Title: Differences in patterns of physical participation in recreational activities between children with and without intellectual and developmental disability

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Differences in patterns of physical participation in recreational activities in children with and without intellectual and developmental disability

Abstract

Background: Children with intellectual and developmental disability (IDD) are at risk of experiencing limited participation in recreational activities, where they may be present but not physically engaged.

Aim: To compare patterns of physical engagement in recreational activities between children with and without IDD.

Methods and procedures: Fifty children with IDD (26 boys, 24 girls; mean age 8.7 years) were matched for age and sex with 50 typically developing children. Parents completed a questionnaire which captured participation in 11 recreational activities involving hand use as an indication of physical engagement.

Outcome and results: More than 80% of children in both groups participated physically in eight recreational activities, but fewer children with IDD participated in six activities when compared with typically developing children. Children with IDD also participated less frequently in five activities and required more assistance to participate in all the 11 activities. Parents wanted their child with IDD to participate in 10 recreational activities with less assistance.

Conclusions and implications: The difference between the groups related to participation frequency, independence, and parents' desire for changes in their child's participation. Greater efforts are needed to address these differences and to support recreational participation in children with IDD.

Keywords: Participation; Recreation; Children; Intellectual and Developmental disability.

What this paper adds?

Previous research on the recreational participation of children with intellectual and developmental disability (IDD) has tended to focus on children with mild IDD. This study extends the current knowledge by investigating the patterns of recreational participation of children with moderate or severe IDD and by comparing these patterns with those of typically developing children. Since children with moderate or severe IDD may be physically present but may be less involved in engaging in activities, we targeted their physical engagement by studying the extent to which they participated in recreational activities requiring hand use. We found that children with IDD participate physically in most recreational activities. However, compared with typically developing children, a lower percentage of children with IDD participated in six specific activities (card/board games, computer games, using electronic devices, doing creative art/craft, organized sport, and taking photographs for fun). Children with IDD also participated less frequently in five activities, three of which are physically related (unstructured physical activities and organized sport). Major differences between the groups were found in the children's independence and their parents' desire for change. The parents of a child with IDD wanted their child to participate in 10 activities with less assistance, in particular playing with construction toys and computer games, doing creative art/craft, and engaging in physical activities and organized sport.

Highlights

- Children with IDD engage physically in most recreational activities.
- Children with IDD participate less frequently in physical activities.
- Children with IDD require more assistance during recreational participation.
- Parents want their child with IDD to participate with less assistance.

1. Introduction

Participation is defined as involvement in life situations by the International Classification of Functioning, Disability and Health (ICF) (World Health Organization, 2001), and recreation is included as an essential life situation. Participation in recreational activities enables children to achieve happiness, develop skills and competencies, form social relationships, and enhance their self-efficacy (Hoogsteen & Woodgate, 2010; Powrie, Kolehmainen, Turpin, Ziviani, & Copley, 2015). For example, participation in physical recreation activities or sports can help children to develop healthy life habits which in turn improve health and quality of life (Khalili & Elkins, 2009; Murphy & Carbone, 2008). Children's perception of self-efficacy and positive mood have been found to benefit from sport or leisure participations by providing freedom of choice and pleasured experience (Grandisson, Tetreault, & Freeman, 2012; Vogt, Schneider, Abeln, Anneken, & Struder, 2012). In addition, participation in recreational activities affords children with many opportunities to interact with other children, make friends, and develop social competence (Ozer et al., 2012; Solish, Perry, & Minnes, 2010). Increasing attention has been thus given to the investigation of children's recreational participation patterns, particularly for children with disability who may have limited ability to play or interact with others (Dahan-Oliel, Mazer, & Majnemer, 2012; Imms, 2008; Shields, King, Corbett, & Imms, 2014).

Distinguishing between physical presence and physical engagement is important when investigating recreational participation of children with disability. Recent advances in the concept of participation (Coster et al., 2011; Imms et al., 2017; Kang, Palisano, King, & Chiarello, 2014) show that participation encompasses two key elements: attendance (defined as "being there") and involvement (defined as "the experience of participation"). Attendance at recreational activities may be easier to achieve than actual involvement because attendance requires only that the child attends and observes others' engagement (Kang et al., 2014; Maxwell, Augustine, & Granlund, 2012). By contrast, the involvement

aspect of participation includes the additional elements of engagement, motivation, persistence, social connection, and level of effort (Coster et al., 2011; Hoogsteen & Woodgate, 2010; Imms et al., 2017; Kang et al., 2014). Under this conceptualization of participation involvement, physical engagement refers to a child's actual performance of the activity (Kang et al., 2014) and may involve the use of the hands (e.g., playing computer games) or lower extremities (e.g., playing soccer). As noted by Imms et al. (2017), attendance (physical presence) is a necessary requirement but does not always lead to involvement such as physical engagement. Investigations of the involvement in recreational participation of children with disability are needed to understand the "physically doing" aspect.

Most prior studies of recreational participation of children with disability have focused on children with physical disability (Law, Anaby, DeMatteo, & Hanna, 2011; Ullenhag, Krumlinde-Sundholm, Granlund, & Almqvist, 2014), cerebral palsy (Imms, 2008; Longo, Badia, & Orgaz, 2013; Majnemer et al., 2008), or high-functioning autism (Hilton, Crouch, & Israel, 2008; Potvin, Snider, Prelock, Kehayia, & Wood-Dauphinee, 2013). However, little is known about the recreational participation patterns of children with intellectual and developmental disability (IDD) (Shields et al., 2014), a group that is characterized by intellectual disability in combination with other lifelong disabilities. Children with IDD often exhibit reduced cognitive functioning, communication, and motor skills, which affect their recreational participation (Agran, Brown, Hughes, Quirk, & Ryndak, 2014; Shields et al., 2014). Therefore, understanding the recreational participation patterns of children with IDD and how these patterns compare with those of typically developing children is needed to maximize the recreational participation opportunities and to optimize the therapy services for children with IDD.

A systematic review by Shields et al. (2014) identified four studies that compared recreational participation patterns between children with IDD and typically developing

children. These studies reported that children with IDD participated in a similar number of informal recreational activities (e.g., reading, playing computer games, or doing puzzles) and at a similar frequency as their typically developing peers (Ehrmann, Aeschleman, & Svanum, 1995; Margalit, 1984; Matthews, 1982; Solish et al., 2010). However, children with IDD participated in fewer formal recreational activities (e.g., organized physical activities) or did so less frequently. Shields et al. (2014) commented that these results may be inconclusive because three of the four studies were considered outdated (i.e., published before the introduction of the ICF participation concept). In addition, the children in these studies were not matched for sex and age, which can affect children's participation (Longo et al., 2013; Mc Manus, Corcoran, & Perry, 2008; Ullenhag et al., 2014). King et al. (2013) compare the recreational participation patterns between 38 matched pairs of children with and without IDD. Surprisingly, children with IDD participated in more informal recreational activities than their typically developing peers, although their participation in physical activities and skill-based activities (e.g., playing a musical instrument or learning to dance) remained lower.

The aforementioned studies on recreational participation of children with IDD have focused on children with mild rather than moderate or severe IDD. For example, King et al. (2013) selected children with IDD who had adequate cognitive and communicative abilities to answer the questions about participation. Also, no studies have differentiated the concepts of physical engagement from presence or have specifically investigated the physical engagement in recreational activities of children with IDD. It is possible that children with moderate or severe IDD may be as physically present but less involved in actually engaging in activities as their typically developing peers. For example, two studies have reported that children with disability desired for active involvement in doing the activities that they prefer rather than just being physically present (Bedell, Khetani, Cousins, Coster, & Law, 2011; Eriksson & Granlund, 2004). Solish and her colleagues (2010) also

found that children with IDD tend to engage in recreational activities that are potentially passive and less physically involved such as watching television. There is a need for studies that investigate the physical engagement in recreational activities of children with IDD.

The aims of this study were (a) to investigate the patterns of physical engagement in recreational activities among children with moderate or severe IDD and (b) to compare their participation patterns with those of their typically developing peers. To capture children's physical engagement, a newly developed participation measure, the Children's Assessment of Participation with Hands (CAP-Hand) (Chien, Rodger, & Copley, 2015), was used to focus on recreational activities that require hand use (details described later). We assumed that use of the hands is an indication of children's physical engagement, especially in activities requiring hand use (Chien, Rodger, Copley, & McLaren, 2014). This assumption is based on several theoretical frameworks (Chien, Brown, & McDonald, 2009; Kimmerle, Mainwaring, & Borenstein, 2003) and observational studies (Marr, Cermak, Cohn, & Henderson, 2003; McHale & Cermak, 1992), in which children use their hands to explore and manipulate various objects as well as participate in fine motor activities most of the time.

2. Material and methods

2.1 Research design

A secondary analysis was performed using the data extracted from two pre-existing databases obtained between 2012 and 2013 (Chien et al., 2015). One dataset included data from 97 children with IDD, and the other dataset included data from 105 typically developing children. From the two datasets, the children with IDD were matched for age and sex with the typically developing children. Ethical approval for this study was granted by the Queensland Department of Education, Training, and Employment (550/27/1126) and

by the ethical review committee at The University of Queensland (2011000600).

2.2. Participants and procedure

Participants were children aged between 2 and 12 years who lived within the Brisbane Metropolitan region of Queensland, Australia, and their parents. Children with IDD were included if they attended special schools and their parents were able to read English. To be enrolled in special schools within the Brisbane Metropolitan region, one essential criterion is that "the person has a severe disability which includes intellectual disability" (Queensland Government, 2006). However, children were excluded from this study if they had only severe physical, visual, or hearing impairments. Typically developing children were included if they attended kindergarten or school and their parents were able to read English. Children were excluded from the typically developing group if they had certain impairments, disabilities, or health conditions that might affect their participation according to the parents' report.

Children with IDD were recruited using a cohort study design. All 15 special schools located within the Brisbane Metropolitan region were invited, and 11 of the schools provided permission for research participation. All of the parents who had children eligible for the study were sent a research invitation with the initial questionnaire package, which included a parents' report about their child's participation and a demographic questionnaire. Of 956 parents invited, 97 agreed, and they completed and returned the questionnaires by post (10.1% response rate). Upon receipt of the first set of questionnaires from the parents, the second questionnaire package was sent to them. The second questionnaire package included additional questionnaires that assessed children's developmental statuses. Sixty-seven of 97 parents who completed the initial questionnaires returned the second-round questionnaires (69.0% response rate).

Typically developing children were recruited from two kindergartens and one primary school within the same region using convenience sampling. Four hundred of the initial questionnaire package, which was the same as that sent to the parents of children with IDD, were distributed to the parents of typically developing children, and 116 were returned (29.0% response rate). Eleven of these children had an impairment or disability according to their parents' report and were excluded, and the data for 105 children were used.

2.3. Measures

2.3.1. Children's Assessment of Participation with Hands

Children's physical engagement in recreational activities was measured using the recreational subscale of the CAP-Hand (Chien et al., 2015). The CAP-Hand was developed as a parent-reported questionnaire for children with and without disability in the age range of 2−12 years (Chien et al., 2015). To capture the concept of children's physical engagement, each CAP-Hand item contains a life situation that typically requires hand use, and the question begins with "*Does your child use his/her hands to*" engage in that life situation. The life situation is described further with a set of similar activities directed towards a personally or socially meaningful goal for participation, within specific setting(s), and with potential surrounding people or children, by adopting the contemporary participation definition proposed by Coster and Khetani (2008). Full descriptions of the CAP-Hand recreational items can be found in the Appendix. For readability, the descriptions of each item are abbreviated throughout this article.

The original version of the CAP-Hand includes 11 items in the recreational subscale. In each item, the parent is asked to report "yes" or "no" to indicate whether his/her child participates in the life situation. Some items may not be suitable for all children, and a "not applicable" option can be chosen, and was treated as a missing value in the analysis. If the child does participate, the parent then identifies how often the child has participated in the

past 3 months (1 = less than once per month and 5 = every day); how much assistance the child requires during participation (1 = mostly assisted and 4 = independent); and whether the parent wants to see the child's participation in this type of life situation change (no or yes; if yes, four nominal options of "do more often", "do less often", "need less help", and "enjoy more" can be chosen). Four types of scores can be created for each item: Do participate (based on the response of yes/no), Frequency (based on rating scores), Independence (based on rating scores), and Desired change (based on the response of yes/no and the categories of desired change).

Evidence of the unidimensionality of the CAP-Hand recreational subscale has been established using Rasch measurement model after two misfit items were suggested for removal (i.e., Play computer games and Use electronic devices for relaxation/enjoyment) (Chien et al., 2015). However, the two misfit items were used in this study because the analysis was performed at the item level rather than the total subscale level. Test–retest reliability for all the recreational items except for one item (Engage in unstructured physical activities in community) was acceptable (Chien et al., 2015).

2.3.2. Demographic questionnaire

A parent-reported questionnaire was designed to obtain demographic information about the children's gender, age, and types of diagnoses and disabilities (where the parents can choose multiple diagnoses/disabilities which their child has) as well as the family characteristics (including family income, parents' educational level, and employment status).

2.3.3. Developmental Profile-3 (DP-3)

The children's development was measured using the DP-3 parent/caregiver checklist version (Alpern, 2007) to indicate the level of severity of the child's disability. The DP-3 is

designed for use in children from birth to 12 years and includes five scales that assess development of physical, adaptive behaviour, social–emotional, cognitive, and communication abilities. Each scale comprises 34–38 items (with 180 items in total), and each item is scored using a yes or no checklist. Scores are calculated by counting the number of the items rated as yes in each scale and are then transformed to standard scores and descriptive categories (i.e., above average, average, below average, or delayed) when compared with an existing norm (Alpern, 2007). The DP-3 parent/caregiver checklist version has acceptable internal consistency as well as construct and discriminant validity (Alpern, 2007).

2.4. Data analysis

A power calculation was performed using published data on participation in recreational activities compared between children with and without IDD (Solish et al., 2010; Woodmansee, Hahne, Imms, & Shields, 2016). To detect a clinically important difference of 20% between the groups in the diversity of participation for a specific activity (with a two-sided 5% significance level and a power of 80%), a sample size of 47 participants per group was required (Chow, Shao, & Wang, 2008).

Descriptive statistics were used to summarize the demographic characteristics and developmental issues. For categorical variables (the Do participate and Desired change scores), the number and percentage of the children who participated or the parents who desired a change are reported. *Chi*-squared tests were used to compare the groups of children with and without IDD. For ordinal variables (the Frequency and Independence scores), the median and interquartile range (IQR) are reported because the data were non-normally distributed. Mann–Whitney *U* tests were also performed to analyze between-group differences. The significance level was set at 0.05 for all statistical analyses. Effect sizes (*r*) were also calculated to compare the Frequency and Independence scores

between groups; an *r* value of > 0.50 is considered large, 0.30–0.49 medium, and 0.10–0.29 small (Fritz, Morris, & Richler, 2012).

3. Results

3.1. Participants

Fifty children with IDD were matched for sex and age with 50 typically developing children. The mean age of the participants was 8.7 years (standard deviation = 2.3 years), and 26 (52%) were boys. According to parent report, the group of children with IDD had a median value of two types of diagnoses/disabilities (IQR = 2): intellectual disability (n = 23, 46%), autism (n = 20, 40%), language/speech delay (n = 19, 38%), developmental delay (n = 15, 30%), learning disability (n = 10, 20%), physical disability (n=10, 20%), Down/fragile X syndrome (n = 6, 12%), and pervasive developmental delay (n = 2, 4%). Table 1 shows the family characteristics of children with and without IDD. By comparison, there were no statistical differences in the educational levels between the mothers ($\chi^2 = 3.07$, $P = 0.55$) and fathers ($\chi^2 = 2.03$, $P = 0.73$) of the two groups. However, the number of children with IDD who had equal to or more than average family income was significantly fewer than that of typically developing children ($\chi^2 = 7.77$, $P < 0.01$). There were also higher proportions of the mother and fathers who had no job employment in the IDD group ($\chi^2 = 11.79$, $P <0.01$ and $\chi^2 = 4.28$, $P < 0.05$, respectively), compared to those of typically developing children.

[Insert Table 1 about here]

In addition, 33 of the 50 parents of children with IDD returned the DP-3. Thirty of these children (91%) exhibited overall delayed development; 31 (94%) showed delays or

were below average in the cognitive domain and the other two (6%) were categorized as average. Seven of the 17 children whose parents did not return the DP-3 were unable to follow one-step instructions based on the teacher report and/or our classroom observations. Taken together, these data indicated that most of the children included in the IDD group had moderate to severe disability.

3.2. Do participate

More than 80% of children in both groups participated in eight of the 11 recreational activities that involved physical use of their hands (Table 2). Compared with typically developing children, children with IDD were less likely to play card/board games ($\chi^2 = 14.3$, $P < 0.01$), play computer games ($\chi^2 = 7.3$, $P < 0.01$), use electronic devices for relaxation/enjoyment ($\chi^2 = 4.9$, $P < 0.05$), do creative art/craft ($\chi^2 = 4.9$, $P < 0.05$), engage in organized sport ($\chi^2 = 4.3$, $P < 0.05$), and take photographs for fun ($\chi^2 = 13.4$, $P < 0.01$). Three specific activities (playing card/board games, engaging in organized sport, and taking photographs for fun) had large differences in percentages (≥20%) between children with and without IDD.

[Insert Table 2 about here]

3.3. Frequency

Children with IDD engaged physically less frequently in five of the 11 recreational activities than did their typically developing peers (Table 2). These activities were using electronic devices for relaxation/enjoyment ($U = 868.5$, $P < 0.05$), getting books and turning pages to look at pictures or read ($U = 920.0$, $P < 0.01$), engaging in unstructured physical activities at home ($U = 710.0$, $P < 0.01$) and in the community ($U = 807.0$, $P < 0.01$), and engaging in organized sport ($U = 204.5$, $P < 0.01$). Medium effect sizes were found for the

latter three activities in relation to physical activities or organized sport (r = 0.31–0.45).

3.4. Independence

Children with IDD required greater assistance during physical engagement in all of the 11 recreational activities than did their typically developing peers (Table 2). Significant group differences (U = 100.5–540.0, $P < 0.01$) with medium to large effect sizes ($r \geq 0.33$) were found for these activities. For children with IDD, the activities requiring more assistance were creative art/craft (median value = 1.0), playing card/board games (median value = 2.0), getting books to look/read (median value = 2.0), unstructured physical activities (median value = 2.0), and organized sport (median value = 2.0) compared with other recreational activities with a median value of 3.0.

3.5. Desired change

For all of 11 recreational activities, significantly more parents in the IDD group desired changes in their child's participation compared with parents of the typically developing group (χ^2 = 6.7–38.3, $P < 0.05$; Table 2). Table 3 shows the types of changes desired by the parents in both groups. Compared with the parents of the typically developing group, significantly more parents in the IDD group wanted their child to "do more often" for nine activities (χ^2 = 5.3–9.7, $P < 0.05$), to "do less often" for one activity (χ^2 = 6.3, $P < 0.01$), to "need less help" for 10 activities (χ^2 = 4.7–20.4, $P < 0.05$), and to "enjoy more" for one activity (χ^2 = 7.7, $P < 0.01$).

[Insert Table 3 about here]

4. Discussion

This study contributes to the growing knowledge about the recreational participation of children with IDD. No previous studies have investigated and compared the recreational activities in which children physically participate between children with moderate to severe IDD and typically developing children. This study used a new parent-report questionnaire (CAP-Hand) that captures children's participation in recreational activities requiring hand use as a form of physical engagement. Overall, the findings showed that these children with IDD participated physically in most recreational activities but that they participated less frequently (especially in physical activities) than their typically developing peers. Children with IDD also required considerably more assistance and their parents wanted more changes in their child's participation in recreational activities. Such notable differences in dependence and desired changes between children with and without IDD has not been reported previously in the context of recreational participation (King et al., 2013; Shields et al., 2014; Solish et al., 2010) and our findings add to the current body of knowledge. The findings of this study also provide information about the areas where greater efforts may be needed to promote opportunities and experiences in physical engagement in recreational activities in children with moderate to severe IDD.

It has been argued that children's recreational opportunities may be limited by environmental constraints and social isolation from typically developing children, such as by attending a special school (Agran et al., 2014; Chien, Branjerdporn, Rodger, & Copley, 2017). Although the children with IDD in this study were segregated in special schools, they participated in several recreational activities to a similar level as their typically developing peers. This finding agrees with previous studies of children with mild IDD (Ehrmann et al., 1995; King et al., 2013; Solish et al., 2010) but can be interpreted differently in terms of the extent of participation. The participation concept captured in the present study relates

specifically to physical engagement using the hands. Our findings suggest that children with IDD were given hands-on opportunities to physically engage in some or all parts of the recreational activities involving the hands. This finding is encouraging because children with disability are commonly reported to be merely present and to observe but not to participate directly in certain activities (Bedell et al., 2011) or to participate only in recreational activities that are passive and require few or no physical demands, such as watching television or listening to music (Modell, Rider, & Menchetti, 1997; Solish et al., 2010).

By contrast, this study found that, compared with typically developing children, 20% more children with IDD did not participate in card/board games, organized sport, and taking photographs for fun. Of note, a number of the parents specified that physical engagement in these recreational activities was not applicable to their child with IDD. Several reasons could contribute to this not applicable response. Some parents may think that their child does not have adequate cognitive/communicative functioning to engage in activities that are rule-governed such as card/board games or organized sport, or engage in activities that involves complicated equipment such as cameras and smart phones for taking photographs. Some may not have a camera or access to specialized team sport programs in the local community that integrate children with and without disability. If the not applicable choices were counted as no participation in the analysis, the difference between children with and without IDD who did not participate in the three recreational activities would be even larger. Future attempts may be needed, such as adapting card/board games to have fewer cognitive demands, encouraging local sport clubs to develop inclusive programs, or providing affordable and easy-to-use cameras or smart phones for taking photographs to provide more equitable access to recreational activities.

We found a significant medium effect size for the difference in the frequency of participation in all physically related activities between children with and without IDD. This

finding is consistent with the findings of Ehrmann et al. (1995) but contrast with those of King et al. (2013), who found no difference in the frequency of participation between children with and without IDD. Differences in results may reflect dissimilar participant characteristics; for example, our study included children who had moderate to severe conditions whereas King et al. (2013) included children who had sufficient cognitive ability to complete the self-report. This implies that, although children with IDD in this study participated in unstructured physical activities at home (median value = 2–3 times a week) and in the community (median value = once a week) as well as organized sport at a community venue/club (median value = once a month), their participation frequency may still be less than that of children with mild IDD. We note that their participation frequency decreased with the complexity of the environment in which the physical activities occurred: from home to community facilities to sport clubs. These findings are of concern given that the benefits of regular participation in physical activities and sports have been reported, such as preventing childhood obesity (Dykens, Rosner, & Butterbaugh, 1998; Murphy & Carbone, 2008), increasing cardiopulmonary function (Khalili & Elkins, 2009), developing social competence (Maturo & Cunningham, 2013; Ozer et al., 2012; Solish et al., 2010), and promoting mental health (Biddle & Asare, 2011; Vogt et al., 2012).

It was not surprising that participation independence in all of the recreational activities was significantly lower in children with IDD than in their typically developing peers in this study. Solish et al. (2010) and King et al. (2013) also reported that children with IDD participated in more recreational activities with others (mainly parents or adults), which implies that there is a need for additional support to facilitate their participation. However, the differences in the parents' desires for changes between the two groups (Table 2) showed five recreational activities in which >35% of the parents of a child with IDD wanted their child to participate with less assistance. This percentage was significantly higher than that for the parents of a typically developing child. These activities include playing with

construction toys, doing art/craft and, in particular, all physically related activities, which may need more parental assistance with the set-up and facilitation. We speculate that the parents of a child with IDD wish their children to become more skilled and/or self-determined in creative or physical activities particularly as the child matures. One potential strategy to encourage the independence of children with IDD is to provide more inclusive programs in which children with IDD take part in creative/physical activities with their typically developing peers (Agran et al., 2014; King, Petrenchik, Law, & Hurley, 2009). Such inclusive programs could benefit children with IDD by developing fundamental capacities (Grandisson et al., 2012), making friends with typically developing peers (Seymour, Reid, & Bloom, 2009), and providing opportunities for self-determination (e.g., making choices, expressing preferences, and setting goals) (Hughes, Cosgriff, Agran, & Washington, 2013; Wehmeyer, 2007). These benefits may facilitate children with IDD to become less dependent on adult assistance in the future.

Desire for change is a participation dimension, newly proposed by Coster et al. (2011), which serves as a way to capture parents' satisfaction with their child's current participation in a given type of activity. It is considered to be clinically useful in setting or planning intervention goals based on the areas in which changes are most desired (Khetani, Cliff, Schelly, Daunhauer, & Anaby, 2015). We found that a higher percentage of the parents of a child with IDD desired significantly more changes in their child's participation in all recreational activities compared with the parents of a typically developing child. The most commonly reported change desired was to help their child to participate more frequently (n = 121). However, an increased number of statistically significant group differences were actually found in the parents' desire for less assistance rather than for greater frequency in the comparison of specific types of desired changes between the two groups. The implication of this finding is that many parents of a child with IDD wish their child to participate more often in recreational activities. However, addressing participation

independence seems to be more imperative for children with IDD based on the comparison between parents of a child with IDD and those of a typically developing child.

Clinical implications could be drawn from the findings of this study in order to optimize therapy services for children with IDD. One could be the need to prioritise interventions on the activities (e.g., physical activities, organized sport, card/board games, or photograph shooting for fun) in which children with IDD participate less than their typically developing peers. Service providers could also develop strategies that are used to encourage greater participation and independence, such as coaching parents (Graham, Rodger, & Ziviani, 2009), adapting activity demands or materials (Ashburner, Rodger, Ziviani, & Hinder, 2014), and modifying environmental barriers or leveraging resources (Anaby, Law, Teplicky, & Turner, 2015). In addition, therapy services may consider providing or incorporating inclusive programs (e.g., sports or physical activities) to promote recreational participation and independence of children with IDD.

This study has a number of limitations. One limitation is the convenience sample of typically developing children, which may not be truly representative. The second limitation is that four special schools did not consent to research participation, which may have compromised the validity of the cohort study design to recruit children with IDD who attend a special school. The third limitation is the low response rates, and it is possible that the parents who responded were more active in their child's participation than those who chose not to respond. It has been also reported that the parents of children with IDD are likely under stress (Feldman, Leger, & Walton-Allen, 1997; Olsson & Hwang, 2001) or time-poor to address their children's complex demands (McCann, Bull, & Winzenberg, 2012). This may have reduced the parents' willingness for research participation and further limited the generalizability of the study's findings to all children with IDD. The fourth limitation is that children with and without IDD were not matched for their family characteristics such as family income or parents' employment status. We did not gather the information about the

number of the caregivers who looked after the child at home. Furthermore, we did not compare recreational participation of children with IDD by specific comorbidity they had (e.g., autism) due to the small sample size. These factors may contribute to differences in children's participation in recreational activities (Grandisson et al., 2012; Marquis & Baker, 2015; Solish et al., 2010; Ullenhag et al., 2014) and could be considered in future comparative studies between children with and without IDD.

In addition, the CAP-Hand questionnaire includes only recreational activities that require hand use as an indication of physical engagement. Therefore, some recreational activities that are social (e.g., visiting with friends) or do not involve hand use mainly (e.g., singing or going to a public library) are not included in the CAP-Hand and were not compared in this study. Other social or generic participation measures should be used in future research to complement the findings of the present study. Future studies should also include other involvement aspects of participation (e.g., social engagement, motivation, enjoyment, and persistence) by children with IDD in recreational activities.

5. Conclusions

This study investigated the recreational participation patterns of children with moderate to severe IDD by assessing their physical engagement in recreational activities that involve hand use. Although children with IDD participated in several the recreational activities to a similar extent as their typically developing peers, there were significant differences in their participation frequency and independence. Major differences were also found in the parents' desire for change, and the commonly reported changes desired by parents related to more frequent participation and with less assistance. These findings indicate where greater efforts may be needed to inform the future development of strategies and programs that promote the physical engagement in recreational activities of children

with moderate to severe IDD.

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Table 1: Family characteristics of participating children

	Children with IDD (n=50)	Children without IDD (n=50)
Family income, n (%)		
Less than average	21 (42.0)	12 (24.0)
Equal to or more than average	19 (38.0)	38 (76.0)
Missing	10 (20.0)	0 (0.0)
Mother's education, n (%)		
High school or lower	11 (22.0)	11 (22.0)
College or diploma	18 (36.0)	18 (36.0)
Undergraduate	11 (22.0)	8 (16.0)
Postgraduate	10 (20.0)	13 (26.0)
Mother's employment, n (%)		
Without jobs	30 (60.0)	13 (26.0)
With any jobs	20 (40.0)	37 (74.0)
Father's education, n (%)		
High school or lower	13 (26.0)	14 (28.0)
College or diploma	13 (26.0)	13 (26.0)
Undergraduate	7 (14.0)	7 (14.0)
Postgraduate	10 (20.0)	10 (20.0)
Missing	7 (14.0)	6 (12.0)
Father's employment, n (%)		
Without jobs	4 (8.0)	0 (0.0)
With any jobs	40 (80.0)	45 (90.0)
Missing	6 (12.0)	5 (10.0)

Note: Average family income was AUD $1,400 (weekly before tax) at the time when this study was conducted.

Table 2: Recreational participation profile of children with and without IDD

Items	Do participate, n (%)		Frequency, median (IQR)			Independence, median (IQR)			Desired change, n (%)	
	With IDD	Without IDD	With IDD	Without IDD	*r*	With IDD	Without IDD	*r*	With IDD	Without IDD
1. Play with construction toys	42 (84.0)	44 (88.0)	3.0 (3.0)	3.0 (2.0)	<0.01	3.0 (2.0)	4.0 (0.0)**	0.58	26 (61.9)	8 (18.2)**
2. Play card/board games	22 (68.8)	49 (98.0)**	2.0 (3.0)	2.0 (1.0)	0.21	2.0 (1.5)	4.0 (1.0)**	0.56	15 (68.2)	14 (28.6)**
3. Play computer games	38 (86.4)	50 (100.0)**	5.0 (2.0)	4.0 (1.3)	0.11	3.0 (2.0)	4.0 (0.0)**	0.51	22 (57.9)	8 (16.0)**
4. Use electronic devices for relaxation/enjoyment	39 (90.7)	50 (100.0)*	5.0 (1.0)	5.0 (0.0)*	0.22	3.0 (2.0)	4.0 (0.0)**	0.44	19 (48.7)	8 (16.0)**
5. Do creative art/craft	41 (82.0)	47 (95.9)*	3.0 (3.0)	4.0 (2.0)	0.17	1.0 (2.0)	4.0 (1.0)**	0.70	32 (78.0)	12 (25.0)**
6. Get books and turn pages to look at pictures or read	47 (94.0)	50 (100.0)	4.5 (1.0)	5.0 (1.0)**	0.26	2.0 (3.0)	4.0 (0.0)**	0.61	28 (59.6)	9 (18.0)**
7. Play musical instruments/toys	34 (87.2)	38 (84.4)	3.0 (2.0)	2.5 (2.0)	0.17	3.0 (2.0)	4.0 (1.0)**	0.40	20 (58.8)	10 (26.3)**
8. Engage in unstructured physical activities at home	46 (92.0)	49 (98.0)	4.0 (2.0)	5.0 (1.0)**	0.41	2.0 (1.3)	4.0 (1.0)**	0.62	38 (82.6)	11 (22.4)**
9. Engage in unstructured physical activities in community	43 (86.0)	48 (96.0)	3.0 (2.3)	4.0 (1.0)**	0.31	2.0 (2.0)	4.0 (1.0)**	0.70	36 (83.7)	9 (18.8)**
10. Engage in organized sport	13 (68.4)	42 (89.4)*	3.0 (3.0)	4.0 (1.0)**	0.45	2.0 (1.5)	4.0 (1.0)**	0.51	12 (92.3)	8 (19.0)**
11. Take photographs for fun	20 (64.5)	46 (95.8)**	2.0 (4.0)	2.0 (2.0)	0.16	3.0 (2.0)	4.0 (1.0)**	0.33	9 (45.0)	7 (15.2)**

Note: IDD = intellectual and developmental disability; n = number of children; IQR = inter-quartile range; *r* = effect size.

* $P < 0.05$; ** $P < 0.01$.

Table 3: Types of desired change in recreational participation of children with and without IDD

Items	Do more often, n (%)		Do less often, n (%)		Need less help, n (%)		Enjoy more, n (%)	
	With IDD	Without IDD	With IDD	Without IDD	With IDD	Without IDD	With IDD	Without IDD
1. Play with construction toys	13 (31.0)	3 (6.8)**	1 (2.4)	1 (2.3)	14 (33.3)	4 (9.1)**	9 (18.0)	1 (2.3)**
2. Play card/board games	10 (43.5)	8 (16.3)*	1 (4.3)	1 (2.0)	4 (17.4)	4 (8.2)	3 (13.0)	1 (2.0)
3. Play computer games	7 (17.9)	0 (0.0)**	5 (12.8)	5 (10.0)	7 (17.9)	1 (2.0)**	5 (12.8)	2 (4.0)
4. Use electronic devices for relaxation/enjoyment	4 (10.3)	0 (0.0)*	6 (15.4)	6 (12.0)	7 (17.9)	2 (4.0)*	4 (10.3)	1 (2.0)
5. Do creative art/craft	16 (39.0)	8 (16.7)*	0 (0.0)	0 (0.0)	17 (41.5)	2 (4.2)**	10 (24.4)	5 (10.4)
6. Get books and turn pages to look at pictures or read	16 (34.0)	7 (14.0)*	2 (4.3)	0 (0.0)	7 (14.9)	0 (0.0)**	9 (19.1)	4 (8.0)
7. Play musical instruments/toys	13 (38.2)	9 (23.7)	0 (0.0)	0 (0.0)	5 (14.7)	0 (0.0)*	5 (14.7)	3 (7.9)
8. Engage in unstructured physical activities at home	16 (34.8)	7 (14.3)*	2 (4.3)	0 (0.0)	18 (39.1)	1 (2.0)**	12 (26.1)	7 (14.3)
9. Engage in unstructured physical activities in community	17 (39.5)	7 (14.6)**	2 (4.7)	0 (0.0)	16 (37.2)	1 (2.1)**	8 (18.6)	4 (8.3)
10. Engage in organized sport	5 (35.7)	4 (9.5)*	0 (0.0)	0 (0.0)	7 (50.0)	3 (7.1)**	2 (14.3)	3 (7.1)
11. Take photographs for fun	4 (20.0)	5 (10.9)	4 (20.0)	1 (2.2)**	2 (10.0)	0 (0.0)*	1 (5.0)	3 (6.5)

Note: IDD = intellectual and developmental disability; n = number of children.

* $P < 0.05$; ** $P < 0.01$.

Appendix: Full descriptions of the 11 recreational items in the CAP-Hand

Abbreviated descriptions	Full descriptions
1. Play with construction toys	Play with construction toys with family/ friends at home or at other venues (outside school). For example, your child may play with some kinds of blocks (e.g., wooden blocks, Lego blocks or unifix cubes) or build models.
2. Play card/board games	Play card games or board games with family/friends at home or at other venues (outside school).
3. Play computer games	Play computer games, video games, or hand-held electronic games at home or at other venues (outside school). For example, video games may include playing Wii, Playstation, or Xbox. Hand-held electronic games may include Nintendo DS, iPad or mobile phone games.
4. Use electronic devices for relaxation/enjoyment	Use electronic devices for relaxation/enjoyment at home or other venue (outside school). For example, your child may turn on the television and use the remote control to watch programs; use a VCR or DVD player to watch movies; or use a radio, CD player, MP3 player, or iPod to listen to music.
5. Do creative art/craft	Do creative art or craft with family/friends at home or at other venues (outside school). For example, this may include scribbling, colouring, drawing, cutting, pasting, making objects from recycled items (e.g., boxes or cardboard), knitting, making jewellery, playing with playdough, origami, etc.
6. Get books and turn pages to look at pictures or read	Get books and turn pages to look at pictures or read for relaxation/enjoyment at home or at the library. For example, your child may get a story book, magazine, or novel to look at or read.
7. Play musical instruments/toys	Play musical instruments or play with musical toys at home or at other venues (outside school). For example, your child may play with some kinds of musical toys or informal/formal musical instruments that can make sounds for the purpose of practice/fun/entertainment with family/friends.
8. Engage in unstructured physical activities at home	Engage in unstructured physical activities as play with family/friends at home (incl. backyard). For example, this may include playing in sand pit, playing on a swing, ball games, Frisbee, hopscotch, playing tag, bike riding, scooter riding, rough housing, tree climbing, skipping rope, swimming, etc.

9. Engage in unstructured physical activities in community	Engage in unstructured physical activities as play with family/friends in community (incl. outdoor facilities). For example, this involves using community outdoor facilities and may include playing in sand pit, playing on a swing, ball games, Frisbee, hopscotch, playing tag, bike riding, scooter riding, rough housing, tree climbing, skipping rope, swimming, etc.
10. Engage in organized sport	Engage in organized sport at a community venue or club. For example, this may include playing football, cricket, basketball, netball, handball, tennis, hockey, baseball, golf, bowling, badminton, gymnastics, dancing, swimming club/lesson, etc.
11. Take photographs for fun	Take photographs of something or somebody for fun at home or at a community venue. For example, your child may use a traditional camera, digital camera or mobile phone camera to take photographs.