



Differences between Pre-School Children with and without Special Educational Needs Functioning, Participation, and Environmental Barriers at Home and in Community Settings: An International Classification of Functioning, Disability, and Health for Children and Youth Approach

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The International Classification of Functioning, Disability, and Health for Children and Youth (ICF-CY; WHO, 2007) provides a framework for child functioning with an emphasis on child participation. Participation is defined as “involvement in life situations” and can be influenced by both child characteristics (health conditions, body functions, and structures) and contextual factors (facilitators or barriers of the physical or social environment) (WHO, 2007). This study is aimed at characterizing the functioning of pre-school-aged children, based on their frequency of participation in home and community activities and on the perception of environmental barriers to their participation by parents, using an ICF-CY approach. Differences between children with Special Educational Needs (SEN) ($n = 42$) and children without SEN ($n = 74$) were analyzed. Parents of 116 children from the Porto District (Portugal) completed an adapted version of the Young Children’s Participation and Environment Measure (YC-PEM; Khetani et al., 2013a). To assess child functioning, pre-school teachers completed six items of the Matrix for Assessment of Activities and Participation (Castro and Pinto, 2015), corresponding to six code sets of the ICF-CY Developmental Code Sets (Ellingsen, 2011). Children with SEN showed lower levels of functioning when compared to children without SEN, according to their pre-school teachers. Parents of children with SEN reported that their children participated less frequently in home activities. Specifically, significant differences were found in household chores, at home. Parents of children with SEN perceived more environmental factors as barriers in both settings when compared to parents of children without SEN. Differences between groups in specific environmental factors are presented with reference to the YC-PEM environmental content linked to the ICF-CY environmental

domains (Khetani, 2015). Findings highlight the importance of identifying and adjusting environmental barriers, through family-centered practices, to promote child participation and overall functioning. The adoption of the ICF-CY (WHO, 2007) is recommended when implementing and monitoring inclusive services and practices. Results are further analyzed and discussed with reference to the biopsychosocial model of the ICF-CY (WHO, 2007).

Keywords: environment, functioning, International Classification of Functioning, Disability, and Health for Children and Youth, participation, pre-school Special Educational Needs

INTRODUCTION

The International Classification of Functioning, Disability, and Health for Children and Youth (ICF-CY; WHO, 2007) has been used in Portuguese educational settings since 2008 for eligibility decisions and for assessment-intervention practices in individual education planning. The ICF-CY introduces a framework to understand child functioning with an emphasis on child participation (WHO, 2007). Participation in home and community settings is considered vital in early childhood, especially for young children with Special Educational Needs (SENs), as these are natural learning environments essential to their learning and development (Law, 2002; Dunst et al., 2006; Imms et al., 2016). Therefore, the main purpose of this study is to describe differences between Portuguese pre-school-aged children with and without SEN, characterizing their functioning, based on the frequency of participation in home and community activities and on their parents' perception of environmental barriers, based on an ICF-CY approach.

Perspectives on disability have been changing throughout history, from the medical model, which viewed disability as the manifestation of a health condition, to the social model, which considered disability as a social construct (McDougall et al., 2010). Most recently, the biopsychosocial model considers all the factors that have an influence on health and functioning in a more balanced way. According to this perspective, the concept of disability includes biological, psychological, and social aspects, emphasizing the dynamic interactions between the individual and the environment (Mpopfu and Oakland, 2010).

The conceptual framework of the ICF-CY (WHO, 2007) for understanding functioning and disability is based on a biopsychosocial perspective of health. The ICF-CY constitutes a common language, a conceptual framework, and a multidimensional taxonomy to classify child functioning, describing the complex interactions between the child's health condition (body functions and body structures), participation in daily life activities (activities and participation), and contextual factors (environmental factors and personal factors). The classification is a valuable tool for research, clinical, and educational use to describe child functioning with an emphasis on child participation and environmental factors (WHO, 2007).

The concept of participation has been discussed in current literature as it is considered a major health and functioning outcome (Law, 2002; Imms et al., 2016). Enhancing participation can

be considered the ultimate health and functioning intervention goal (Imms et al., 2016), because of its positive relationship with the well-being and quality of life (Law, 2002). Moreover, participation is assumed by international guidelines as a fundamental human right of all children (Brown and Guralnick, 2012). This non-discriminative human rights perspective focuses on the development of an inclusive society with equal opportunities, where all contexts are available and accessible for all children to actively perform the same activities (Maxwell et al., 2012).

Authors have been working on a clear definition of participation and on establishing key aspects for measurement purposes, for both research and practice (Coster and Khetani, 2008; Granlund, 2013; Imms et al., 2016). Participation is defined by the ICF as "involvement in life situations" (p. 9, WHO, 2007) and is considered a multidimensional concept (Granlund, 2013; King, 2013), measured in two dimensions: the frequency of attending a life situation and the level of engagement in each life situation. Attendance (having the opportunity of being in a life situation) asserts itself as a prerequisite to engagement, which includes factors of an intrinsic nature, like affect, preferences, motivation, and the child's sense of self (Granlund, 2013; King, 2013; Imms et al., 2016). Restrictions to participation can occur due to child factors, considering his or her capacity to perform a task, or factors of the physical and social environment that influence performance, what the child does in a natural context (WHO, 2007).

Different studies describe the participation of young children with disabilities as restricted when compared with their typically developing peers, namely in terms of the intensity of participation (Chiarello et al., 2012), the frequency of participation and involvement in daily life activities (Lim et al., 2016), child independence, and enjoyment (Soref et al., 2011). Parents of young children with disabilities report lower satisfaction levels (Soref et al., 2011), more difficulties and restrictions (Khetani et al., 2013b), and desire more change in their child participation (Lim et al., 2016) than parents of typically developing children.

This evidence is even more apparent as children with disabilities get older. Levels of participation decrease as children grow up, especially in the transition to adolescence (Jarus et al., 2010). Young children reveal higher satisfaction levels with the activities they participate in (Ullenhag et al., 2014), but their intensity of participation diminishes with age (King et al., 2009; Palisano et al., 2011). While at school, children and youth with disabilities participate less frequently and with lower levels of involvement in home and community activities than their typically developing peers (Bedell et al., 2013; Law et al., 2013).

According to the ICF-CY framework, the dimension of participation interacts with the environment, namely with physical, social, and attitudinal environmental factors of everyday life settings (WHO, 2007). These factors include barriers and facilitators that can either promote or hinder participation, making it easier or harder for children to participate in a certain activity (WHO, 2007). Maxwell and Granlund (2011) and Simeonsson et al. (2001) defined a spectrum of five environmental dimensions to access the conditions for participation (from attendance to involvement): availability—the objective possibility to participate in a life situation; accessibility—the perceived access to a life situation; affordability—the amount of financial, time, and energy effort considered to participate in a life situation; accommodability—the adaptation of a situation to the individual; and acceptability—the acceptance of a person's presence in a life situation (Maxwell et al., 2012).

Recent studies document that parents of pre-school children with disabilities identify more environmental barriers and fewer environmental supports at home and in the community (Lim et al., 2016; Kang et al., 2017). Those barriers were related to the physical design of home and community, family resources, social attitudes, assistance and supports outside of home, transportation, and assistive devices or equipment (Kang et al., 2017). Adequate financial support, public awareness, programs, and services were also identified as environmental factors potentially important for parents of young children with disabilities (Lim et al., 2016). The USA Division for Early Childhood (2014) recommends adjustments to these physical and social environments to support young children's health, learning, and development.

Studies have emphasized the role of environmental factors in the participation of pre-school- and school-aged children in everyday life situations (Anaby et al., 2014; Albrecht and Khetani, 2016; Guichard and Grande, 2017; Di Marino et al., 2018). Results showed that child characteristics (namely child functioning, the presence of disability, functional limitations, or complexity of the child's condition) had an indirect effect on participation in home, school, or community activities through perceived environmental barriers or supports by parents. This evidence suggest that specific environmental factors are modified and are considered a major target of intervention to promote child participation and functioning (Anaby et al., 2014; Albrecht and Khetani, 2016; Guichard and Grande, 2017; Di Marino et al., 2018).

The Portuguese law for children with SEN—Decree-Law no. 3/2008—focuses on specific support measures to promote child participation, using the ICF-CY's theoretical framework to guide assessment-intervention processes. The Decree-Law no. 3/2008 requires the elaboration of an Individualized Education Program for each student with SEN, which includes a functioning profile with information regarding the student's health condition (body functions and structures), his or her participation in everyday life situations, and environmental factors (facilitators and barriers).

The introduction of the ICF-CY in Portuguese Law as a framework both for eligibility and for assessment-intervention practices has changed the paradigm in Special Education, from a medical perspective to a more multidimensional and biopsychosocial approach. However, some difficulties concerning this

shift of paradigm have been reported. Studies describe the need to include environmental factors in functioning profiles, as they are rarely used, and declare a lack of consistency between the domains used in assessment and intervention, because few domains are included in both stages (Castro et al., 2014; Sanches-Ferreira et al., 2015; Silveira-Maia et al., 2017).

Therefore, for an adequate implementation of the ICF-CY in Portugal, further development of an effective and reliable application method in the field of Special Education is still needed. Although professionals in Portugal consider that the ICF-CY promotes a more inclusive approach to education and a better comprehension of child functioning, they still face challenges regarding its use. Professionals highlight the need for more effective collaboration between peers, specialized training, and assessment tools that contemplate both child participation and environmental influences (Sanches-Ferreira et al., 2014).

Coster et al. (2012) addressed this need for multidimensional assessment measures, by creating the *Participation and Environment Measure for Children and Youth* (PEM-CY; Coster et al., 2010) and its version for children aged between 0 and 5 years old, the *Young Children's Participation and Environment Measure* (YC-PEM; Khetani et al., 2013a). These measures consider the parents' perspective to evaluate participation at both home, school, and community and the environmental factors that influence those settings. The assessment of participation by the PEM-CY and the YC-PEM includes questions about three aspects: frequency of participation ("how often"), levels of involvement ("how involved"), and the parents' desire for change in each activity. Environmental factors include questions about supports and barriers that either facilitate or hinder participation in each setting (Coster et al., 2012).

In this way, the PEM-CY and the YC-PEM address both the participation dimension and the environment dimension from the ICF-CY conceptual framework (Coster et al., 2012). In a meta-analysis by Chien et al. (2014), the PEM-CY has shown to contain 88% of items assessing "Participation." The PEM-CY covered all nine domains of the ICF-CY activities and participation, the best represented being d9—*Community, social, and civic life* (30 items), followed by d8—*Major life areas* (11 items), d5—*Selfcare* (8 items), and d6—*Domestic life* (7 items). A most recent report by Khetani (2015) showed that all five ICF-CY environmental domains were linked to the YC-PEM environment content. Each ICF-CY environmental domain was associated with one or more YC-PEM environment items. This evidence indicates that the YC-PEM captures a broad range of environmental factors defined by the ICF-CY (Khetani, 2015).

The main goal of the present study is to characterize the functioning of pre-school-aged children, their frequency of participation in home and community activities, and their parents' perception of environmental barriers in both settings, comparing children with SEN and children without SEN from the Porto District (Portugal). The study focuses only on the frequency of participation as it is a prerequisite of involvement that allows an assessment of the availability, accessibility, and affordability of the activities (Maxwell et al., 2012). Environmental barriers faced by children with SEN, when compared with children without SEN, will be analyzed with reference to the YC-PEM

environmental content linked to the ICF-CY environmental domains (Khetani, 2015).

MATERIALS AND METHODS

Participants

Participants were 116 pre-school-aged children ($M = 52.64$ months; $SD = 6.38$) attending 40 inclusive classrooms from the Porto District (Portugal). From the ministry of education website identifying all schools in the Porto District, schools were randomly selected. Overall, 80 pre-school directors were contacted until 42 accepted to participate. Children were recruited for a larger research project about child engagement and the effects of interactive processes in the inclusive pre-school settings, which included those 42 classrooms. A total of 524 children (and parents) from 42 classrooms were contacted for the larger study, and 365 agreed to participate. The present study was conducted in 40 classrooms, and 116 children were selected. In each classroom, on average, three children were selected for this study: one or two children with SEN and two children without SEN.

For the present study, researchers met with 42 parents of children with SEN and 74 parents of children without SEN. The key informant was the mother ($n = 94$), the father ($n = 10$), both the father and the mother ($n = 10$), or the grandmother ($n = 1$). Mothers were between 23 and 47 years old ($M = 35.59$; $SD = 5.359$) and had completed, on average, 11 years of schooling ($M = 10.60$; $SD = 3.30$). Fathers were between 25 and 64 years old ($M = 38.02$; $SD = 6.584$) and had completed, on average, 10 years of schooling ($M = 9.60$; $SD = 3.44$). The families' overall monthly incomes ranged from values lower than 500€ ($\pm\$538$) to values higher than 2,500€ ($\pm\$2688$), with 62.9% of families having monthly incomes lower than or equal to 1,250€ ($\pm\$1344$).

Pre-school teachers were all female, and their age was, on average, 50 years old ($M = 49.79$; $SD = 6.70$). They had approximately 16 years of schooling ($M = 16.10$; $SD = 0.45$) and 25 years of experience teaching in pre-school settings ($M = 25.46$; $SD = 7.24$).

Measures

First, parents were asked to complete a brief sociodemographic questionnaire, with questions about parents' age, occupation, schooling, and monthly income. Then, they answered the adapted Portuguese version of the YC-PEM (Khetani et al., 2013a). The YC-PEM was designed for children aged 0–5, with and without disabilities, with the purpose of providing a comprehensive description of children's participation and environmental factors in daily life settings, according to the parents' perspective. The Portuguese-adapted version of the YC-PEM included questions about participation in home and community activities (frequency of participation and involvement) and questions about the environmental barriers, supports, and resources perceived by parents at home and in the community setting.

Children's frequency of participation was rated on an 8-point scale from 0, meaning *Never*, to 7, meaning *Once or more times per day*. Environmental factors and resources were assessed on a 3-point scale, from 1, meaning *No impact/Usually helps/Usually yes*, 2, meaning *Sometimes helps, sometimes makes harder*, and

3, meaning *Usually makes it harder/Usually not*. The internal consistency of this adapted Portuguese version ranged from 0.58 to 0.65 for the frequency of participation scales and from 0.65 to 0.75 for the perceived environmental barrier scales.

In the creation of composite variables for the frequency of participation in home activities, items related to basic care routines were removed because of their low variability, and three items of community activities (classes and lessons, organized physical activities, and religious or spiritual gatherings) were also removed because 65% of children had never participated in those. Although data on involvement were collected, the present study only focuses on the frequency of participation dimension, as explained in the "Introduction" section.

A short version of the Matrix for Assessment of Activities and Participation (MAAP; Castro and Pinto, 2015) was completed by pre-school teachers to assess child functioning. The MAAP was developed based on the ICF-CY conceptual framework and provides a functioning profile to be used by researchers and practitioners focused on the child's performance in his or her natural environments (Castro and Pinto, 2015). In this version, the usual performance of the child was rated on a 5-point scale, 1 meaning *Not able* and 5 *Without any difficulty* in six items of the MAAP, corresponding to six ICF-CY Developmental Code Sets (Ellingsen, 2011). The ICF-CY Developmental Code Sets provide a summary of child functioning in a specific age and developmental group (Ellingsen 2011). This measure demonstrated an internal consistency of 0.930.

Procedures

Data Collection Procedures

Ethics approval was obtained by the Portuguese National Data Protection Authority (no. 16785/2015) and the Committee for Monitoring Studies in Education Settings of the General Direction of the Ministry of Education (no. 0535000001). Separate ethics approval from the Faculty of Psychology and Educational Sciences (University of Porto) was not required.

Informed written consent was obtained from the teachers and parents, after fully explaining the study protocol. Teachers characterized child functioning for children whose parents gave permission for their participation in this study. Then, parents were contacted and a meeting was arranged according to the parents' availability, either at school or at home. Parents completed the sociodemographic questionnaire and the Portuguese-adapted version of the YC-PEM (Khetani et al., 2013a) with the assistance of a trained member of the research team to answer questions and to clarify language issues.

Data were collected between February and July 2016. All the information given by parents and teachers was anonymous, confidential, and used only for research purposes.

Data Analysis Procedures

Descriptive analysis was first conducted to characterize sociodemographic variables, the children's functioning scores, the children's frequency of participation in home and community activities, and perceived environmental barriers by parents in both settings (home and community).

Correlation coefficients among variables (child functioning, environmental barriers at home and in the community, and the frequency of participation in home and community activities) were computed calculating the Spearman coefficient of correlation.

Then, the two groups of children (children with SEN— C_1 —and children without SEN— C_2) were compared in terms of (1) child functioning, (2) the frequency of participation in home and community activities, and (3) the perception of environmental barriers by parents in both settings (home and community). Mann–Whitney non-parametric test was used. Results were interpreted based on the magnitude of differences between groups, calculated by converting Z -values to r -values, using the formula suggested by Rosenthal (1991) and recommended by Field (2009). Bonferroni adjustments were applied to multiple comparisons.

Post hoc power calculations were performed using the software G*Power 3.1 (Faul et al., 2007, 2009). Power analysis was performed including the following criteria: two-tailed test, min ARE parent distribution, α -probability error of 0.05, and means and standard deviations for each group regarding the outcome variables (displayed in **Table 1**). Results revealed that the sample size was adequate to detect small- to high-effect sizes, with achieved power ranging from 0.71 to 1.00.

RESULTS

Characterization of Children with and without SEN Levels of Functioning

According to pre-school teachers, children with SEN (C_1) had lower levels of functioning (Mdn = 16.00), when compared with children without SEN (C_2) (Mdn = 26.00), $U = 2.679,00$, $z = 6.365$, $p < 0.001$, $r = 0.59$ —large-effect size. Differences in each *ICF-CY Developmental Code Set* are presented in **Table 2**. A Bonferroni correction was applied, and so all effects are reported at a 0.008 level of significance.

In **Table 3**, associations between child functioning and the frequency of participation and environmental barriers in both settings are presented. Children with higher levels of functioning participate more often in home ($r = 0.34$, $p < 0.001$) and community activities ($r = 0.28$, $p = 0.003$) and their parents perceive fewer environmental factors as barriers at home ($r = -0.35$, $p < 0.001$) and in the community ($r = -0.41$, $p < 0.001$).

Characterization of Environmental Barriers Perceived by Parents of Children with and without SEN at Home and in the Community

Parents of children with SEN perceived more environmental factors as barriers at home (Mdn = 1.29) and in the community (Mdn = 1.45), when compared with parents of children without SEN (Mdn = 1.08; Mdn = 1.12), $U = 747.000$, $z = -4.814$, $p < 0.001$, $r = -0.45$ —large-effect size for home setting—and $U = 572.500$, $z = -5.484$, $p < 0.001$, $r = -0.51$ —large-effect size for community setting. Differences between groups in each

environmental factor, at home and in the community, paired with ICF-CY environmental (Khetany, 2015), are presented in **Table 4**. A Bonferroni correction was applied, and so all effects are reported at a 0.010 level of significance for home setting and 0.007 for community setting. Regarding the remaining environmental factors (which were not paired with the ICF-CY environmental domains), results are presented in **Table 5**. A Bonferroni correction was applied, and so all effects are reported at a 0.006 level of significance for home setting and 0.005 for community setting.

Children whose parents perceive fewer environmental barriers in those settings participate more often at home ($r = -0.35$, $p < 0.001$) and in the community ($r = -0.22$, $p = 0.022$) (cf. **Table 2**).

Characterization of Frequency of Participation in Home and Community Activities of Children with and without SEN

Children with SEN had a lower frequency of participation in overall home activities (Mdn = 5.44), when compared with children without SEN (Mdn = 5.99), $U = 2.134,50$, $z = 3.39$, $p < 0.001$, $r = 0.32$ —moderate-effect size. In terms of specific sets of home activities, no differences between groups were found in terms of interactive and organized play ($U = 1.664,00$, $z = 0.57$, $p = 0.57$) and socializing with friends and family ($U = 1.891,50$, $z = 1.851$, $p = 0.064$). On the other hand, according to the parents' perspective, children with SEN participated less frequently in household chores (Mdn = 4.25) than children without SEN (Mdn = 5.75), $U = 2117.00$, $z = 3.295$, $p = 0.001$, $r = 0.31$ —moderate-effect size. A Bonferroni correction was applied, and so all effects are reported at a 0.013 level of significance.

No differences were found between children with and without SEN in participation in overall community activities ($U = 1.826,50$, $z = 1.99$, $p = 0.046$, $r = 0.19$). Relative to specific sets of community activities, no differences between groups were found in terms of neighborhood and community outings ($U = 1.612,50$, $z = 0.506$, $p = 0.613$), community-sponsored activities ($U = 1.831,50$, $z = 1.745$, $p = 0.081$), and recreational activities and trips ($U = 1.991,50$, $z = 2.441$, $p = 0.015$, $r = 0.23$). A Bonferroni correction was applied, and so all effects are reported at a 0.013 level of significance.

DISCUSSION

The major goal of the present study was to characterize the dimensions of health and functioning of the ICF-CY biopsychosocial framework. Considering the ICF-CY approach, the study aimed at increasing knowledge about the levels of functioning, environmental factors, and the frequency of participation in home and community activities of Portuguese pre-school children with and without SEN.

Overall, according to pre-school teachers, children with SEN had lower levels of functioning when compared with children without SEN, concerning both their global score and their score in each *ICF-CY Developmental Code Set* (Ellingsen, 2011), except for the ability to perform a single task (d210). The largest

TABLE 1 | *Post hoc* power calculations.

Variables		C ₁		C ₂		d	Power
		M	DP	M	DP		
Overall functioning		16.79	6.31	25.23	4.43	1.55	1.00
Functioning levels	d137—Basic knowledge skills	3.09	1.39	3.81	1.20	0.55	0.76
	d210—Ability to perform a single task	3.19	1.35	3.79	1.17	0.47	0.62
	d815—Involvement in pre-school tasks	3.56	1.26	4.37	0.96	0.72	0.93
	d330—Conversation	3.05	1.45	3.96	1.20	0.68	0.91
	d140—Attention	2.74	1.20	3.64	1.23	0.74	0.94
	d880—Play competences	3.60	1.28	4.34	1.00	0.64	0.87
Home	Frequency of participation	5.22	1.10	5.99	0.99	0.74	0.94
	Environmental barriers	1.28	0.20	1.13	0.18	0.79	0.97
Community	Frequency of participation	3.29	0.98	3.59	0.78	0.34	0.37
	Environmental barriers	1.45	0.30	1.18	0.18	1.09	0.99
Home Frequency of participation	Interactive and organized play	7.39	0.84	7.57	0.58	0.25	0.22
	Household chores	4.33	1.99	5.66	1.62	0.73	0.94
	Socializing with friends and family	3.74	1.77	4.29	1.53	0.33	0.36
Community Frequency of participation	Neighborhood and community outings	4.43	1.33	4.48	1.00	0.04	0.05
	Community-sponsored activities	2.95	1.17	2.68	1.21	0.23	0.19
	Recreational activities and trips	2.36	1.32	3.53	1.12	0.96	0.99
Home Environmental barriers	Information	1.28	0.55	1.05	0.28	0.53	0.71
	Sensory qualities	1.12	0.39	1.10	0.34	0.05	0.06
	Attitudes and actions of professionals	1.02	0.15	1.03	0.16	0.06	0.06
	Services	1.21	0.60	1.03	0.23	0.40	0.47
	Policies	1.95	0.93	1.59	0.78	0.42	0.52
	Physical layout	1.14	0.47	1.03	0.16	0.31	0.32
	Physical demands of typical activities	1.26	0.54	1.00	0.00	0.68	0.90
	Cognitive demands of typical activities	1.28	0.55	1.05	0.23	0.55	0.74
	Social demands of typical activities	1.16	0.49	1.07	0.25	0.23	0.20
	Child's relationships with family	1.12	0.39	1.05	0.28	0.21	0.17
	Supplies	1.14	0.47	1.05	0.28	0.23	0.20
	Time to support child participation	1.44	0.70	1.37	0.66	0.10	0.08
	Money to support child participation	1.65	0.81	1.21	0.55	0.64	0.87
Community Environmental barriers	Information	1.74	0.93	1.25	0.66	0.61	0.83
	Sensory qualities	1.51	0.75	1.05	0.28	0.81	0.97
	Outside weather conditions	1.59	0.59	1.42	0.53	0.30	0.31
	Child's relationship with peers	1.12	0.40	1.11	0.36	0.03	0.05
	Attitudes of other members	1.24	0.58	1.04	0.20	0.46	0.60
	Programs and services	1.33	0.68	1.11	0.43	0.39	0.46
	Policies	2.29	0.78	1.48	0.75	1.06	0.99
	Physical layout	1.34	0.66	1.16	0.41	0.33	0.35
	Physical demands of typical activities	1.20	0.51	1.03	0.16	0.45	0.58
	Cognitive demands of typical activities	1.49	0.75	1.07	0.30	0.74	0.94
	Social demands of typical activities	1.22	0.57	1.10	0.38	0.25	0.22
	Safety	1.32	0.61	1.18	0.45	0.26	0.24
	Access to personal transportation	1.40	0.79	1.16	0.55	0.35	0.39
	Access to public transportation	1.21	0.56	1.11	0.36	0.21	0.17
	Equipment or supplies	1.30	0.71	1.04	0.26	0.49	0.64
	Time to support child participation	1.44	0.70	1.37	0.68	0.10	0.08
	Money to support child participation	1.81	0.88	1.36	0.67	0.67	0.79

differences between groups were in the Developmental Code Sets related to attention (b140) and involvement in pre-school tasks (d815). On the other hand, the smallest differences between groups were in terms of basic knowledge skills (d137).

Instead of characterizing and dividing children by etiology, based on biomedical diagnosis, a holistic functioning profile allows us to describe their performance in everyday settings, emphasizing both their major strengths and limitations (McDougall et al., 2010). The categorization of children by

etiology or diagnosis does not provide relevant information about functioning. According to the ICF-CY, functioning includes the interaction between the child (with a health condition and developmental status) and the contextual factors that surround him or her (both environmental and personal) (WHO, 2007). The ICF-CY biopsychosocial framework helps to question the medical model principle by which disability is seen as a result of impaired body structures and/or functions. According to the ICF-CY perspective, disability includes functional restrictions,

TABLE 2 | Differences between children with SEN (C₁) and children without SEN (C₂) regarding levels of functioning in the 6 ICF-CY Developmental Code Sets.

Functioning levels	C ₁	C ₂	Mann-Whitney test				
	Mdn	Mdn	U	z	p	r	Effect size
d137—Basic knowledge skills	3.00	4.00	2.02450	2.683	0.007*	0.25	Small
d210—Ability to perform a single task	3.00	4.00	1.98950	2.480	0.013		
d815—Involvement in pre-school tasks	4.00	5.00	2.15500	3.620	0.000*	0.34	Moderate
d330—Conversation	3.00	4.00	2.13800	3.374	0.001*	0.31	Moderate
d140—Attention	2.00	3.00	2.21000	3.777	0.000*	0.35	Moderate
d880—Play competences	4.00	5.00	2.10550	3.320	0.001*	0.31	Moderate

*Significant level at 0.008 (Bonferroni adjustment).

TABLE 3 | Correlations among variables: child functioning, environmental barriers, and the frequency of participation at home and in the community setting.

Correlations	Child Functioning	Home		Community	
		Environmental barriers	Frequency of participation	Environmental barriers	Frequency of participation
Child Functioning					
Home	Environmental Barriers	-0.350***	0.337***	-0.412***	0.281**
	Frequency of participation	0.337***	-0.346***	0.654***	-0.234*
Community	Environmental Barriers	-0.412***	0.654***	-0.382***	0.479***
	Frequency of participation	0.281**	-0.234*	0.479***	-0.218*

*p < 0.05; **p < 0.01; ***p < 0.001.

TABLE 4 | Differences between children with SEN (C₁) and children without SEN (C₂) in each environmental factor linked to the ICF-CY domains by Khetany (2015) at home and in the community.

Environmental barriers			C ₁	C ₂	U	z	p	r	Effect size
YC-PEM items	ICF-CY Domains (linkage proposed by Khetani, 2015)	Mdn	Mdn						
Home	Information	e1: Products & technology	1.00	1.00	1.27100	-3.12	0.002*	-0.29	Moderate
	Sensory qualities	e2: Natural environments and human changes	1.00	1.00	1.55150	-0.21	0.832		
	Attitudes and actions of professionals	e4: Attitudes	1.00	1.00	1.57600	0.14	0.892		
	Services	e5: Services, systems and policies	1.00	1.00	1.40900	-2.39	0.017		
	Policies	e5: Services, systems, and policies	2.00	1.00	1.23950	-2.08	0.037		
Community	Information	e1: Products & technology	1.00	1.00	1.12400	-3.46	0.001**	-0.32	Moderate
	Sensory qualities	e2: Natural environments and human changes	1.00	1.00	1.00900	-4.54	0.000**	-0.43	
	Outside weather conditions	e2: Natural environments and human changes	2.00	1.00	1.28950	-1.40	0.161		
	Child's relationship with peers	e3: Support and relationships	1.00	1.00	1.49250	-0.046	0.963		
	Attitudes of other members	e4: Attitudes	1.00	1.00	1.29800	-2.39	0.017	-0.22	
	Programs and services	e5: Services, systems, and policies	1.00	1.00	1.34950	-2.22	0.026	-0.21	
	Policies	e5: Services, systems, and policies	2.00	1.00	72500	-4.96	0.000**	-0.46	Large

*Significant level at 0.01 (Bonferroni adjustment).

**Significant level at 0.007 (Bonferroni adjustment).

activity limitations, and participation constraints; the characterization of these features was enabled by measures such as the MAAP (Castro and Pinto, 2015).

Therefore, it is recommended that assessment-intervention processes consider not only the nature and severity of functional restrictions but also the child's participation in daily life settings as well as contextual factors, through the identification of barriers and facilitators. In this process, it is important to emphasize the need to complement medical diagnosis with a more functional approach to guide decision making in the eligibility process. Although the Portuguese legislative framework for children with

SEN recommends a functioning profile to document eligibility with information regarding both the student and his/her medical condition, participation, and environmental factors, studies state that environmental factors are rarely included and described in functioning profiles (Castro et al., 2014; Sanches-Ferreira et al., 2015; Silveira-Maia et al., 2017).

However, as the ICF-CY biopsychosocial paradigm of health and functioning theorizes, the environment has shown to play a vital role in explaining children's participation levels (Anaby et al., 2014; Albrecht and Khetani, 2016; Guichard and Grande, 2017; Di Marino et al., 2018). Environmental factors interact with

TABLE 5 | Differences between children with SEN (C₁) and children without SEN (C₂) in environmental factors at home and in the community.

Environmental barriers		C ₁	C ₂	Mann-Whitney test				
YC-PEM Items	Mdn	Mdn	U	z	p	r	Effect size	
Home	Physical layout	1.00	1.00	1.46450	-1.56	0.118		
	Physical demands of typical activities	1.00	1.00	1.24100	-4.05	0.000*	-0.38	Moderate
	Cognitive demands of typical activities	1.00	1.00	1.28650	-2.86	0.004*	-0.27	Small
	Social demands of typical activities	1.00	1.00	1.48950	-9.40	0.347		
	Child's relationships with family	1.00	1.00	1.48800	-1.12	0.262		
	Supplies	1.00	1.00	1.48700	-1.14	0.253		
	Time to support child participation	1.00	1.00	1.48750	-0.59	0.558		
	Money to support child participation	1.00	1.00	1.09350	-3.59	0.000*	-0.33	Moderate
Community	Physical layout	1.00	1.00	1.34000	-1.37	0.170		
	Physical demands of typical activities	1.00	1.00	1.31650	-2.40	0.016		
	Cognitive demands of typical activities	1.00	1.00	1.06250	-4.04	0.000**	-0.38	Moderate
	Social demands of typical activities	1.00	1.00	1.37850	-1.36	0.174		
	Safety	1.00	1.00	1.35050	-1.28	0.201		
	Access to personal transportation	1.00	1.00	1.37300	-1.93	0.053		
	Access to public transportation	1.00	1.00	1.49350	-0.79	0.427		
	Equipment or supplies	1.00	1.00	1.35450	-2.65	0.008		
	Time to support child participation	1.00	1.00	1.47550	-0.68	0.497		
	Money to support child participation	2.00	1.00	1.12450	-3.02	0.003**	-0.28	Small

*Significant level at 0.006 (Bonferroni adjustment).

**Significant level at 0.005 (Bonferroni adjustment).

all components of functioning and provide an assessment of the physical, social, and attitudinal impact of barriers and supports to participation. The present study reports that parents of children with higher levels of functioning perceive fewer environmental factors as barriers to participation. Then, as previous research reports (Lim et al., 2016; Kang et al., 2017), when compared with parents of typically developing children, in the present study, parents of children with SEN perceived more environmental factors as barriers both at home and in the community setting. Furthermore, this study aimed at identifying specific environmental factors perceived by parents of children with SEN as barriers to provide some preliminary evidence about the nature of these aspects that are hindering child participation.

Based on a previous work by Khetany (2015), who paired some YC-PEM environmental factors with the ICF-CY content, results showed that the four major ICF-CY environment domains perceived by parents of children of SEN as barriers were products & technology (e1), natural environments and human changes (e2), and services, systems, and policies (e5). Concerning the home setting, parents of children with SEN identified mainly a distal and macrosystemic factor as a barrier: information about activities, services, and programs (e1). In the community, proximal and microsystemic factors were considered (i.e., sensory qualities of community settings). However, macrosystemic and distal variables were also referenced by parents: information about activities, services and programs (e1) and neighborhood, childcare, and employer policies (e5).

This preliminary evidence about environmental factors that are possibly hindering young children participation highlights the importance of professionals establishing collaborations not only with families but also with communities. Partnerships with communities could provide more effective information being delivered to families about home and community activities and

programs. Also, sensory qualities of community settings could be altered or improved to allow some children to participate.

International conventions and recommended practices provide a framework for professionals, families, and communities concerning inclusion and the well-being of children with disabilities (Brown and Guralnick, 2012). More specifically, in Portugal, legislation for children with SEN is grounded on the ICF-CY's theoretical framework for decision-making processes and individual planning in education, emphasizing inclusion and child participation. Yet, parents of children with SEN in Portugal continue to perceive policies and services as barriers to child participation. These results highlight the need to close the gap between policies and the quality of services and supports. As recommended by Brown and Guralnick (2012), policy makers need to address this issue by truly implementing and monitoring effective programs and high-quality services to families of young children with SEN.

Concerning the remaining environmental factors addressed in the YC-PEM, results indicated that parents of children with SEN perceived physical and cognitive demands of typical home and community activities and money to support child participation in both settings as barriers. As recommended by the USA Division for Early Childhood (2014), services should identify these physical and cognitive demands that are restricting child participation in a more detailed way, according to parents. Through family-centered practices, the adjustment of environmental factors is defined as a priority so that all children have their right to participate fulfilled (DEC, 2014).

Furthermore, the remaining environmental barrier identified (money to support child participation at home and in the community) is related to the affordability dimension of Maxwell and Granlund (2011) and Simeonsson and colleagues (Simeonsson et al., 2001) model. Affordability is conceptualized as a condition to participate and includes a subjective evaluation of financial

constraints. This dimension implies that efforts (in this case, financial or material) are worth the return to participate in a situation. In this case, parents perceive money as a constraint to participation.

Overall, several physical, social, and psychological elements were identified as barriers that hinder child participation. Moreover, results showed that children whose parents perceive fewer factors as environmental barriers participate more often at home and in the community. These findings are consistent with the abovementioned model that relates environmental conditions (availability, accessibility, affordability, accommodability, and acceptability) with participation. Families need to make an overall positive assessment of conditions to participate (environmental factors) to provide children the opportunity to engage in diverse life situations. This model has been used to assess inclusive education (Simeonsson et al., 2001; Maxwell and Granlund, 2011), but assessments of home and community settings are also warranted.

In line with this evidence, Badley (2008) proposes an interactive relationship between the environment and participation. According to the author, environmental factors act as facilitators and barriers, but also as scene settings, that influence participation (Badley, 2008). In the present study, home and community activities are scene settings and, according to their parents, children with SEN participate less frequently in household chores. Furthermore, children with SEN were demonstrated to have a lower frequency of participation in home activities when compared with children without SEN.

These preliminary findings show that children with disabilities have fewer opportunities to participate in home activities. As their frequency of participation is diminished, children have a lower range of experiences, with fewer opportunities to interact with different people, to socialize with peers, and to perform different tasks and roles, in diverse physical and social settings (Almqvist et al., 2007; Eriksson et al., 2007). Moreover, these young children with SEN have fewer opportunities to learn cultural meaningful behavior, which contributes to their learning and development (Dunst et al., 2006). According to this perspective, participation can be conceptualized as an expression of inclusion (Maxwell et al., 2012), the ultimate health and functioning outcome, and the pivotal goal of intervention with young children with SEN (Law, 2002; Imms et al., 2016).

The YC-PEM appears to provide meaningful content about the parents' perspective of child participation and environmental factors at home and in the community setting. The multidimensionality of this measure is in line with the ICF-CY biopsychosocial model of functioning, as it considers the child and his/her health condition, participation in daily life settings, and environmental factors (supports and barriers). While allowing the change and adjustment of contextual settings to the child's idiosyncratic characteristics, services should promote child functioning and participation, through family-centered practices (DEC, 2014).

The ICF-CY provides a comprehensive background, in which the developing child interacts with the environment, participating in daily life activities. The common language of the ICF-CY contributes to describe the complex interactions between biological, psychological, and social factors (WHO, 2007). Although the YC-PEM has been linked to ICF-CY content (Coster et al., 2012;

Khetani, 2015), further studies in Portugal are needed to address the possibility of using the YC-PEM in assessment-intervention processes, so that professionals can use it as a tool to characterize participation and environmental factors with families and community members.

The utilization of the ICF-CY in Portuguese educational settings is mandatory for eligibility decisions and for assessment-intervention practices, according to Decree-Law 3/2008. This procedure for individual education planning allowed a comprehensive approach to functioning, describing both the children's health condition, as their participation and environmental factors (barriers and facilitators). Although Portuguese professionals still face challenges regarding the use of the ICF-CY in individual education programs (Sanches-Ferreira et al., 2014), this legislation based on the ICF-CY can be adopted across countries in order to provide a comprehensive framework to describe and promote child functioning and development. Simultaneously, specialized training on ICF-CY as well as on assessment tools should be provided to professionals (Sanches-Ferreira et al., 2014).

Limitations

The present study has some limitations that should be considered. First, child functioning was collected through an assessment of six *ICF-CY Developmental Code Sets* by pre-school teachers. Although pre-school teachers are privileged key informants, for their training and knowledge about child development, it would have been valuable to address the parents' perception and an observational measure of child functioning, in a more comprehensive profile, with a larger number of ICF-CY domains. Furthermore, results focus on the frequency of participation only. Participation, as defined by the ICF-CY, includes the child's experience of participation, considering more intrinsic factors, like affect, preferences, or motivation. Also, the differences between groups' effect sizes in the different dimensions (functioning, frequency of participation, and environmental factors) were modest, but larger sample sizes are needed to strengthen the results. This sample is not representative of the Portuguese population, so a cautious interpretation and generalization of results and conclusions is needed. Finally, future studies should further analyze the perspective of parents about the participation and environmental factors of Portuguese young children with and without SEN, considering the ICF-CY biopsychosocial framework. Considering prior evidence about the predictive role of country of residence in children with disabilities' participation levels (Fauconnier et al., 2009; Ullenhag et al., 2012), comparative studies are also needed to emphasize geographical variation in inclusive policies and practices across countries.

Conclusion

The present study showed that children with SEN have lower levels of functioning, participate less frequently in home activities (especially in household chores), and their parents perceive more barriers in both settings (home and community), when compared with parents of children without SEN. Environmental factors perceived as barriers at home and in the community setting by parents of children with SEN included information, financial support, and policies, but also sensory qualities and demands of

typical activities. Moreover, parents of children with higher levels of functioning perceive fewer environmental barriers, and these children participate more frequently in home and community activities.

These findings provide descriptive evidence about the ICF-CY dimensions in Portuguese pre-school children with and without SEN and highlight the importance of identifying and adjusting specific physical and social environmental barriers, through family-centered practices, in order to promote child participation and functioning. Therefore, results suggest that professionals and policy makers should adopt the ICF-CY multidimensional perspective to ensure the inclusion of every child in daily life settings, when implementing and monitoring services and practices.

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of the Portuguese National Data Protection Authority (no. 16785/2015) with written informed consent from all subjects.

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- All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the Portuguese National Data Protection Authority.

AUTHOR CONTRIBUTIONS

SG, CG: all authors made substantial contributions to the conception, design of the work, analysis, and interpretation of data for the work, drafting the work, and revising it critically for important intellectual content. The authors gave the final approval of the version to be published and agreed to be accountable for the content of the work.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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