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**Physical activity and play behaviours in children and young people with intellectual disabilities: A cross-sectional observational study**

# Physical Activity and Play Behaviours in Children and Young People with Intellectual Disabilities: A Cross-Sectional Observational Study

## Abstract

The benefits of physical activity (PA) and active play for children and young people are well established. However, there is a lack of PA research involving children and young people with intellectual disabilities (ID). This study investigated habitual PA and recess play behaviour in 70 5-15yr old participants with ID using objective methods (accelerometers) and systematic observation techniques (SOCARP). Results showed that few children were active enough to benefit their physical health (23% of the cohort). No differences in habitual PA, sedentary behaviour, or recess play behaviours were observed between boys and girls. Participants spent most of their recess time alone or playing in small groups, with no participants engaging in large group play. Older participants spent more recess time playing in small groups rather than playing alone and participants with Autistic Spectrum Disorder (ASD) spent more time engaged in active pursuits and less time standing than non-ASD participants. Positive correlations were observed between time spent alone and PA. These findings contrast with those typically observed in a mainstream school setting. In conclusion, interventions designed from formative research are needed to promote PA within this population. Implications for school psychologists are discussed.



*Key Words:* physical activity; play behaviour; active play; recess; intellectual disability; children

# Physical Activity and Play Behaviours in Children and Young People with Intellectual Disabilities: A Cross-Sectional Observational Study

Physical activity (PA) is an important determinant of health that is associated with a range of physiological benefits in children, including reduced cardiometabolic risk and more preferable body size (Boddy et al., 2014). PA in childhood is also positively associated with mental health (Ahn & Fedewa, 2011) and academic achievement (Fedewa & Ahn, 2011), and it is therefore important that children and young people accrue sufficient PA. Current UK (Department of Health, 2011), World Health Organization (WHO, 2010) and U.S. (USDHHS, 2008) guidelines state that children and young people should accrue at least 60 minutes of daily moderate to vigorous physical activity (MVPA) to gain health benefits. Despite this recommendation, it is widely acknowledged that many children fail to achieve this minimum level of PA (Ekelund, Tomkinson, & Armstrong, 2011; The Health and Social Care Information Centre, 2013). Furthermore, studies investigating the habitual PA levels of children and young people in mainstream groups consistently report that boys are more active than girls (Rowlands, Pilgrim, & Eston, 2008), and PA declines with age (Trost et al., 2002). It is therefore important for children and young people to develop healthful behaviours in childhood/youth to reduce this age-related decline, and also for health professionals, teachers, parents, and other key stakeholders to examine the *opportunities* for children to be active more often and at health enhancing intensities in order to *maximise* their potential.

## Recess

Children and young people accrue PA through a range of opportunities, including those provided through school attendance--for example Physical Education classes, recess periods, and school-based activity clubs. Recess is often a compulsory component of a school pupil's daily routine, providing the opportunity for one or more periods of discretionary PA

that can contribute up to approximately 40% of children and young people's recommended daily PA (Ridgers, Stratton, & Fairclough, 2006). Children and young people experience approximately 600 recess periods each academic year (Ridgers et al., 2006); therefore, recess provides a significant opportunity for PA engagement. The benefits of recess are not confined to those related to PA *per se*. For example, recess is associated with better ratings of class behaviour in mainstream schools (Barros, Silver, & Stein, 2009) and provides opportunities for free or unstructured play, which are important for children's emotional, cognitive, social and psychosocial development. Through play children can develop problem solving skills, negotiation, practice leadership, play creatively, develop friendships, and learn coping skills including conflict management (Ginsburg, 2007; Knowles, Parnell, Stratton, & Ridgers, 2013).

A range of studies have investigated recess play behaviours in children and young people from mainstream schools, and commonly report that boys are more active than girls (Ridgers, Salmon, Parrish, Stanley, & Okely, 2012), typically engaging in more large group and sport related play, with girls spending more time socialising in smaller groups (Knowles et al., 2013; Ridgers et al., 2006; Roberts, Fairclough, Ridgers, & Porteous, 2013). One recent systematic review described no differences in recess activity by school grade level or age, and offered inconclusive evidence related to differences in recess PA between children with or without special educational needs; these findings suggest that more, better designed studies are needed in this area (Ridgers et al., 2012).

**Intellectual Disabilities and Physical Activity**

Few PA studies have focussed on children and young people with intellectual disabilities. For the purposes of this study, intellectual disabilities (ID) are defined as:

> a significantly reduced ability to understand new or complex information and to learn and apply new skills (impaired intelligence). This results in a reduced ability to cope independently (impaired social functioning), and begins before adulthood, with a lasting effect on development (WHO, 2014).

The term ID encompasses a range of conditions including global developmental delay, autistic spectrum disorder (ASD) and Down syndrome. Examination of the habitual PA literature that has focussed on children with ID reveals that studies are often small (typically $n < 50$) and incorporate wide age ranges of participants (e.g., young people and adults grouped together). Despite these methodological issues, a recent review found that children and young people with ID were consistently less active than their non-ID peers, with authors highlighting the need for more, appropriately designed studies to be conducted within this population (Hinckson & Curtis, 2013). Studies focussing specifically on children and young people with ASD and comparing them to non-ASD groups are more common in the academic literature than studies including participants with a range of IDs or focussing on the special educational needs school environment. For example, one study reported differences in habitual PA by age, suggesting that PA declines as young people with ASD get older, which mirrors findings commonly reported in the non-ASD literature (Pan & Frey, 2006).

**Intellectual Disabilities and Recess**

Recent, formative, qualitative studies have suggested that opportunities for children and young people with ID are limited outside the school setting in the UK (Downs, Boddy, Knowles, Fairclough, & Stratton, 2013; Downs et al., 2014), and that schools represent the most accessible opportunity for children and young people with ID to be physically active. Recess may therefore be an even more important opportunity for children and young people with ID to accrue PA when set against the perceived lack of opportunities available outside

the school setting and also highlights the potential for working within the school setting to promote PA through appropriately designed intervention studies.

In comparison to research focussing on habitual PA, studies assessing recess play behaviours are more plentiful within the ID groups, especially in children with ASD. However, these studies tend to focus on interactions, psychosocial factors, and educational/treatment interventions rather than investigating PA related behaviours. Studies have often focussed on the use of recess or play interventions to influence social interactions, stereotypic behaviours and challenging behaviours (e.g., those described in Lang et al., 2011), rather than promote engagement in health enhancing PA. This is despite the wide range of benefits PA confers, such as improvements in self-esteem, reduced anxiety (Biddle & Asare, 2011), academic attainment (Fedewa & Ahn, 2011), plus additional benefits for children with ID, such as improved social interactions, cognition, motor skills, language and reduced stereotypic behaviours (Lang et al., 2010). For example, one study that focussed on social skills training (greeting, imitating, sharing taking turns, etc.), reinforcement and feedback reported improved social interactions in ASD children (Gonzalez-Lopez & Kamps, 1997). Other approaches such as correspondence training and activity schedules have also reported positive changes in play, stereotypy and challenging behaviour (Machalicek et al., 2009) Studies that have investigated recess PA behaviours in children and young people have mainly focused on one specific classification group (e.g., children with ADHD or ASD), or have used subjective or objective measures to assess activity alone rather than in combination with systematic observation techniques. Systematic observation techniques provide important contextual information including origin, type and role of facilitation, in addition to measurement of PA levels. Research conducted in the USA involving 5-12 year old children described no significant differences in recess PA or habitual PA when comparing ASD children to non-ASD controls (Rosser Sandt & Frey, 2005). Other research, focussing on

children with ADHD described no significant differences in recess PA in comparison to non-ADHD controls, but did describe more PA during seated classroom activities (Tsujii et al., 2007). One recent study from the UK employed observational techniques in addition to objective assessments of PA and described differences in recess play behaviour in children classified as ASD in comparison to other ID groups. Children with ASD were less habitually active than those with behavioural and emotional needs and tended to spend more time alone at recess than other groups (Bingham, Boddy, Ridgers, & Stratton, In Press). As children with ASD tend to engage in ritualistic or stereotypic play behaviours and have difficulty interacting with peers (Machalicek et al., 2009; Pan, 2009), time spent alone in recess may be expected, but whether this is associated with lower levels of PA during recess in comparison to non-ASD children with intellectual disabilities is not clear.

At present, little is known about how active children and young people with ID are, how they engage in recess play behaviours, and how active they are during this PA context provided daily. Furthermore, it is unclear whether PA differences exist by sex, age, and type of ID. Thus, the aim of this study was to investigate levels of habitual PA and recess play behaviours in a group of children and young people with intellectual disabilities and examine whether there were any differences in these variables by sex, age group, and ID group.

## Method

### Participants and Procedure

After gaining university ethical approvals, school gatekeeper consent, informed parental consent, and participant assent, 70 5- to 15-year-old old children and young people (mean age 9.97 years, n = 57 boys, 13 girls) from four special educational needs schools (two primary/elementary schools, 2 secondary/high schools) were involved in this cross-sectional, observational study. Initially twelve special educational needs schools were invited to

participate by email and follow up face to face meetings with the research team. Four schools agreed to participate, giving a 33% school recruitment rate. Data collection for this study took place in two phases, with phase one taking place in January 2013 and phase two taking place in September 2013 in the North-West region of England, UK. Schools and parents provided details related to their child's main intellectual disability, with children being grouped within this study as Autistic Spectrum Disorder (ASD) or non-ASD.

**Measures**

Anthropometric data collection sessions were conducted on school sites by trained research personnel. Using standard techniques (Lohman, Roche, & Martorell, 1988) body mass to the nearest 0.1kg (Seca, Bodycare, Birmingham, UK), stature and sitting stature to the nearest 0.1cm (Seca, Bodycare, Birmingham, UK) were assessed. Using standard regression equations, participants' dates of birth, the date anthropometric measures were taken and anthropometric data, somatic maturation (years to peak height velocity) was calculated for each participant (Mirwald, Baxter-Jones, Bailey, & Beunen, 2002). Body mass index (BMI) and BMI Z-scores were also calculated for each participant (Cole, Freeman, & Preece, 1995) and weight status was also classified according to international age and sex specific cut points (Cole, Bellizzi, Flegal, & Dietz, 2000).

**Physical activity monitoring.** Objective assessments of PA were conducted using uniaxial accelerometers (ActiGraph GT1M, MTI Health Services, Pensacola, FL). ActiGraph accelerometers are valid and reliable for use with children (Ekelund et al., 2001), though few studies have used accelerometers in groups of children and young people with intellectual disabilities. For example, 11 of the 30 studies included within a recent review used accelerometers to measure PA (Hinckson & Curtis, 2013). Accelerometers are small, sealed units that are often worn on an elastic belt at various locations on the body, most commonly

the right hip and the wrist. The monitors are piezoelectric transmitters that capture accelerations and convert this information into a measure of movement, e.g. counts (Ridgers & Fairclough, 2011). Data are summed over specific periods of data collection termed epochs (typically ranging from 1 second through to 60 seconds) and cut points are applied to this data to classify the frequency, intensity, and duration of physical activity.

Participants were shown how to wear the monitors and when to remove them and put them back on. Information related to the monitors was provided for parents and teachers. Children were instructed to wear the accelerometer on their right hip for seven consecutive days during waking hours. Participants were asked to remove the monitors when engaging in water based activities (e.g. swimming, bathing) and when they went to bed. The monitors were set to record using 5-second epochs of data collection, in order to capture the sporadic nature of children's PA (Baquet, Stratton, Van Praagh, & Berthoin, 2007). Bouts of ≥ 20 minutes of consecutive zero counts (1-minute spike tolerance) were used to define periods when the monitor had been removed, and were subtracted from daily wear time (Catellier et al., 2005). A valid day was defined as ≥9hrs of monitor wear time on a week day and ≥8hrs on a weekend day. Participants required any three valid days to be included within analysis (Mattocks et al., 2008). PA data were classified into sedentary time, light PA (LPA), moderate PA (MPA), and vigorous PA (VPA) using empirical cut points (Evenson, Catellier, Gill, Ondrak, & McMurray, 2008). Moderate to vigorous PA (MVPA) was calculated as the sum of MPA and VPA. Participants were classified as meeting or not meeting PA guidelines on the basis of accruing a mean of ≥60 minutes MVPA per day.

**Recess observations**

Observations of play behaviour were completed during school recess on school sites using the System for Observing Children's Activity and Relationships during Play (SOCARP;

(Ridgers, Stratton, & McKenzie, 2010). After observers were trained in the observation technique and the appropriate level of inter-observer reliability had been achieved (minimum interclass correlation coefficient of 0.8 for each component), they completed the SOCARP protocol either scoring observations live on school sites during recess, or where consent was provided, video recording the recess session and scoring the session retrospectively. SOCARP uses a 10-second time sampling method, which involves 10 seconds of observation followed by a 10-second recording period. SOCARP uses a predefined scoring proforma, which includes a range of measures that classify the type and context of activity for each 10-second observation period. Participants observed in January 2013 were observed for 5 minutes due to school time, space, weather and resource limitations, and participants observed in September 2013 were observed for 10-minute periods. For the purposes of this study, the proportion of time (%) participants spent in different activity intensities, types of activities, and various group sizes were retained for analysis.

**Statistical Analysis**

Differences in anthropometric variables between boys and girls were compared by one-way analysis of variance (ANOVA). One-way multivariate analysis of covariance (MANCOVA) was used to examine differences in sedentary time and accelerometer assessed PA components between boys and girls (MANCOVA 1), by school age group (≤11.9yrs vs ≥12yrs, MANCOVA 2) and by ASD or non-ASD classification (MANCOVA 3) controlling for BMI, maturation, accelerometer wear time and sex (except MANCOVA 1). MANCOVA was also used to examine differences in recess physical activity, type of activity and group size by sex (MANCOVA 4), age group (MANCOVA 5) and ID classification (MANCOVA 6), controlling for maturation, BMI and sex (except MANCOVA 4). In order to examine the relationship between group size and other variables partial correlations were completed with model 1 (SOCARP assessed PA and type of activity) controlling for sex, BMI and

maturation, and model 2 (accelerometer assessed PA) controlling for sex, BMI, maturation and accelerometer wear time. An alpha value of $p \leq 0.05$ was used to represent statistical significance, and all analyses were conducted using SPSS V21 (SPSS Statistics, IBM).

## Results

Table 1 displays raw mean age, maturation, and anthropometric data for the whole cohort (n = 70, 57 boys, 13 girls) by sex.

[TABLE 1 ABOUT HERE]

### Physical Activity Data

Thirty-three participants (n = 26 boys and 7 girls) met the accelerometer wear time inclusion criteria and were included within analysis, resulting in a 47% compliance rate to the accelerometer protocol. This compliance rate is lower than we would expect to see in non-ID children, for example a compliance rate of 73.4% was observed in a group of non-ID children from a similar geographical area (Fairclough et al., 2013) and lower than the compliance rate described in one study involving participants with Down syndrome of 82.6% (Sheilds, Dodd, & Abblitt, 2009). Information related to compliance to accelerometer protocols is scarce in the ID literature and information related to inclusion criteria is limited; therefore, it is difficult to establish whether the compliance rate within the present study is "normal" or large given the study population. Out of the 34 participants only 23% of the sample (n = 8, 7 boys and 1 girl) achieved ≥60mins MVPA/day. Table 2 displays the adjusted mean sedentary time, LPA, MPA, VPA and MVPA by sex, age group and ID group. No significant differences were apparent between boys and girls. There were no significant differences by school age group or by ASD or non-ASD groups.

[TABLE 2 ABOUT HERE]

**SOCARP data**

Complete SOCARP and covariates data were available for 64 participants (54 boys, 10 girls). Table 3 displays adjusted mean SOCARP data by sex, age group, and ASD group for the cohort. Participants tended to spend most of their time standing or walking, with no time spent lying down. No children spent any time playing in large groups, with children spending the majority of their time either playing in small groups or alone. Participants spent most of their time playing games, with small amounts of time spent playing sport related activities or sedentary games.

[TABLE 3 ABOUT HERE]

The MANCOVA analysis found no significant differences in SOCARP variables between boys and girls. Older children spend significantly more time playing in small groups (83.8 % vs 42.9%, $p = 0.003$), and significantly less time playing alone (14.2% vs 55.1%, $p = 0.003$) in comparison to younger children. Participants classified as ASD spent significantly less time standing (24.9% vs 41.8%, $p = 0.03$) and significantly more time engaged in very active physical activities (22.2% vs 8.6%, $p = 0.004$) in comparison to the non-ASD group.

**Correlation Analysis**

Partial correlation analysis was conducted to assess the correlations between group size and other SOCARP (model 1) and accelerometer assessed variables (model 2). For model 1, significant positive correlations were observed between spending time in 'medium' sized groups and standing ($r = .29$, $p = 0.02$) and sedentary time ($r = .27$, $p = 0.04$). Spending time during recess in medium sized groups was also negatively correlated with walking ($r = -.29$, $p = 0.03$). No other significant correlations were observed between group sizes and SOCARP variables. For model 2, time spent 'alone' was negatively correlated with

accelerometer assessed sedentary time (r = -.45, $p$ = 0.02), and positively correlated with LPA (r = .44, $p$ = 0.02), and MPA (r = .42, $p$ = 0.03). Time spent playing in small groups was positively correlated with sedentary time (r = .54, $p$ < 0.01), and negatively correlated with LPA (r = -.51, $p$ < 0.01), and MPA (r = -.48, $p$ = 0.01). No significant correlations were observed between medium group sizes and accelerometer assessed physical activity, or between VPA and any group sizes.

## Discussion

The results of this study suggest that children and young people with intellectual disabilities (ID) are not sufficiently physically active to benefit their physical health. The proportion of children meeting PA guidelines was lower than would be expected in mainstream children in the UK. For example in the UK recent evidence described that 51% of 8 year old children met PA guidelines (Griffiths et al., 2013). Globally, estimates using self-reported data suggest that a similar proportion (20%) of non-ID adolescents meet daily PA guidelines (Hallal et al., 2012). The low proportion of children meeting PA guidelines concurs with previous research in this area (Hinckson & Curtis, 2013) including studies that have focussed on children with ASD in comparison to mainstream peers (Pan, 2008). The outcomes of the main analysis suggested that there were no statistically significant differences in accelerometer assessed sedentary time or habitual PA between boys and girls, between age groups or between ASD or non-ASD groups. These findings are in contrast to those observedin similar studies conducted in mainstream schools with non-ID children, where boys are consistently reported as being significantly more active than girls (Rowlands et al., 2008), and younger children are more active than older children and young people (Trost et al., 2002).

The outcomes of the systematic observation of recess behaviour provided some objective insights into children and young people with ID's play behaviours. No children engaged in large group play, which within the mainstream literature is associated with sport related games and MVPA (Ridgers et al., 2012). A large proportion of time was spent playing alone, which may reflect the nature of participants' ID, particularly those with ASD who demonstrate impaired or infrequent social interactions, restricted and repetitive behaviour patterns, and impaired communication in comparison to non-ASD children (Pan, 2008). As large group play is usually associated with sport related activities and higher levels of MVPA, time spent alone or in small groups would be associated with lower levels of MVPA in mainstream children. Evidence is inconclusive for ID children (Ridgers et al., 2012), but in this study, time spent alone was positively correlated with LPA and MPA, suggesting a different relationship than would be expected in mainstream groups. Once again, no differences in recess activity were observed between boys and girls, which is in contrast to previous recess research conducted within mainstream schools with non-ID groups, where boys tend to dominate the play space and engage in sport related large group play (Ridgers et al., 2012; Ridgers et al., 2006). The lack of differences between boys and girls observed in our study may be due to the specialist nature of the schools, which did not provide segregated areas for 'sport' type activities, and as such do not reinforce a stereotyped environment. Further, the imbalance of the proportion of boys to girls in the school settings may mean that girls interact more with boys during recess than in a mainstream setting. Alternatively, the absence of any observed differences between boys and girls may simply be due to the lack of interactions between participants in general, and as a result the gender stereotyped behaviours do not manifest within this setting or population group. Older children exhibited more small group play and spent less time alone than younger children, which may be due to the active pursuit of socialisation during recess. Interestingly, participants classified as ASD were less

likely to spend time standing, and more likely to spend time being "very active." This suggests that ASD children replaced standing time with vigorous PA during recess.

The correlational analysis suggests that children playing in small groups spent more time standing around and being sedentary. This reflects the social aspect of recess, where children may (or may not) use discretionary time to engage with peers in social activities (Ridgers et al., 2006). This presents an opportunity to try to facilitate small groups to engage in active play, with the focus on "active" socialisation contexts rather than competition and "sport" related activity. This issue is confirmed within model two, where small group play was positively correlated with sedentary time and negatively associated with habitual light intensity and moderate intensity PA. In contrast to the 'mainstream' literature, time spent alone was negatively correlated with sedentary time and positively correlated with light PA and moderate PA, suggesting that children playing alone accrue more habitual PA. This may reflect the ID of the children, suggesting their preference for playing alone (Pan, 2009). To enable researchers to understand the type of activity engaged in by individuals alone, future studies should aim to include more contextual information within the SOCARP tool to examine the type of activity engaged in alone and the individual nature of play behaviours in this population. This may include providing more detailed categories and classification methods than the current options of "games, sport, locomotion or sedentary" to give a more representative tool to explore the recess behaviours of this group.

**Limitations**

There are a number of limitations within this study. Primarily, the sample size was small and compliance to the accelerometer protocol was poor, resulting in a reduced sample for analysis. This resulted in underpowered analysis, and may limit generalizability. However, small sample sizes are commonly reported in studies working with special

educational needs schools and children and young people with intellectual disabilities. This study represents one of the largest studies to date that has used objective measures to estimate physical activity in children and young people with ID in a narrow age range [previous studies have included wide age ranges, for example 12-70 years (Phillips & Holland, 2011)], and to combine systematic observation techniques to measure recess play behaviour in combination with objective assessments of PA. The poor compliance rate to the accelerometer protocol requires further investigation and formative work to understand how compliance can be improved in future studies. It may be prudent, subject to ethical considerations, to examine the effect of some accelerometer compliance strategies used in non-special education needs settings such as reminder phone calls, providing incentives and the use of activity logs (Trost, McIver, & Pate, 2005) within ID studies. Despite the benefits of using SOCARP, the tool did not provide sufficient detail related to the type of activities participants engaged within, and also did not include a clear mechanism for recording staff interactions which could be key in the facilitation of PA within this population. The use of SOCARP and similar observation techniques should be incorporated in future studies to help provide contextual information and collect data that require little in terms of participant burden and disturbance of usual routines, however the level of detail needs to be increased when recording activity "type" and staff interactions, within this group of the population.

**Implications for School Psychologists**

Children and young people with intellectual disabilities are not active enough to benefit their physical health. Recess provides a daily opportunity for discretionary PA in a safe, supervised environment. This is perhaps even more important for this population, where many barriers are perceived to exist to PA engagement outside the school environment (Downs et al., 2013; Downs et al., 2014). Participants within this study engaged in small group activities at generally low PA intensities. School psychologists should consider ways

of promoting active play during recess and across the school day that is practical for the population group. Targeted physical activity developed by the school psychologist at the secondary or tertiary level of intervention would serve to individualize the type of activity that would be most beneficial to this population (Fedewa, Candelaria, Erwin, & Clark, 2013). Physical activities of health enhancing moderate to vigorous intensities, which involve children using major muscle groups would be most beneficial; for example, games and activities that involve running, skipping, jumping, hopping and some elements of object control skills to promote fundamental movement skill competency and physical literacy would be ideal. The promotion of traditional recess 'sport' inspired games may not be effective for this population, but positive, facilitative interactions with staff and the provision of encouragement or role models may help increase the activity levels of children and young people with ID during school. For example, studies conducted with ASD children suggest that activity schedules, task correspondence training (Machalicek et al., 2009), modelling, reinforcing and prompting (Lang et al., 2009) may improve play behaviour and such approaches may also be useful to increase PA levels. School psychologists have the training required to implement interventions based on these strategies. School psychologists are thus in a prime position to use such techniques with students who have an ID to promote physical activity.

Physical activity is crucial to children's health and well-being. The associations between PA and physiological health are well established, but it is also important to remember the wider benefits of physical activity for psychosocial health, cognitive development and academic attainment (Ahn & Fedewa, 2011; Biddle & Asare, 2011; Fedewa & Ahn, 2011), particularly for children with special needs that do not receive as much physical activity as typically-developing children (Hinckson & Curtis, 2013). Given that students with ID have reaped psychosocial benefits from physical activity (Lang et al., 2010;

Machalicek et al., 2009) and that the current study reinforces the importance of obtaining adequate bouts of physical activity for health promotion, ensuring daily physical activity within this population is therefore of clear importance to life-long well-being.

**Future Research**

It is important to explore potential methods to enable children and young people with ID to increase PA in to gain the health and wider developmental benefits that engaging in PA confers. Interventions developed from formative study conclusions that represent the participants as well as parents, teachers and carers, are required to examine the effectiveness of school based PA promotion for children and young people with intellectual disabilities. This research must use robust, objective measures as well as qualitative techniques to elucidate the impact on PA behaviour, wider academic and behavioural effects and the acceptability of such interventions for the population in question. Furthermore, studies are required internationally to examine any cultural or national differences in physical activity and play behaviours within children and young people with ID.

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**Tables and Figures**

Table 1

*Mean [SE] Anthropometric and Age Characteristics of the Participant Group*

| | Boys | Girls | *P* value |
|---|---|---|---|
| Stature (cm) | 135.3 [1.9] | 138.2 [5.5] | .55 |
| Weight (kg) | 38.7 [2.6] | 44.3 [5.9] | .36 |
| BMI (kg/m2) | 20.3 [0.9] | 22.2 [1.5] | .33 |
| BMI Z-score | 0.81 [0.26] | 1.45 [ 0.39] | .28 |
| Age (years) | 9.9 [0.3] | 10.3 [0.7] | .60 |
| Maturation offset (years) | -3.6 [0.3] | -1.3 [0.6] | .001 |
| Overweight & Obese (%) | 47% | 46% | N/A |

Table 2

*Means [SE] for Sedentary Time and Physical Activity, Adjusted for BMI, Maturation, Accelerometer Wear Time and Sex (Except for Sex Analysis)*

| | Group | | *P* value |
|---|---|---|---|
| | Boys n = 26 | Girls n = 7 | |
| Sedentary time (mins/day) | 424.0 [11.8] | 452.8 [24.7] | .98 |
| LPA (mins/day) | 193.2 [9.1] | 196.9 [19.2] | .87 |
| MPA (mins/day) | 30.7 [2.2] | 28.3 [4.5] | .65 |
| VPA (mins/day) | 19.1 [2.0] | 17.0 [4.2] | .67 |
| MVPA (mins/day) | 49.8 [3.8] | 45.3 [8.0] | .63 |
| | ≤11.9 years n = 18 | ≥12.0 years n = 15 | |
| Sedentary time (mins/day) | 414.1 [17.2] | 436.3 [19.5] | .47 |
| LPA (mins/day) | 202.9 [13.3] | 183.4 [15.1] | .42 |
| MPA (mins/day) | 31.4 [3.2] | 28.8 [3.6] | .65 |
| VPA (mins/day) | 18.7 [3.0] | 18.6 [3.4] | .98 |
| MVPA (mins/day) | 50.1 [5.6] | 47.4 [6.4] | .79 |
| | ASD Group n = 9 | Non-ASD n = 24 | |
| Sedentary time (mins/day) | 428.2 [12.3] | 413.5 [20.8] | .56 |
| LPA (mins/day) | 190.5 [9.5] | 203.2 [16.1] | .52 |
| MPA (mins/day) | 29.6 [2.2] | 31.8 [3.8] | .64 |
| VPA (mins/day) | 18.7 [2.1] | 18.5 [3.6] | .96 |
| MVPA (mins/day) | 48.3 [4.0] | 50.3 [6.8] | .81 |

Table 3

*Means [SE] for SOCARP variables, adjusted for BMI, maturation and sex (except for sex analysis)*

| SOCARP Component (% of recess) | Boys n = 54 | Girls n = 10 | *P* value | ≤11.9 years n = 42 | ≥12 years n = 22 | *P* value | ASD Group n= 17 | Non-ASD Group n = 47 | *P* value |
|---|---|---|---|---|---|---|---|---|---|
| Lying down | 0.9 [0.4] | 0.1 [1.0] | .48 | 1.1 [0.6] | 0.0 [.85] | .35 | 1.6 [0.7] | 0.4 [0.4] | .19 |
| Sitting | 11.2 [3.2] | 20.1 [7.9] | .32 | 15.1 [4.3] | 7.8 [6.7] | .43 | 13.5 [5.9] | 12.3 [3.5] | .86 |
| Standing | 37.0 [3.6] | 38.9 [8.9] | .85 | 35.2 [4.8] | 41.3 [7.5] | .56 | **24.9 [6.4]** | **41.8 [3.8]** | **.03** |
| Walking | 38.0 [2.9] | 32.9 [7.1] | .52 | 36.0 [3.9] | 39.4 [6.0] | .58 | 37.7 [5.3] | 37.0 [3.1] | .90 |
| Very active | 13.0 [2.2] | 8.0 [5.5] | .42 | 12.6 [3.0] | 11.5 [4.6] | .86 | **22.2 [3.8]** | **8.6 [2.2]** | **.004** |
| Alone | 43.6 [5.1] | 27.2 [12.4] | .24 | **55.1 [6.3]** | **14.2 [9.8]** | **.003** | 46.7 [9.3] | 39.0 [5.5] | .49 |
| Small group | 53.4 [5.0] | 76.1 [12.3] | .1 | **42.9 [66.2]** | **83.8 [9.6]** | **.003** | 54.4 [9.2] | 57.9 [5.4] | .75 |
| Medium group | 3.0 [1.7] | -3.3 [4.2] | .17 | 2.0 [2.3] | 2.0 [3.5] | 1.0 | -1.1 [3.1] | 3.1 [1.9] | .26 |
| Large Group | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Sport | 5.4 [2.3] | 5.5 [5.7] | .98 | 6.0 [ 3.1] | 5.1 [4.8] | .94 | 3.6 [4.2] | 6.1 [2.5] | .61 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Games | 65.3 [5.1] | 75.9 [12.6] | .45 | 70.2 [6.8] | 60.9 [10.6] | .53 | 72.7 [9.4] | 64.9 [5.5] | .48 |
| Sedentary | 20.2 [4.1] | 9.7 [10.0] | .35 | 16.4 [5.4] | 22.7 [8.4] | .58 | 13.3 [7.4] | 20.4 [4.4] | .42 |
| Locomotion | 9.1 [2.4] | 8.8 [5.9] | .97 | 7.9 [3.2] | 11.3 [5.0] | .61 | 10.4 [4.4] | 8.6 [2.6] | .73 |