Title: Parent-reported participation in children with moderate-to-severe developmental disabilities: Preliminary analysis of associated factors using the ICF framework

Running Title: Factors associated with children's participation

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Parent-reported participation in children with moderate-to-severe developmental disabilities: Preliminary analysis of associated factors using the ICF framework

Children with developmental disabilities are at risk for limited participation in everyday activities. This study investigated factors that hindered or facilitated participation in 58 children with moderate-to-severe developmental disabilities who attended special schools. The parents completed surveys on their children's participation, developmental profile, environmental restrictions, parental self-efficacy, and family demographics. Multiple regression analyses indicated that four variables were identified as strong predictors of specific children's participation and, overall, explained a small to moderate magnitude of variance. Social-emotional ability was associated positively with all aspects of children's participation (including diversity, intensity, and enjoyment). Children with better communication and those who had only one sibling engaged in a higher number of activities and did so more frequently. The children of parents with higher self-efficacy enjoyed themselves more during participation. The findings provide preliminary information that could be useful for families and healthcare professionals to facilitate participation of children with moderate-to-severe developmental disabilities.

Keywords: participation; children; intellectual disability; social-emotional ability; special school; autism spectrum disorder

Introduction

Participation in everyday life is vital for children's development of functional skills, adaptive behaviours, and social well-being (Hoogsteen & Woodgate, 2010; King et al., 2003; Law et al., 2004). According to the International Classification of Functioning, Disability and Health (ICF) (World Health Organization, 2001), participation is defined as an individual's involvement in life situations and it is conceptually influenced by the individual's health condition as well as a range of intrinsic and extrinsic factors. Children who have certain disabilities/disorders are at risk for restricted participation in everyday life. Promoting children's participation has been thus recognised as a clinically important goal and outcome for healthcare and rehabilitation (King et al., 2003; Law et al., 2004).

Identification of factors that facilitate or hinder participation specific to children with disabilities could assist families and healthcare professionals to provide suitable resources, services, and programmes to enable these children's optimal participation. Many studies have identified possible factors affecting participation at the child level. Children's age and gender are often considered as salient personal factors, as younger children and girls have appeared to participate in a greater number of activities and/or participate in activities more frequently (King, Law, Hurley, Petrenchik, & Schwellnus, 2010; Longo, Badia, & Orgaz, 2013; Mc Manus, Corcoran, & Perry, 2008; Ullenhag, Krumlinde-Sundholm, Granlund, & Almqvist, 2014). The severity of disability such as more severe spasticity or associated impairments was found to relate to lower intensity (i.e., frequency) of participation in children with cerebral palsy (Majnemer et al., 2008; Mc Manus et al., 2008). King et al. (2006) and Palisano et al. (2011) tested their proposed participation models, in which a number of functional abilities (e.g., physical, cognitive, communicative and adaptive behaviour abilities) made direct contributions to explaining participation intensity of children with cerebral palsy.

The role of environments in children's participation is also recognised in the ICF (World Health Organization, 2001), theoretical models (Kang, Palisano, King, & Chiarello, 2014;

King et al., 2003), and accumulated qualitative knowledge (Bedell, Khetani, Cousins, Coster, & Law, 2011; Harding et al., 2009). Majnemer et al. (2008) and Palisano et al. (2011) found access to rehabilitation/healthcare services to be positively associated with the diversity and intensity of activities in which children with cerebral palsy participated. Family-related characteristics such as family income, family structure, and parents' education or employment status had direct or indirect effects on children's participation (Gee Kee, Chien, Rodger, & Copley, 2014; King et al., 2006; Palisano et al., 2011; Soref et al., 2012). In other studies, barriers in physical environments or lack of social support were associated with reduced intensity of activity engagement in children with various disabilities (Anaby et al., 2014; Hammal, Jarvis, & Colver, 2004; Longo et al., 2013). Previous research also suggests that parents have an important role in children's participation and, if the parents feel confident in their parenting ability (termed parental self-efficacy), they are likely to organise and carry out tasks that foster positive developmental outcomes in their child (Coleman & Karraker, 1998; Montigny & Lacharite, 2005). All aspects of children's participation have been found to associate positively with parental self-efficacy in a study of children with and without mild motor disabilities by Soref et al. (2012).

Although previous studies, based on the above, have identified many important factors affecting children's participation, the majority were focused on children with physical disabilities or mild developmental disabilities. There is, however, little known about whether the same factors are also important for children with moderate-to-severe developmental disabilities, a vulnerable group that has been seldom involved in studies investigating participation. In particular, children who are segregated in special schools have been found to exhibit lower communication interaction (Foreman, Arthur-Kelly, Pascoe, & King, 2004) and social competence (Fisher & Meyer, 2002), which could have a higher risk for reduced participation than children who have similar levels of disabilities but receive education in

mainstream schools. Knowledge of factors influencing participation for this group of children is needed to guide assessments, interventions, and services that promote their participation.

The aims of this study were to explore and identify specific factors related to participation in children with moderate-to-severe developmental disabilities who attended special schools. Due to limited research on participation of this group of children, potential factors were initially identified through appraisal of previous findings in children with mild developmental disabilities (Fong et al., 2011; King et al., 2003; Leung, Chan, Chung, & Pang, 2011; Rosenberg, Ratzon, Jarus, & Bart, 2012) and discussion amongst the research team. We further based the ICF, which reflects a biopsychosocial perspective emphasising the interaction between a child's functioning and the environment during participation, to categorise these factors into the child and environmental level. Using ICF terminologies, the factors influencing participation at the child level might include: personal factors (age and gender) and activities or so-called the ability to execute a task or an action (including physical, adaptive behaviour, social-emotional, cognitive, and communicative abilities). At the environment level, potential factors might include the number of services accessed and siblings, family income, parents' age, education and employment, environmental restrictions across home, education, and community, and parental self-efficacy. Given the multi-factorial nature of participation (King et al., 2003; Palisano et al., 2011), we hypothesised that some child and/or environmental factors could have stronger relationships with participation of the children with moderate-to-severe developmental disabilities and, overall, explain a small or moderate amount of variance in participation.

Methods

Participants

The participants of this study were part of a larger research study that developed and validated a new children's hand-use life participation measure during 2012−2013 (Chien,

Rodger, & Copley, 2015). Ethical approval for the entire study was granted by the Department of Education, Training and Employment (file number: 550/27/1126) and ethical review committee at The University of Queensland (project number: 2011000600).

Initially all the 15 public special schools located within Brisbane Metropolitan regions in Australia were invited for research participation. Eleven schools provided permission for this study, while three declined and one school specifically for children with visual impairments was ineligible. A total of 97 participants were eventually recruited from those special schools in this study. Inclusion criteria were that children had developmental disabilities, were aged between 2 and 12 years, and their parents could read English. All parents of these children provided written consent for research participation and completed the first package of research questionnaires (including demographics). Eight-two (84.5%) of these 97 parents specified their willingness to receive the second package of four additional questionnaires (which were used for this study) by mail to their homes. Reminders were sent if the mailed questionnaires were not returned within two weeks. Fifty-eight (70.7%) of the 82 consenting parents returned the completed questionnaires.

Table 1 summarises demographic characteristics of the children and parents who did and did not return research questionnaires. In the group of parents who returned the questionnaires, there were 37 boys and 21 girls. Their average age was 8 years 4 months (with a standard deviation of 31.7 months). The parents reported that their children had an average of 2.5 diagnoses/disabilities, 48.3% of which was intellectual disability, 39.7% autism spectrum disorder, 32.8% developmental delay, and 34.5% language/speech delay. The multiple-disability characteristic indicated that these children had moderate-to-severe developmental disabilities, which also accorded with the criteria for enrollment in special schools (Queensland Government, 2006). There were no significant differences in the personal and environmental factors between the children of parents who returned additional questionnaires and those who did not (see Table 1).

Insert Table 1 about here

Measures

Children's participation in everyday life

The Children Participation Questionnaire (CPQ) (Rosenberg, Jarus, & Bart, 2010a) is a parent-reported questionnaire originally designed to capture everyday life participation of children aged 4−6 years. For the purpose of the present study, we used the CPQ for children aged 2−12 years because its items were also appropriate for younger children (Gee Kee et al., 2014) as well as children of elementary school age (Rosenberg, 2015). The CPQ consists of 44 items across six life domains: activities of daily living, instrumental activities of daily living, play, leisure, social participation, and education. For each CPQ item, parents rate how frequently their child participates (using a 6-level rating scale from 0=never to 5=everyday). If the child participates in a particular activity, the parents further report on the degree of assistance provided (from 1=fully assisted to 6=independent), the child's enjoyment (from 1=does not enjoy at all to 6=enjoys very much), and the parents' satisfaction (from 1=not at all satisfied to 6=very satisfied). Thus, the CPQ yields five participation dimension scores based on all domains: participation diversity (i.e., the total number of activities in which the child participates; maximum of 44), participation intensity (mean score of 0−5), child independence (mean score of 1−6), child enjoyment (mean score of 1−6), and parents' satisfaction (mean score of 1−6). The CPQ has demonstrated acceptable internal consistency and established convergent and divergent validity (Rosenberg et al., 2010a; Rosenberg, Jarus, Bart, & Ratzon, 2011). All the CPQ participation dimensions have excellent test-retest reliability (Rosenberg et al., 2010a). However, in this study, we only asked the parents to complete three dimensions (i.e., participation diversity, participation intensity, and child

enjoyment) of the CPQ, as they are the most commonly used dimensions (Chien, Rodger, Copley, & McLaren, 2014; McConachie, Colver, Forsyth, Jarvis, & Parkinson, 2006).

Variables related to personal factors

A parent-reported questionnaire was designed specifically for this study to obtain demographic information about children's gender, age, and types of diagnoses/disabilities (where the parents can choose multiple diagnoses/disabilities which their child has).

Variables related to environmental factors

In the same demographic questionnaire, several environmental variables were also included: the types of services/programmes in which the child is currently involved; the number of siblings the child has; the mother's and father's characteristics (including age, education level, and employment status); and family income (weekly before tax).

In addition, the Environmental Restriction Questionnaire (ERQ) (Rosenberg, Ratzon, Jarus, & Bart, 2010b) was used to measure parental perception of environmental factors that restrict their children's participation. It consists of 35 items covering a range of physical and social environmental aspects, and 33 of these can be further grouped into three domains: home (eight items), community (12 items), and education (13 items). Parents are asked to rate on a 6-level Likert scale (from 1=does not at all limit to 6=limits to a great degree) the extent to which each item restricts their child's participation. Parents could also mark the 'not applicable' column if they perceive any item as non-relevant to their child. The average scores of all items in each domain can be used as domain scores for home, community, and education, respectively. The ERQ has been reported to demonstrate acceptable internal consistency as well as construct validity based on factor analysis and comparison of known group differences (Rosenberg et al., 2010b).

The Parenting Sense of Competence (PSOC) (Johnston & Mash, 1989) was used in this study to obtain parents' perception of their parenting role as an indication of parental self-efficacy. It consists of 17 items but the final item (i.e., being a good mother/father is a reward in itself) is often omitted due to its lack of factor loading reported by Johnston and Mash (1989); therefore, the 16 items were included for the study analysis. In each item, parents are asked to rate on a 6-point Likert scale ranging from 6=strongly disagree to 1=strongly agree. The total scores of the 16 items in the PSOC can be calculated as the measure of parental self-efficacy. The PSOC has acceptable internal consistency, construct validity based on factor analysis, as well as convergent and divergent validity from a range of studies (Gilmore & Cuskelly, 2009; Johnston & Mash, 1989; Lovejoy, Verda, & Hays, 1997).

Variables related to activities (ability)

The Developmental Profile-3 (DP-3) (Alpern, 2007) was used to measure children's development across five domains of physical, adaptive behaviour, social-emotional, cognitive, and communication abilities. The DP-3 can be used in children from birth to 12 years and includes two versions of the interview form and parent/caregiver checklist. In both versions, five scales are included to assess development of each domain and each scale is composed of 34−38 items (with 180 items in total). The current study used the parent/caregiver checklist version, where the parents were required to complete the yes/no checklist for all the items. Domain scores can be calculated by counting the number of the items rated as yes in each domain, and range from 0−35 (physical), 0−37 (adaptive behaviour), 0−36 (social-emotional), 0−38 (cognitive), and 0−34 (communication). According to Alpern (2007), the DP-3 parent/caregiver checklist version has acceptable internal consistency as well as construct and discriminant validity.

Statistical analysis

Descriptive analyses were firstly conducted to characterise basic properties of the observed variables included in this study. In particular, the normality was checked using the Kolmogoroy-Smirnov test. We found that several observed variables did not have a normal distribution and were subsequently collapsed into dichotomous categories to enable further regression analyses. These variables included the number of services accessed and siblings, family weekly income, mothers' and fathers' education levels and employment status, as well as environmental restrictions (see Table 1 for collapsed categorisation).

To investigate the extent to which the ICF-related personal factors, environmental factors, and activities were associated with children's participation, three multivariable linear regression models were performed (one participation diversity model, one participation intensity model, and one child enjoyment model). To accommodate the small sample size of this study, however, we performed the analyses in three phases. First, each variable was examined univariably to determine which variables could potentially be included in a subsequent multivariable model. The variables that showed significance at the $p < .05$ level in each of the univariate models were considered for inclusion. Second, multivariable regression analyses using an enter method were performed to explore the extent to which the included variables explained the variance for each of the three participation dimensions and which variables had stronger relationships. The significance level was set at $p < .05$. Collinearity in the multivariable models was also verified (using the correlation matrix for the independent variables and variation inflation factor > 4) (Pallant, 2007). Third, we validated all the multivariable models using bootstrapping methods, in which 2000 repeated samples with the same size as the present sample were drawn at random (with replacement). Bootstrapping estimates and confidence intervals were then produced using the 2000 replications for comparison (Efron & Tibshirani, 1986). All analyses were performed using the Statistical Package for Social Science (SPSS) version 20.0.

Results

As for participation diversity of the 58 children in the current study, on average, they participated in 35.4 (nearly 80%) out of 44 activities included in the CPQ. The average of participation intensity scores (2.94 out of 5) indicated that the children engaged in those activities once a week. The average of child enjoyment scores (4.72 out of 6) revealed that their enjoyment was rated by parents as moderate.

Table 2 summarises the factors that were significantly associated with the three CPQ dimension scores in each of the univariate regression models, and Appendix 1 details the results of all variables considered. In the participation diversity dimension, six significantly associated factors were found including: one environmental factor (i.e., the number of siblings) and all the five activity variables (including physical, adaptive behaviour, social-emotional, cognitive, and communicative abilities). These six factors plus home restrictions (an environmental factor) were also significantly associated with children's participation intensity. In the child enjoyment dimension, only the parental self-efficacy (an environmental factor) and social-emotional and cognitive abilities demonstrated significant association. In addition, it is noted that none of the variables from the personal factors were identified as significant factors in any of univariate regression models.

Insert Table 2 about here

During the preparatory analysis for multivariable regression models, two variables demonstrated multicollinearity. One was cognitive ability which strongly correlated to physical [$r(56) = .76$, $p < .001$] and communicative [$r(56) = .87$, $p < .001$] abilities. The other was adaptive behaviour ability which strongly correlated to physical [$r(56) = .85$, $p < .001$] and communicative [$r(56) = .71$, $p < .001$] abilities. Furthermore these two abilities were also highly correlated with each other [$r(56) = .81$, $p < .001$]. Thus, the cognitive and adaptive

behaviour abilities were removed from the multivariable regression models of participation diversity and intensity.

Table 3 shows final multivariable regression models of three children's participation dimensions, each of which included three to five independent variables that were identified as significant in the univariate models. All included variables had variation inflation factors of < 4 in those models, indicating that no multicollinearity was present. Other assumptions of homescedasticity, normality, and linearity were also confirmed.

Insert Table 3 about here

For the participation diversity dimension, the included variables explained 44% of the variance, $R^2 = .44$, $F(4, 53) = 12.37$, $p < .001$, 95% CI [.27, .62]. The amount of explained variance was considered of moderate magnitude. The number of siblings, social-emotional ability, and communicative ability were identified as significant factors for children's participation diversity. For the participation intensity dimension, the included variables explained 22% of the variance, $R^2 = .22$, $F(5, 52) = 4.14$, $p = .003$, 95% CI [.05, .38], which was of a small magnitude. The number of siblings and social-emotional ability were significant factors for children's participation intensity. For the child enjoyment dimension, the included variables explained 24% of the variance, $R^2 = .24$, $F(3, 54) = 6.83$, $p = .001$, 95% CI [.06, .41]. The magnitude of explained variance was small. Parental self-efficacy and social-emotional ability were significant factors for children's enjoyment during participation. In addition, the bootstrapping methods confirmed similar results in each model, in which the significant factors did not include zero in their non-standardised estimates within the 95% bias-corrected accelerated confidence intervals (Table 3). This indicated the stability for those factors to be identified as significant in the 2000 bootstrapping resamples.

Discussion

In contrast to the majority of participation studies focusing on children with physical disabilities or mild developmental disabilities, this study is the first to investigate potential factors influencing participation of children with moderate-to-severe developmental disabilities who attended special schools. While many factors were explored in the present study, only four (two related to children's ability and two related to environmental factors based on the ICF framework) significantly explained a small to moderate magnitude of variance in specific participation dimensions. No significant predictors were found in children's personal factors. Taken together, the study findings generally support our hypotheses that some child and environmental factors significantly impacted participation.

Somewhat surprisingly in view of previous research, out of the four factors identified in this study, children's social-emotional ability was a significant predictor consistently for all aspects of participation in the current study. This ability refers to children's interpersonal relationships, social/emotional understanding, and functional performance in social situations (Alpern, 2007). In other words, it is regarded as the manner in which a child relates to friends, relatives, or adults. It could be possibly inferred that children with significant developmental disabilities, who have higher abilities to interact with people, express their emotions or conform to social rules, took part in more activities with more intensity as well as experienced more enjoyment (as reported by their parents). King et al. (2006), however, did not find a similar relationship in their study on children with physical disabilities. It is speculated that, although physical problems reduce children's mobility or usage of body language for social interaction, children with physical disabilities may not have social-emotional issues that could significantly impact their participation. By contrast, children with significant developmental disabilities may exhibit more impaired social-emotional ability due to delays plus impairments in recognising emotional expression, nonverbal language, and/or psychological problems such as disruptive or antisocial

behaviours (Case-Smith, 2013; Kopp, Baker, & Brown, 1992; Shaw, Keenan, & Vondra, 1994). Interventions focusing on social-emotional ability may be needed to promote these children's participation.

The number of siblings that the child has was negatively associated with his/her participation diversity and intensity. This finding implies that, if the family has more than two children, the one with significant developmental disabilities is unlikely to engage in more activities or do so more frequently than the other children with disabilities who have no or only one sibling. It is possible that the parents may not have sufficient time/energy to support the child's participation because of intensive daily care of their other children or daily demands from each child (King et al., 2003). This finding highlights the importance of addressing family's coping strategies and support mechanisms to enhance children's participation.

Children's communicative ability and parental self-efficacy were the two variables that were found to predict participation diversity and enjoyment, respectively. Of note, communicative ability was initially associated with participation 'intensity' in the univariate analysis, but was a non-significant factor when compared to other variables in the multivariable model. Such a pattern is consistent with previous studies (Bult et al., 2013; Rosenberg et al., 2012), indicating that communicative ability may not be as strong a factor for the intensity of children's participation. However, the contribution of communicative ability to participation 'diversity' was evident in this study, where almost the same variables as the intensity model were compared. A possible explanation is that better communication ability may enable children's engagement in more everyday activities (as they could understand instructions or express their needs properly), but to engage in the activities with more intensity may require other important factors.

Parents are crucial in providing children with opportunities to take part in activities. This study revealed the importance of parental self-efficacy in predicting children's participation

enjoyment, in accordance with Soref et al.'s finding (2012). The higher the level of parental self-efficacy, the greater the enjoyment parents reported for their child during activities. Coleman and Karraker (1998) argued that parents with high self-efficacy had a strong sense of personal empowerment in their parenting role which fostered enjoyment in the process of parenting their child. This enjoyment in the parenting process may, in turn, create pleasurable and positive experiences in their child's participation (Pajares, 2006). It is noted that this study did not find the same contribution of parental self-efficacy on children's participation diversity or intensity, as did Soref et al.'s study. The differential results may be attributable to the significant developmental disabilities in the children included in this study. Even though the parents perceived themselves as effective in their parenting role, children's functional abilities may still play a more decisive role than other variables in participation diversity and intensity in this significantly disabled group.

There are potential implications that could be drawn from the preliminary findings of this study. One could be the need to prioritise assessment specifically on the factors identified (e.g., children's social-emotional ability or parental self-efficacy) to help understand these children's strengths and weaknesses for participation. Service providers may be further able to plan suitable interventions that address these factors to promote the children's participation. A number of effective interventions to improve children's social-emotional ability have been reviewed by Case-Smith (2013). Increasing parental self-efficacy through parents' groups or coaching has also been demonstrated as effective to promote children's participation (Graham, Rodger, & Ziviani, 2013). Future studies could examine the effectiveness of these interventions when being used to improve participation of children with moderate-to-severe developmental disabilities.

This study has several limitations. First, a parent-reported participation measure was used. The parents may interpret their child's participation differently from the child's self-perceived participation. Future studies using child-reported measures of participation are

encouraged, but some children with significant disabilities can not self-report. Second, this study accounted for the participation models with merely a small to moderate magnitude. Other potential factors relating to participation such as children's sensory processing ability (Chien, Rodger, Copley, Branjerdporn, & Taggart, 2016), mastery motivation (Majnemer, 2011), or parental stress (King et al., 2003) were not included in the study due to research burden for children and parents. Furthermore, children's cognitive and adaptive behaviour abilities were excluded from two multivariable regression analyses of this study because of high relationship with other developmental variables. While combining all developmental variables into one composite score could be a possible solution, this would prevent identification of specific important factors (e.g., social-emotional ability) in this study. Future studies that clarify the role of these two abilities in children's participation and include additional factors are needed. Finally, the most notable limitation of this study was the small sample size. Difficulties in recruiting children with significant disabilities in the study had to be recognised as the parents may have been time-poor given the multiple demands of their children. These children may also have undergone many investigations in special schools, reducing the parents' willingness for participation in this study. While we have used the bootstrapping methods to replicate the results, future studies are still needed to confirm the study findings by recruiting a larger sample and including children with moderate-to-severe developmental disabilities who attend mainstream schools.

Conclusion

This study provides preliminary knowledge about potential factors relating to participation in children with moderate-to-severe developmental disabilities attending special schools. Social-emotional ability was identified as the strongest factor across all aspects of participation diversity, intensity, and enjoyment in this group of children. Children who have better communication skills or only one sibling engage in a higher number of activities and

do so more frequently. The children of parents who have higher self-efficacy experience more enjoyment during engagement in everyday activities. Assessment and intervention may target these identified factors to promote participation of children with moderate-to-severe developmental disabilities. Further studies are needed to explore and identify other factors that facilitate or hinder participation in this group of children.

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Table 1. Characteristics of participants

Characteristics grouped by ICF factors	Participants who returned additional questionnaires (*n* = 58)	Participants who did not return additional questionnaires (*n* = 24)
Personal factors		
Age (month)	100.5 (31.7)	109.4 (26.8)
Gender: male / female	37 (63.8) / 21 (36.2)	15 (62.5) / 9 (37.5)
Environmental factors		
No. of services accessed: single / multiple	24 (41.4) / 34 (58.6)	15 (62.5) / 9 (37.5)
No. of siblings: ≤one / >one sibling	33 (56.9) / 25 (43.1)	13 (54.2) / 11 (45.8)
Family weekly income: ≤AUD $1400 / >AUD $1400	24 (41.4) / 23 (39.7)	9 (37.5) / 7 (29.2)
Mother's characteristics		
Age (year)	40.0 (6.4)	40.4 (7.0)
Education: without/with university degree	36 (62.1) / 22 (37.9)	18 (75.0) / 6 (25.0)
Employment: without / with any jobs	35 (60.3) / 23 (39.7)	12 (50.0) / 12 (50.0)
Father's characteristics		
Age (year)	41.8 (6.9)	43.1 (6.4)
Education: without / with university degree	33 (56.9) / 19 (32.8)	15 (62.5) / 6 (25.0)
Employment: without / with full-time job	11 (19.0) / 40 (69.0)	5 (20.8) / 17 (70.8)
Environmental restrictions		
Home: ≤2 / >2 scores	39 (67.2) / 19 (32.8)	NA
Community: ≤2 / >2 scores	31 (53.4) / 27 (46.6)	NA
Education: ≤2 / >2 scores	33 (56.9) / 25 (43.1)	NA
Parenting self-efficacy	66.4 (11.8)	NA
Activities		
Physical ability	21.3 (7.4)	NA
Adaptive behaviour ability	18.8 (6.5)	NA
Social-emotional ability	17.6 (5.2)	NA
Cognitive ability	19.5 (6.8)	NA
Communicative ability	17.3 (6.1)	NA

Note. The results are presented as mean (*SD*) or *n* (%). The sample sizes in father's characteristics are varied due to missing data. AUD = Australian dollars; NA = not available.

Table 2. Factors significantly associated with children's participation in each of univariate regression models

Participation dimensions and factors	*B*	95% CI	R^2	*p*
Participation diversity				
No. of siblings (>one sibling)	-2.64	[-5.22, -0.06]	.07	.045
Physical ability	0.31	[0.15, 0.47]	.21	<.001
Adaptive behaviour ability	0.37	[0.19, 0.55]	.23	<.001
Social-emotional ability	0.57	[0.35, 0.77]	.34	<.001
Cognitive ability	0.38	[0.22, 0.55]	.28	<.001
Communicative ability	0.48	[0.31, 0.66]	.35	<.001
Participation intensity				
No. of siblings (>one sibling)	-0.24	[-0.47, 0.01]	.07	.046
Home restrictions (>2 scores)	-0.31	[-0.56, -0.06]	.10	.015
Physical ability	0.02	[0.01, 0.04]	.13	.005
Adaptive behaviour ability	0.03	[0.01, 0.05]	.17	.001
Social-emotional ability	0.04	[0.01, 0.06]	.17	.002
Cognitive ability	0.24	[0.01, 0.04]	.13	.006
Communicative ability	0.22	[0.01, 0.04]	.09	.021
Child enjoyment				
Parenting self-efficacy	0.02	[0.01, 0.04]	.14	.004
Social-emotional ability	0.06	[0.03, 0.09]	.21	<.001
Cognitive ability	0.03	[0.01, 0.05]	.08	.028

Note. Each factor is treated as the only independent variable in each of the univariate regression analyses. This table includes only the factors that were significant at $p < .05$ in regression analysis, and complete results can be found in Appendix 1. Categorical variables are presented with a parenthesis in which the characteristic of interest is specified.

Table 3. Multivariable regression models of children's participation and ICF factors

Participation	Model effects		Parameter estimates			Bootstrap	
dimensions and factors	R^2	*p*	*B*	95% *CI*	*p*	*B*	95% *CI*
Participation diversity	.44	<.001*					
No. of siblings (>one sibling)			-2.57	[-4.60, -0.53]	.014*	-2.59	[-4.40, -0.72]
Physical ability			-0.05	[-0.24, 0.15]	.621	-0.06	[-0.27, 0.18]
Social-emotional ability			0.38	[0.11, 0.65]	.006*	0.39	[0.15, 0.67]
Communicative ability			0.30	[0.07, 0.54]	.012*	0.31	[0.05, 0.53]
Participation intensity	.22	.003*					
No. of siblings (>one sibling)			-0.22	[-0.45, 0.01]	.047*	-0.22	[-0.43, -0.01]
Home restrictions (>2 scores)			-0.24	[-0.49, 0.02]	.073	-0.23	[-0.48, 0.05]
Physical ability			<0.01	[-0.03, 0.02]	.898	<0.01	[-0.02, 0.02]
Social-emotional ability			0.03	[-0.01, 0.06]	.049*	0.03	[0.01, 0.07]
Communicative ability			0.01	[-0.02, 0.03]	.646	0.01	[-0.02, 0.03]
Child enjoyment	.24	.001*					
Parenting self-efficacy			0.02	[0.01, 0.03]	.033*	0.02	[0.01, 0.03]
Social-emotional ability			0.05	[0.04, 0.09]	.032*	0.05	[0.01, 0.09]
Cognitive ability			<0.01	[-0.03, 0.04]	.856	<0.01	[-0.02, 0.04]

Note. All listed factors are treated as independent variables in the corresponding multivariable regression analyses at the same time. Categorical variables are presented with a parenthesis in which the characteristic of interest is specified.

* $p < .05$.

Appendix 1. Univariate associations between children's participation and ICF-related factors included in this study

	Participation diversity				Participation intensity				Child enjoyment			
ICF factors	*B*	95% CI	R^2	*p*	*B*	95% CI	R^2	*p*	*B*	95% CI	R^2	*p*
Personal factors												
Age	0.01	[-0.04, 0.04]	<.01	.954	<0.01	[-0.01, 0.01]	<.01	.854	-0.01	[-0.01, 0.01]	.04	.160
Gender (girl)	0.50	[-2.26, 3.25]	.02	.719	0.02	[-0.23, 0.28]	<.01	.871	-0.12	[-0.50, 0.27]	.01	.550
Activities												
Physical ability	0.31	[0.15, 0.47]	.21	<.001*	0.02	[0.01, 0.04]	.13	.005*	0.01	[-0.02, 0.03]	.01	.473
Adaptive behaviour ability	0.37	[0.19, 0.55]	.23	<.001*	0.03	[0.01, 0.05]	.17	.001*	0.02	[-0.01, 0.05]	.04	.143
Social-emotional ability	0.57	[0.35, 0.77]	.34	<.001*	0.04	[0.01, 0.06]	.17	.002*	0.06	[0.03, 0.09]	.21	<.001*
Cognitive ability	0.38	[0.22, 0.55]	.28	<.001*	0.24	[0.01, 0.04]	.13	.006*	0.03	[0.01, 0.05]	.08	.028*
Communicative ability	0.48	[0.31, 0.66]	.35	<.001*	0.22	[0.01, 0.04]	.09	.021*	0.03	[-0.01, 0.06]	.05	.090
Environmental factors												
No. of services accessed (multiple)	-0.42	[-3.10, 2.28]	<.01	.759	0.03	[-0.22, 0.28]	.01	.805	-0.03	[-0.40, 0.35]	<.01	.890
No. of siblings (>one sibling)	-2.64	[-5.22, -0.06]	.07	.045*	-0.24	[-0.47, 0.01]	.07	.046*	0.10	[-0.27, 0.47]	.01	.593
Family income (>AUD $1,400)	0.57	[-2.39, 3.53]	<.01	.699	-0.03	[-0.30, 0.24]	<.01	.828	-0.05	[-0.47, 0.36]	<.01	.792
Mother's age	0.05	[-0.16, 0.26]	<.01	.634	<0.01	[-0.02, 0.02]	<.01	.880	-0.02	[-0.05, 0.01]	.03	.244
Mother's education (with university degree)	0.82	[-1.90, 3.54]	.01	.547	0.12	[-0.13, 0.37]	.02	.357	0.01	[-0.37, 0.39]	<.01	.958
Mother's employment (with any jobs)	2.18	[-0.46, 4.83]	.05	.104	0.07	[-0.18, 0.32]	.01	.599	-0.07	[-0.45, 0.31]	.01	.709
Father's age	0.01	[-0.19, 0.22]	<.01	.896	0.01	[-0.01, 0.02]	.01	.580	-0.01	[-0.04, 0.02]	.02	.369
Father's education (with university degree)	-1.07	[-3.97, 1.83]	.01	.465	-0.15	[-0.42, 0.12]	.02	.276	-0.31	[-0.70, 0.10]	.04	.133
Father's employment (with full-time job)	0.77	[-2.67, 4.22]	<.01	.655	0.06	[-0.26, 0.38]	<.01	.722	-0.07	[-0.55, 0.41]	.02	.767
Home restrictions (>2 scores)	-1.72	[-4.50, 1.07]	.03	.222	-0.31	[-0.56, -0.06]	.10	.015*	-0.21	[-0.60, 0.18]	.02	.286
Community restrictions (>2 scores)	1.46	[-1.17, 4.09]	.02	.270	0.01	[-0.23, 0.26]	<.01	.911	-0.13	[-0.50, 0.24]	.01	.483

Education restrictions (> 2 scores)	0.60	[-2.07, 3.27]	<.01	.655	0.04	[-0.21, 0.29]	<.01	.755	-0.24	[-0.60, 0.13]	.03	.202
Parenting self-efficacy	0.02	[-0.10, 0.13]	<.01	.789	<0.01	[-0.01, 0.01]	<.01	.722	0.02	[0.01, 0.04]	.14	.004*

Note. Each factor is treated as the only independent variable in each of the univariate regression analyses. Categorical variables are presented with a parenthesis in which the characteristic of interest is specified.

* $p < .05$.