostic and Statistical Manual of Mental Disorders (DSM [3]) and the International Classification of Diseases and Related Health Problems (ICD [4]). Autism Spectrum Disorders (ASD) are diagnostic categories classified as F84 and as 299 – Pervasive Developmental Disorders – on ICD-10 and DSM-IV-TR, respectively. In spite of the utility of diagnostic classifications both at the clinical and at the educational level, for intervention purposes more specific functioning criteria are needed to develop individualized assessment-intervention procedures. In fact, as diagnostic categories provide reduced information on the specific characteristics of each person's functioning in his/hers daily life environments, an approach is needed in order to complement diagnostic categories with functional information [5]. In fact, while

Correspondence: Susana Castro, Faculty of Psychology and Educational Sciences, Porto University, Rua Alfredo Allen 4200-135, Porto, Portugal. Tel: +351 91 6254028. E-mail: susanacastro161@gmail.com

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DSM-IV manual provides a multi-axial system for classifying diseases and health problems, it does not address specific features of functioning using a common language. The system enables the classification of health conditions using Axis I, II and III; besides, this information may be complemented with data concerning individual functioning (Axis V) as well as environmental events (Axis IV). However, the functional data provided by this system was found to be too general and, as a common language was needed when describing the specificity of each person's functioning., the development of the ICF-CY created the potential to complement the diagnostic manuals classification, even when using the DSM-IV multi-axial system. The two types of classification systems illustrate two different views of the disability concept: while diagnostic manuals focus on the characteristics of the disease, the ICF/ICF-CY system provides individualized data on functioning (good quality or low quality functioning) based on a multidimensional perspective. Therefore, the two types of classifications are not mutually exclusive; they may complement each other, illustrating the complementarity between the medical and the functional approaches to disability. This complementarity is the basis for the definition of the biopsychosocial model of disability.

According to Wilczynski and colleagues [6], ASD is a unique diagnostic group due to the wide disparities of functioning characteristics among children classified within this category. In fact, while communication delays constitute a great deal of concern regarding some of the forms of this diagnostic categories, this does not always happen in all forms of the spectrum, such as in Asperger Syndrome. The author's even state that the main areas of delay in ASD – communication, social interactions and restricted and repetitive interests and behaviors – need to be considered and addressed, irrespective of the diagnostic rendered. Moreover, there are several distinct intervention programs for ASD, based on different theoretical frameworks, such as applied behavior analysis (ABA) or developmental-relationship based interventions. The quality of these programs was evaluated considering specific criteria, such as their degree of operationalization, fidelity, replication and outcome data, among others [7]. However, despite the high levels of overall quality found for some of these programs, such as the TEACH program, their requirements and structured nature of some of these programs may restrict the individualization of the assessment-intervention process, especially for children with ASD [8].

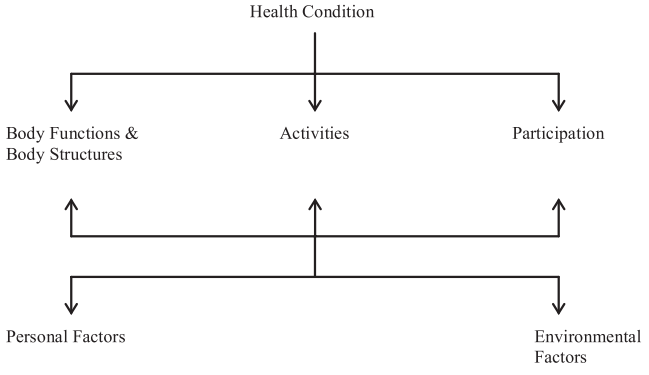

Figure 1. ICF/ICF-CY model (WHO, 2001).

As illustrated in Figure 1, the biopsychosocial model suggests that within a health condition (classified by diagnostic criteria based on the DSM-IV or the ICD-10), it is possible to identify the specific body functions and body structures, activities and forms of participation as well as the environmental factors that characterize the functionality of an individual person based on current assessment data. These dimensions correspond to three main components based on which the ICF/ICF-CY is organized. Each component is divided in chapters and each chapter has numerous alphanumeric codes corresponding to specific functionality dimensions. Each of these codes starts with a letter: "b" for body function's codes; "s" for body structures' codes; "d" for activities and participation codes; and "e" for the environmental factors codes. When documenting a person's functionality status, besides the codes relative to the characteristics being described, the "Universal Qualifier" is added in order to describe the magnitude of the problem observed in each functionality dimension. The "Universal Qualifier" scale ranges from 0 (no problem) to 4 (total problem). To exemplify, if the code "d330.3" is used, this means that within the activities and participation component, specifically in the "speaking" dimension (d330), the person has a "severe" (.3) problem. In the particular case of the environmental factors' dimensions, when describing an environmental characteristic that facilitates the person's functioning, the code is followed by a plus sign (+) before the respective universal qualifier. On the other hand, when describing a characteristic that constitutes a barrier to the person's functioning a "." is used after the code, followed by the qualifier. To exemplify, if the code "e310+4" is used, it means that the support of the immediate family (e310) is a total facilitator of the person's functioning (+4) [2].

For what has been said, aspects of functioning of children diagnosed with an ASD might be more accurately approached in light of the biopsychosocial model of disability [2]. The biopsychosocial model was firstly mentioned by Engel in 1977 and has subsequently been applied in several areas outside the medical science [9].

A particular line of research that followed the ICF publication in 2001 is the identification of essential ICF functionality dimensions for assessment and intervention in specific health conditions for adults (e.g. the work of Starrost et al. [10]). In fact, it is stated that in clinical daily practice clinicians would only need a fraction of the ICF codes. According to Ustun et al. [11] only 20% of the ICF classification codes would explain 80% of the variance observed in daily work with patients. On the other hand, in spite of the main advantage of the ICF as a common language for all professionals of different fields, these authors underline the need to capture the detail of the functioning profile of individuals in a unique group. The ICF "core-sets" comprise such common categories that enable comparisons of functioning among different groups, beyond the health conditions [12]. However, little research has been conducted on the identification of core functionality dimensions for children with different health conditions, using the ICF-CY version. Elligston [13] developed sets of codes, organized per age groups to be used in the assessment-intervention process

of children and adolescents. In this study, the authors used the Delphi technique to obtain consensus among experts in the field of child development for the identification of sets of codes for each age group. Studies that identified core-sets of ICF codes for health conditions in adults also used this methodology. The Delphi technique consists of a sequential process to collect and extract the anonymous judgments of experts using a series of data collection and analysis techniques scattered with feedback [14].

So far, no systematic research has been conducted on the identification of ICF-CY codes for specific developmental disorders. In this paper, we present the results of a research study aiming at identifying core functioning dimensions to be used in the assessment-intervention process with young children with ASD, in order to identify the most relevant biological, psychological and social features of functioning within this specific health condition. The ICF-CY model was used as a framework, thus contributing to a biopsychosocial approach to ASD.

Research question

The following research question was formulated: what are the functionality dimensions regarded by experts in the fields of child development and of Autism Spectrum Disorders as "essential" for the assessment-intervention process with young children diagnosed with an ASD or presenting signs/symptoms from this diagnostic category?

Methods

Participants

For the purpose of inquiring national and international experts on child development, child psychopathology and/or ASDs, 500 contacts were made via e-mail. The contacts were identified by consulting our teams' database, as well as by identifying the contacts of internationally recognized specialists. The initial e-mail, inviting for participation, explained all the details regarding the purpose of the research study as well as the procedure for data collection. The e-mail also contained a web link for the experts to become associated to the online survey and to start responding to the first round questionnaire. Among the 500 contacts established, 150 experts responded to the first round questionnaire of the survey for the identification of core functionality dimensions in children with Autism Spectrum Disorders. On the second round questionnaire, 106 experts responded, and on the third round questionnaire 54 experts participated.

Participants were characterized by answering to the following multiple-choice questions: (1) which category best describes your professional field? (2) What is the current nature of your work? (3) How long have you been involved with your current work? (4) How often do you have contact with children with ASDs and/or families of children with ASD in your work? (5) Do you conduct research on ASD, or ever did in the past? (6) What is the highest level of education you have completed? (7) Where is your primary national residency? (If you live or work in more than one country, please indicate the country where you have your primary employment or spend the majority of your time) (8) Please rate your overall familiarity with the WHO ICF-CY. How familiar do you think that you are about the ICF-CY? (9) Have you ever used the ICF-CY in research, practice, program or policy development for children? (10) Were you involved in the development, review or translation of the ICF-CY?

Materials

Three online based questionnaires were developed using the web platform "Survey Monkey". The first questionnaire was developed based on the ICF-CY structure and content. Respondents were instructed to mark the ICF-CY functionality dimensions that they consider to be important for the purpose of assessment and intervention with children diagnosed with an ASD or presenting ASD signs or symptoms. The questionnaire was divided in two parts: on the first part participants had to mark ICF-CY functionality dimensions considered important from birth to 2 years of age; in the second part participants had to mark the ICF-CY dimensions considered important for ages 2–6 years. This first questionnaire also included ten questions regarding the participants' characteristics (previously mentioned in the participants section); these questions as well as the overall structure of the survey were adapted from Ellingston [13]. The second web-based questionnaire was comprised by the variables marked by experts as being important on the first round questionnaire reaching, at least 80 % of agreement among them. On this second questionnaire, the respondents were instructed to rate each variable as important, very important or essential. For 32 new participants who joined the data collection process in this second round, the second questionnaire also included the questions on participants' characteristics from the first round survey.

The third round questionnaire was comprised by all the variables regarded as essential by at least 50% of the respondents on the second round questionnaire. In this third round questionnaire, participants were instructed to mark whether they subscribed or not the set of variables regarded as essential in the second round by the majority of respondents. In this case, they did not subscribe the whole set, participants had to mark the variables they would exclude and/or refer the ones they would add to the core-set.

Statistical software SPSS PASW Advaced Statistics 18 (SPSS Inc.) was used to conduct data analysis.

Procedure

The Delphi technique was used in order to gather the consensual opinion of experts on the field of child development, psychopathology and ASDs, regarding the main functionality dimensions that should be considered primordial when assessing or intervening with young children diagnosed with ASD or presenting signs/symptoms of an ASD. Figure 2 illustrates the application procedure of the Delphi technique in the present study – a three round online survey.

By responding to the first online survey, the participants were attributed with a code that would remain the same until the end of the three-round survey. The first questionnaire was opened to response for the period of 1 month. Participants

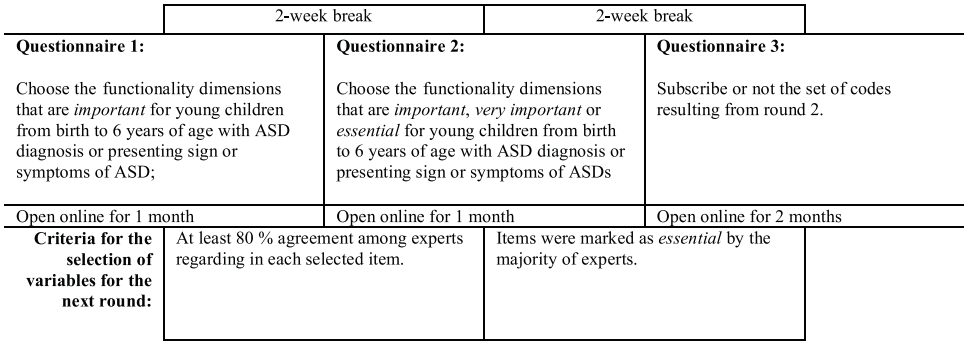

Figure 2. Procedure of the study, according to the Delphi method.

received a reminder 2 days before the deadline for closing the questionnaire. After a 2-week break for data analysis and development of the second round questionnaire, a new e-mail was sent to the participants of the first round, asking them to respond to the second online questionnaire. The second questionnaire was also left open online for the period of 1 month, and the participants received a new reminder 2 days before the deadline for responding to this questionnaire. This questionnaire contained feedback on the percentages of experts that chose each functionality dimension for a particular age group on the previous round. After another 2-week break for data analysis and development of the third round questionnaire, a third e-mail was sent to all the participants asking them to respond to the third online questionnaire. This third questionnaire was open online for 2 months, in order to give opportunity to all the participants from the previous rounds to respond. This procedure in three rounds enabled the participants to notice which categories were regarded as important or as essential by their peers in previous rounds, and to make a choice based on the resulting dimensions in each round, thus progressively narrowing the set of functionality domains. Also information on percentages of agreement from previous questionnaires was included in the second and third rounds, so that the experts could be influenced by the opinions of each other.

Data analysis

Data was analyzed by running frequencies of the functionality domains chosen by the participants in each round, as well as by computing the percentage of agreement among the experts that responded, for each round and for each question.

Results

Among the participants who responded to the first online survey, the majority were psychologists (34%) and teachers (28.7%). A large number of participants chose the option "other" regarding their professional field (16.7%), and the majority of them justified their option by specifying "special education teacher". Other participants were researchers (7.3%), speech therapists (6%), occupational therapists (2%) social workers (2%), physicians (1.3%) and physiotherapists (1.3%). The nature of their working area is mainly educational (62.7%) and clinical (16.7%). The majority of the participants are experienced professionals: 22.7% have more than 20 years of experience, 19.3% have 10–15 years of experience, 16% have 6–9 years of experience and 14% have 16–20 years of experience. Regarding the frequency of contact with children with ASD, the majority of the participants have some contact with these children – on a regular bases (25.3%) or occasionally (24.7%). The majority of the participants did not conduct any research on ASDs (75.3%). Most of the participants are highly qualified – 47.3% have a graduation (5 year degree), 28.6% have a Master's degree and 9,3% have a Ph.D. degree. Participants are from different countries, including the USA (2.7%), Sweden (1.4%) and others (4%) namely Belgium, Canada, Germany, and France. However, the majority of participants are from Portugal (90.7%). Most of the experts are familiarized with the ICF (61.3%) and most of them were not involved in the development, translation or revision of the classification system. In the second and the third round surveys, the participants' characteristics tended to remain the same, in spite of the lower number of respondents. In fact, the majority of participants were still psychologists and teachers, mainly from the educational and clinical field of work, highly experienced, having regular contact with children with ASDs, not having conducted any research on ASDs, highly qualified and with similar geographic distribution frequencies. On the second round questionnaire, 30.2% of respondents had not participated in the first round, but were included in this second survey and continued to participate on the third round questionnaire.

Tables I, II and III present the results obtained in the three rounds regarding the three ICF-CY components: the activities and participation component, the body functions component and the environmental factors component, respectively. As the aforementioned tables illustrate, the Delphi technique helped to reduce the range of choices of the experts among the available functionality dimensions, in the course of the three round surveys. In the first survey, results illustrate the percentage of agreement among participants who responded to each question on whether a specific functionality dimension is more important to the age range from birth to 2 years or to the age range from 2 to 6 years, or to both. As this choice for rating was not mutually exclusive, the sum of the two percentages may be higher than 100%. A criterion of at least 80% of agreement on an item among experts was considered enough to include that item in round two.

Table I. Results of the three-round survey regarding activities and participation dimensions selected by experts.

		Birth to 2 years of age			2–6 years of age		
Rounds of the survey		1st	2nd	3rd	1st	2nd	3rd
ICF-CY functionality dimensions							
d120	Exploring objects by mouthing, touching, tasting or smelling, %	**90.0% (81)**	**50.5 (52)**	**98.1 (53)**	22.4 (22)	-	–
d130	Imitating others' actions, gestures or sounds, %	**82 (82)**	**65.7 (69)**	**96.7**	71 (71)	–	–
d131	Learning through actions with objects, %	79.4 (77)	–	–	73.2 (71)	**93.5 (86)**	**98.3 (53)**
d133	Developing competency using words, phrases or sentences to represent persons, objects, events etc, %	46.3 (44)	–	–	**95.8 (91)**	**75.5 (71)**	**96.2 (52)**
d134	Developing the competence to represent persons, objects, events and feelings through symbols and gestures, %	39.5 (34)	–	–	**93 (80)**	**74.5 (70)**	**98.1 (53)**
d132	Developing competency to learn about the world by asking "why" questions, %	8.7 (6)	–	–	**100.0 (72)**	**69.1 (65)**	**94.4 (51)**
d135	Repeating a sequence of events or symbols as a basic component of learning, such as counting by tens or practicing the recitation of a rhyme, %	7.8 (4)	–	–	**100.0 (53)**	**50.5 (46)**	**81.5 (44)**
d137	Acquiring basic concepts like size, form, quantity, length, same, opposite, %	11.7 (9)	–	–	**98.7 (78)**	**57.4 (54)**	**98.1 (53)**
d155	Developing basic and complex competencies, such as manipulating tools or toys appropriately, %	42.9 (36)	–	–	**88.1 (74)**	**55.3 (52)**	**98.3 (53)**
d160	Focusing attention on specific stimuli without being disturbed by sounds, %	60 (48)	-	-	**87.5 (70)**	**52.7 (49)**	**96.2 (52)**
d161	Maintaining attention for the necessary length of time, %	40.2 (37)	-	-	**95.7 (88)**	**67 (63)**	**96.2 (52)**
d163	Thinking, %	15.1 (8)	–	–	**100.0 (57)**	**65.9 (60)**	**96.2 (52)**
d175	Solving problems, %	24.1 (14)	–	–	**100.0 (58)**	**58.9 (53)**	**98.1 (53)**
d177	Making decisions or choosing between different alternatives, %	30.7 (27)	–	–	**98.9 (87)**	**58.2 (53)**	**98.1 (53)**
d210	Undertaking a single task or responding to a single communication, %	54.9 (50)	–	–	**84.6 (77)**	**54.8 (51)**	**100 (54)**
d220	Undertaking multiple tasks or responding to a command with multiple components or sequence, %	11.1 (7)	–	–	**97.1 (66)**	**53.3 (49)**	**94.4 (51)**
d230	Carrying out daily routines, %	14.5 (9)	–	–	**95.2 (59)**	**59.8 (55)**	**100 (54)**
d240	Handling stress and other psychological demands, %	12.5 (7)	–	–	**96.4 (54)**	**50.6 (45)**	**90.7 (49)**
d250	Managing one's own behaviour, %	25.9 (21)	–	–	**97.5 (79)**	**62.8 (59)**	**100 (54)**
d310	Comprehending meaning of messages in spoken language, receiving and understanding verbal communication, %	72.9 (70)	–	–	**83.3 (80)**	**58.1 (54)**	**100 (54)**
d315	Comprehending meanings of nonverbal messages in body gestures, general signs and symbols, drawings and photographs, %	69.2 (63)	–	–	**85.7 (78)**	**63.4 (59)**	**100 (54)**
d330	Speaking and telling someone something, %	48.9 (43)	–	–	**87.5 (77)**	**62.8 (59)**	**96.2 (52)**
d331	Vocalizing when aware of another person in the proximal environment, %	**94.4 (85)**	**57.8 (59)**	**98.3 (53)**	26.7 (24)	–	–
d335	Using gestures, symbols and drawings to communicate, %	56.3 (49)	**95.2 (99)**	**100 (54)**	**91 (79)**	**59.8 (55)**	**100 (54)**
d350	Having a conversation, %	15 (12)	–	–	**100.0 (80)**	**59.6 (56)**	**98.1 (53)**
d440	Fine hand use,	75.3 (58)	–	–	70.1 (54)	**65.2 (60)***	**100 (54)***
d530	Toileting, %	12.2 (10)	–	–	**96.4 (81)**	**55.9 (52)**	**98.1 (53)**
d540	Dressing oneself including choosing appropriate clothes for a situation, %	9.3 (5)	–	–	**96.3 (52)**	**51.1 (47)**	**94.4 (51)**
d550, d560	Eating and drinking, %	37.8 (31)	–	–	**93.9 (77)**	**65.2 (60)**	**100 (54)**
d571	Avoiding dangerous situations and harm to self, %	15.9 (13)	–	–	**97.6 (80)**	**59.8 (55)**	**98.1 (53)**
d710	Interacting with people, %	65.6 (61)	–	–	**91.4 (85)**	**65.2 (58)**	**98.1 (53)**
d720	Interacting with people in a socially appropriate manner, %	31.3 (25)	–	–	**97.5 (78)**	**61.8 (55)**	**98.1 (53)**
d750	Creating and maintaining informal relationships, %	31.4 (27)	–	–	**97.7 (84)**	**59.3 (54)**	**100 (54)**
d760	Creating and maintaining family relationships and differentiating familiar persons, %	64.3 (54)	–	–	**92.9 (78)**	**64.5 (60)**	**100 (54)**
d810	Engaging in informal education, %	25.7 (18)	–	–	**97.2 (68)**	**53.4 (47)**	**96.2 (52)**
d815	Engaging in preschool education, %	20.9 (18)	–	–	**94.2 (81)**	**66.3 (59)**	**100 (54)**
d880	Playing, %	60.9 (53)	–	–	**94.3 (82)**	**68.8 (64)**	**100 (54)**
d920	Engaging in recreational or leisure activity, %	21.2 (11)	–	–	**98.1 (51)**	**56.2 (50)**	**96.2 (52)**

*, The marked item - fine hand use - was excluded by experts on the first round, but then included again on the second round, after researchers asked the participants whether they were absolutely certain that they wnted to exclude this item. Researchers asked this questions given the relevance of this item for child development in preschool age. Consequently, researchers included it again on the third round.

Table II. Results of the three-round survey regarding body functions selected by experts.

		Birth to 2 years of age			2–6 years of age		
Rounds of the survey		1	2	3	1	2	3
ICF-CY functionality dimensions							
b114	Orientation to time, place and person (e.g., the child is aware of "today", "tomorrow", location of its own identity or the identity of other individuals in the immediate environment), %	10.9 (9)	–	–	**98.8 (81)**	**57.1 (52)**	**98.1 (53)**
b117	Intellectual functions (i.e. functions necessary to integrate all other mental functions, such as the cognitive ones), %	53.6 (37)	–	–	**94.2 (65)**	**52.8 (47)**	**100 (54)**
b122	Psychosocial Functions that lead to the formation of the interpersonal skills needed to establish reciprocal social interactions, %	59.5 (47)	–	–	**93.7 (74)**	**65.9 (62)**	**100 (54)**
b126	Temperament and personality functions (e.g. extraversion, agreeableness, psychic stability), %	50 (34)	–	–	**92.6 (63)**	**53.8 (49)**	**98.1 (53)**
b140	Attention functions (e.g. sustain, shift, divide and share attention; concentration), %	64.7 (55)	–	–	**92.9 (79)**	**57.4 (54)**	**100 (54)**
b144	Memory functions (e.g., to remember, learn and recall things), %	40.5 (30)	–	–	**94.6 (70)**	**53.4 (49)**	**98.1 (53)**
b147	Psychomotor control (e.g. manual and lateral dominance, posturing, quality of psychomotor function, regulation of speed concerning movements or speech), %	56 (42)	–	–	**94.7 (71)**	**52.1 (49)**	**100 (54)**
b152	Emotions regulation and range of emotion (e.g. appropriateness of emotions like affect, sadness, happiness, love, fear, anger, tension, hate), %	51.7 (45)	–	–	**96.6 (84)**	**57.1 (52)**	**100 (54)**
b160	Thought functions (e.g., to control pace, form and content of thought, goal directed and logical thoughts, coherence of thought), %	19.6 (9)	–	–	**100 (46)**	**61.1 (55)**	**98.1 (53)**
b164	Higher level cognitive functions (e.g. abstract thinking, to plan and carry out plans, decision-making), %	11.6 (5)	–	–	**100 (44)**	**58.1 (54)**	**96.3 (52)**
b167	Mental functions of language (e.g., to recognize and use spoken, written or other forms of language like signs, pictures, pictogram etc.), %	41.3 (33)	–	–	**96.3 (77)**	**64.9 (61)**	**98.1 (53)**

*, The marked item - fine hand use - was excluded by experts on the first round, but then included again on the second round, after researchers asked the participants whether they were absolutely certain that they wnted to exclude this item. Researchers asked this questions given the relevance of this item for child development in preschool age. Consequently, researchers included it again on the third round.

As we can see on Tables I, II and III, in the age range from birth to 2 years, 9 activity and participation dimensions, 11 body function dimensions and 29 environmental factors dimensions were identified by experts with at least 80% of the agreement. From these dimensions, those who were included in the second round questionnaire, only one obtained at least 50% of the participants' rating as being essential, were considered in the third round questionnaire. In this second round questionnaire, in the age range from birth to 2 years, only 4 activity and participation and 10 environmental factors dimensions were regarded as essential by at least 50% of the participants. In the final round questionnaire, participants only had to confirm whether they agreed on the functionality dimensions resulting from round 2. As shown in Tables I, II and III, very high percentages of participants (94.4–100%) had consensus on the functionality dimensions defined as the core-set for the assessment-intervention with children presenting signs/symptoms or diagnosed with an ASD from birth to 2 years of age. These functionality dimensions are: exploring objects by mouthing, touching, tasting or smelling, imitating others' actions, gestures or sounds, vocalizing when aware of another person in the proximal environment, using gestures, symbols and drawings to communicate, support

Table III. Results of the three-round survey regarding environmental factors selected by experts.

		Birth to 2 years of age			2–6 years of age		
Rounds of the survey		1	2	3	1	2	3
ICF-CY Functionality Dimensions							
e130	Products and technology for education (e.g. books, computers, educational toys, adapted material for learning such as computer software), %	60.3 (44)	–	–	57.5 (42)	**71.7 (66)***	**98.3 (53)***
e310	Immediate family, %	**96.6(84)**	**75.5 (74)**	**100 (54)**	**91.9 (80)**	**73.9 (68)**	**100 (54)**
e315	Extended family, %	**89.2 (66)**	48.9 (48)	–	**93.2 (69)**	**54.8 (51)**	**92.6 (50)**
e320	Friends, %	61.3 (46)	–	–	**94.7 (71)**	**53.8 (50)**	**98.1 (53)**
e325	Acquaintances, peers, colleagues, neighbours, and community members, %	67,6 (23)	–	–	**97.1 (33)**	**55.3 (52)**	**100 (54)**
e330	People in a position of authority, %	62 (31)	–	–	**94.5 (69)**	**52.7 (48)**	**98.1 (53)**
e340	Personal care providers and personal assistants, %	**89 (57)**	**53.1 (52)**	**98.3 (54)**	**98 (49)**	**60.2 (56)**	**100 (54)**
e355	Health professionals, %	**91.5 (65)**	**57.7 (56)**	**100 (54)**	**91.5 (43)**	**59.8 (55)**	**100 (54)**
e410	Individual attitudes of immediate family members, %	**97.7 (86)**	**77.3 (75)**	**100 (54)**	**90.9 (80)**	**75.5 (71)**	**100 (54)**
e415	Individual attitudes of extended family, %	**92 (69)**	**57.4 (54)**	**94.4 (54)**	**92 (69)**	**62.8 (59)**	**94.4 (51)**
e420	Individual attitudes of friends, %	68.6 (48)	–	–	**94.3 (66)**	**63.8 (60)**	**98.1 (53)**
e425	Individual attitudes of acquaintances, peers, colleagues, neighbours, and community members, %	75.8 (50)	–	–	**93.9 (62)**	**55.4 (51)**	**100 (54)**
e430	Individual attitudes of people in position of authority, %	77.1 (27)	–	–	**94.3 (33)**	**51.7 (45)**	**96.3 (52)**
e440	Individual attitudes of personal care providers and personal assistants, %	**95.2 (59)**	**63.9 (62)**	**96.3 (52)**	**96.3 (52)**	**64.1 (59)**	**100 (54)**
e450	Individual attitudes of health professionals, %	**95.2 (59)**	47.4 (46)	–	**95.2 (59)**	**61.5 (56)**	**98.1 (53)**
e570	Social security (services aimed at providing income support to parents or social assistance programs), %	**98.4 (62)**	**54.3 (51)**	**94.4 (51)**	**92.1 (58)**	**53.9 (48)**	**94.4 (51)**
e575	Social support services, systems, policies (public assistance other than social security), %	**95.9 (47)**	**53.9 (48)**	**94.4 (51)**	**91.8 (45)**	**51.8 (44)**	**94.4 (51)**
e580	Health services (e.g. access to early intervention, technical aids, other health services), %	**94.5 (69)**	**61.7 (58)**	**98.1 (53)**	**93.2 (68)**	**63.7 (58)**	**98.1 (53)**
e585	Education services, %	**83.1 (64)**	**63.5 (61)**	**100 (54)**	**96.1 (74)**	**65.9 (60)**	**100 (54)**

*, The marked item - fine hand use - was excluded by experts on the first round, but then included again on the second round, after researchers asked the participants whether they were absolutely certain that they wnted to exclude this item. Researchers asked this questions given the relevance of this item for child development in preschool age. Consequently, researchers included it again on the third round.

Table IV. Percentage of ICF-CY components in the core-set per age range.

	Activities and participation	Body functions	Environmental factors	
0–2 years of age	4 (28.6%)	0	10 (71.4%)	
2–6 years of age	35 (52.8%)	11 (16.9%)	19 (29.2)	
Total	39 (49.4%)	11 (13.9%)	29 (36.7%)	79

of immediate family, personal care providers and personal assistants, health professionals, individual attitudes of immediate family members, of extended family members, of friends and of personal care providers and personal assistants, social security (services aimed at providing income support to parents or social assistance programs), social support services, systems, policies (public assistance other than social security), health services (e.g. access to early intervention, technical aids, other health services) and education services.

In the age range from 2 to 6 years of age, participants started by choosing 55 activities and participation dimensions, 37 body functions dimensions and 50 environmental factors dimensions with at least 80% of agreement among them. From those, in the second round survey, experts chose 35 activities and participation dimensions, 11 body functions dimensions and 19 environmental factors. In the third round questionnaire, a very high percentage (90.7–100%) of participants confirmed the resulting dimensions from round 2; these functionality dimensions comprising the core-set for this age range, are included in the following ICF-CY chapters: Learning and applying knowledge, general tasks and demands, communication, self-care, domestic life, interpersonal interaction, major life areas, community social and civic life, mental functions, support in relationships, attitudes, products and technology as well as services, systems and policies (see Tables I, II and III).

Table IV also illustrates the percentage of ICF-CY components per age range that were included in the core-set.

Discussion

This study was conducted with participants of different countries and different areas of expertise. In general it is plausible to state that the nature of participants' characteristics demonstrates that that the majority of them are knowledgeable and experienced in working with preschool aged children with ASD, specifically in the educational and clinical areas of intervention. The introduction of new participants in the second round did not alter the main demographic characteristics

of the participants and for this reason, the responses from these new participants were considered for final round questionnaires.

The results of this study illustrate several inquisitive aspects regarding the relevant dimensions of functioning to be considered in the assessment-intervention process with young children with ASD or presenting signs and/or symptoms from this diagnostic category. Firstly, it is interesting to notice that the resulting core-set for the age group from birth to 2 years of age is much smaller than the core-set for the ages 2–6 years. The widely recognized fact that establishing a diagnosis of ASD before the age of 2 is very difficult and sometimes even detrimental may have led participants to be more cautious on the selection of relevant functionality dimensions for ASD within this age group. However, the identification of relevant functioning features in early ages is particularly relevant and should not be dependent on the establishment of the diagnosis. Thus, for this age group, the core-set found by Ellingston [13] for children in general, might be more adequate to identify areas of concern for assessment-intervention purposes.

Another interesting fact is that the majority of functionality dimensions within this age group are from the environmental factors component of the ICF-CY. In another study by Castro et al. [15], 33 individualized education programs (IEPs) of preschool children with ASD were analyzed using the ICF-CY framework and taxonomy as a matrix for the analysis, and one of the main results of this study concerns the fact that no environmental factors were considered in intervention goals, and very few were included in assessment reports. This depreciation of environmental features in what concerns the assessment-intervention practice is not consistent with the present study experts' opinion on what should be considered as relevant. Thus, there seems to be a need for improvement on the definition of professional guidelines and support tools for intervention practices with children with ASD, as well as more investment on professional development with care providers of these children.

The core-set of functionality dimensions for children with ASD from 2 to 6 years of age is more extensive, including several functioning features from all life dimensions – activities and participation, body functions and environmental factors. Many of the functioning features identified as relevant for this age group are directly related with the diagnostic criteria for Pervasive Development Disorders (PDD), such as: (a) all the dimensions of mental functions; this was the only body function selected by the experts, which may be directly related to the diagnostic criteria defined for PDD – restrictive and repetitive interests and behavior; (b) some activity and participation dimensions included in the communication chapter, which may be directly related with the language and communication deficits defined as diagnostic criteria for PDD, namely: "comprehending meaning of messages in spoken language" (d310 [ICF-CY code]), "comprehending meanings of nonverbal language" (d315) or "speaking" (d330); (c) some activity and participation dimensions included in the interpersonal interactions chapter, directly related with the social interactions' deficits defined as diagnostic criteria for PDD, namely: "interacting with people" (d710) and "creating and maintaining informal relationships" (d750). This specification of dimensions of functionality related with diagnostic criteria is of great usefulness when planning interventions and is in line with the biopsychosocial approach to development as it enables the identification of aspects of children's interaction in the various contexts of their daily life, as well as features of these environments that may be of relevance in the developmental process. Besides this fact, it is also interesting to notice that some functionality features identified in this core-set are beyond the diagnostic criteria for ASD: "toileting" (d530), "eating and drinking" (d550, d560), which are functionality dimensions frequently relevant to individualize interventions for children with an ASD, although not specifically mentioned in the diagnostic criteria. This reflects the potential of the biopsychosocial model, not only to complement diagnostic information, but also to improve assessment-intervention procedures. Moreover, the identification of core functioning features in children with ASD can be extremely valuable to teams of professionals working in this area as a way to ensure that team members from different disciplines take into account the essential aspects in the process of assessment-intervention based on a holistic view of each individual child. This core features may also be of use as a baseline to construct new assessment measures based on these dimensions of functioning. The use of the Delphi method as methodology for this study enabled the identification of the experts' opinion as well as their consensus concerning the functionality dimensions that are essential for assessment-intervention with these children. Other studies aiming to identify core functioning features within specific health conditions also used this strategy with good results, same as the work of Glässel and colleagues [16], as well as the one from Kirschneck and colleagues [17].

A few limitations of this study should also be highlighted in order to inform future research: although the three round surveys were opened to experts at international level, a more representative sample was needed, so that the opinion of experts from different countries and cultures could be taken into account at a higher rate. Also, a wider variety of professional backgrounds among participants was desirable, so that the principles of *pluridisciplinary* advocated by the biopsychosocial approach would be fulfilled. In future research, larger studies could also analyze typical expert cohorts. Also, a better characterization of the experts' profiles could contribute to highlight the relevance of each professional field expertise in the assessment-intervention process with these children. This would have introduced more strength to the relevance of the defined core-sets. Also, an extended deadline for responding to each of the three round surveys could have contributed to maintain the participation of a higher number of experts. In fact, even though a reminder was sent two days before

the deadline (the participants had one month to respond to the questionnaires), a high percentage declined participation in the second and third rounds.

Subsequent studies are needed in order to validate the core-sets for the two age groups as representing the most relevant dimensions of functioning in children with an ASD or presenting signs and symptoms of such diagnostic category. A possible future direction for this study is the development of an assessment measurement of functionality comprising the identified items as essential for the assessment of children with ASD.

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