

**SPORT INVOLVEMENT FOR YOUTH WITH AUTISM SPECTRUM  
DISORDERS AND INTELLECTUAL DISABILITIES**

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## Abstract

Little is known about sport participation in youth with Autism Spectrum Disorder (ASD). The current research is the first to systematically examine correlates and outcomes associated with sport involvement in youth with ASD and used two interrelated studies to address several gaps in the literature.

Study 1 examined characteristics of sport involvement (frequency, diversity, positive social experiences [PSE]) for youth with intellectual disability (ID) alone compared to youth with ASD+ID and explored the personal and contextual correlates of involvement. Parents ( $N = 409$ ) of youth involved in Special Olympics (SO) completed an online survey. Although youth with ASD+ID did not differ from youth with ID alone in their frequency or diversity of sport participation, youth with ID alone had higher scores for PSE compared to youth with ASD+ID. Sociocommunicative abilities, coach relationship and resources mediated the relationship between ASD status and PSE.

Study 2 built on the first study by examining how sport involvement was related to psychosocial difficulties and strengths in youth with ASD+ID and ID alone. First, characteristics of sport involvement were examined as correlates of psychosocial difficulties over one year in youth with ASD+ID and ID alone in SO ( $N = 115$ ). Second, a sample of youth with ASD+ID who did not participate in sport ( $N = 58$ ) was compared to the athletes on psychosocial strengths and difficulties. In youth with ASD+ID, but not youth with ID alone, more frequent and social sport involvement was related to improved hyperactivity and peer problems, while more diverse sport participation was associated with greater emotional and hyperactivity problems. Youth with ID also had lower psychosocial difficulties and greater psychosocial strengths than youth with ASD+ID in

sport, and youth with ASD+ID who were not involved with sport had greater difficulties than those who were involved.

These findings from the present studies are the first to highlight the discrepancy in sport participation and outcomes for youth with ASD+ID compared to their peers in sport. A better understanding of the factors related to sport is essential for helping teams, families, and communities foster more positive and healthy sport engagement for youth with ASD+ID.

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## Chapter One: Introduction

Autism spectrum disorder (ASD) is characterised by impairments in social interaction and communication skills, as well as restricted and repetitive patterns of interests and behaviours (American Psychiatric Association, 2013). Individuals with ASD may or may not have an intellectual disability (ID) (31%; CDC, 2014), which is a developmental onset disorder that includes significant intellectual impairments ( $IQ < 70$ ) and adaptive functioning deficits in social, conceptual, and practical domains (APA, 2013). Meanwhile, the prevalence of ASD diagnoses in youth with ID is approximately 18% (Tonnsen et al., 2016). Beyond the deficits associated with such diagnoses, individuals with ASD and ID are also more vulnerable to problems with physical and mental health compared to typically developing populations (McCoy, Jakicic, & Gibbs, 2016; Simonoff et al., 2008; Skokauskas & Gallagher, 2012). Participation in sport and physical activity is a well-known approach for improving physical, social, and emotional functioning in the typically developing population and in youth with ID (e.g., Dykens & Cohen, 1996; Eime, Young, Harvey, Charity, & Payne, 2013; Grandisson, Tetreault, & Freeman, 2012; Maïano, Ninot, Bruant, & Bilard, 2002); however, comparable research for youth with ASD is currently lacking, and it is unclear whether similar patterns of sport involvement and outcomes exist.

There are several gaps in the ASD literature around sport involvement and experiences. Most importantly, it is unknown whether sport participation and experiences are the same for youth with ASD and ID compared to youth with ID alone. Youth with ASD and ID are reported to be less involved in their community activities (e.g., community events, classes/lessons, neighbourhood outings, etc.) and experience more social barriers to participation compared to peers with ID alone (Tint, Maughan, & Weiss, 2017). Others have reported that youth with ASD

and ID need more support from adults to participate in activities compared to those with ID alone (Solish, Perry, & Minnes, 2010). These discrepancies in community and social involvement are in line with the greater social and communication difficulties experienced by youth with ASD and ID compared to those with ID alone (Totsika, Hastings, Emerson, Lancaster, & Berridge, 2011). Given the social and collaborative nature of sport involvement, similar participation issues may be evident for youth with ASD and ID.

A second gap in sport research is that the measurement of involvement for youth with ASD and ID is often limited to whether the individual participates or not. Involvement in sport can be measured in various ways, with several characteristics to consider, including the sport frequency (e.g., how often individual participates) and diversity (e.g., number of sports involved in). In typically developing youth, knowledge about the frequency and diversity of sport participation provides information about beneficial outcomes, such as lower anxiety and depression (Ferron, Narring, Cauderay, & Michaud, 1999; Halldorsson, Thorlindsson, & Sigfusdottir, 2014). When examining how an individual with ASD or ID is involved in sport, their experiences go beyond the number and frequency of sports. Although youth may participate in as many sport activities as their peers, they may experience social situations very differently. Positive social experiences, such as teamwork and social gains (Eime et al., 2012; Holt, Tink, Mandigo, & Fox, 2008; Holt, Kingsley, Tink, & Scherer, 2011), have been found to be associated with life skills in other areas of life and future career development in typically developing high school students (Berrett, 2006; Holt et al., 2008).

Third, beyond the need to investigate group differences in sport participation, studies have yet to examine the factors that may account for differences in characteristics of sport involvement between youth with ASD and ID and youth with ID alone. Similarly, in terms of



outcomes, research is lacking around the psychosocial benefits associated with sport participation in these youth. Although research with typically developing youth has examined the role of sport in the development of positive adjustment and behaviours (Gano-Overway et al., 2009), no studies have examined how strengths are associated with characteristics of sport involvement for youth with ASD.

The current research is the first to systematically examine characteristics of sport involvement in youth with ASD. A detailed examination of associated factors and outcomes related to sport in youth with ASD is a first step in realizing any differences in sport participation and experiences. Knowledge of these constructs may also promote further research in positive psychology, which may help to improve positive and healthy development for individuals with ASD. The current research is comprised of two interrelated studies that use cross-sectional and longitudinal methods.

### **Description of Studies**

In Study 1, we addressed the main gap in previous literature by examining whether there were differences in characteristics of sport involvement (frequency, diversity, positive social experiences) for youth with ASD and ID (ASD+ID) compared to youth with ID alone. Further, we investigated the personal and contextual correlates of sport involvement and examined whether these factors explained any group differences. The personal factors included youth's age, gender, adaptive behaviour, and behaviour problems, while the contextual factors consisted of the availability and adequacy of resources, youth's relationship with coaches, and parent attendance and support of sport. Characteristics of sport involvement included an examination of sport frequency (i.e., how often a youth participates), diversity (i.e., types of sports the youth is involved in), and social sport experiences. Data was collected from Special Olympics (SO)

Ontario and a cross-sectional method was used to address the research questions. Special Olympics (SO) is an international sports program for individuals with ID, regardless of their ability, who are eight years of age or older (History of Special Olympics, n.d.). The Special Olympics organization offers opportunities to improve health and physical fitness behaviours to over four million athletes (Hutzler, Oz, & Barak, 2013; Special Olympics, 2012).

In Study 2, we built on the first study by examining how the characteristics of sport involvement (frequency, diversity, social sport experiences) in youth with ASD and ID were related to psychosocial strengths and difficulties. First, we investigated how characteristics of sport involvement were related to changes in psychosocial difficulties over a one-year period. Second, we examined differences in psychosocial strengths and difficulties across three groups of youth: athletes with ASD+ID, athletes with ID alone, and youth with ASD+ID who did not participate in sports. For the first objective, data was collected from parents of youth involved in SO Ontario and a longitudinal method was used to address the research question. For the second goal, additional data was collected from parents of youth with ASD+ID who were not involved in any sports.

The overall goal of the current research was to develop an understanding of sport involvement in youth with ASD and ID. Cross-sectional and longitudinal methods were used to gather a more comprehensive view of how athletes with ASD and ID experience their involvement in sport. Further, a comparison across groups of athletes with ASD+ID, athletes with ID alone, and youth with ASD+ID who did not participate in sport, allowed for direct testing of how experiences differ depending on ASD diagnosis and involvement in sport. Finally, by examining both correlates and outcome factors associated with sport participation, the studies

provide a more comprehensive understanding of how youth with ASD+ID are involved in sport and how psychosocial factors are impacted by their involvement.

Chapter Two: Study 1 - Patterns of Sport Involvement for Youth with Autism Spectrum Disorder and Intellectual Disability

The following study has been published in the Journal of Applied Research in Intellectual Disabilities: Ryan, S., Fraser-Thomas, J., & Weiss, J. A. (2017). Patterns of sport participation for youth with autism spectrum disorder and intellectual disability. *Journal of Applied Research in Intellectual Disabilities*, <http://dx.doi.org/10.1111/jar.12414>, Copyright © 2017, John Wiley & Sons Ltd, Wiley-Blackwell Publishing Ltd. (United Kingdom)

Sport involvement constitutes an important area of community inclusion and physical activity for people with disabilities, including for people with autism spectrum disorder (ASD) and with intellectual disabilities (ID). ASD is characterised by impairments in social interaction and communication skills, as well as restricted and repetitive patterns of interests and behaviours (APA, 2013). Approximately 56-68% of youth with ASD are thought to also have an intellectual disability (ID;  $IQ \leq 70$ ) or be of borderline intellectual functioning ( $IQ = 71-85$ ) (e.g., Christensen et al., 2012; Yeargin-Allsopp et al., 2003). Along with these difficulties, youth with ASD and ID struggle with emotional and behavioural problems. Totsika and colleagues (2011) reported that the majority of youth with ASD and ID have emotional (71%) and behavioural problems (65-88%), compared to youth with ID alone (emotional problems – 42%; behavioural problems - 46-63%). Similarly, youth with ASD and with ID are more likely to have physical comorbidities than the general population (Bebbington, Glasson, Bourke, de Klerk, & Leonard, 2013; Matson & Goldin, 2013; Thomas, Hovinga, Rai, & Lee, 2017). Youth with ID alone have lower sport participation rates than their typically developing peers (Solish, Perry, & Minnes, 2010; Westendorp, Houwen, Hartman, & Visscher, 2011), and youth with both ASD and ID have lower sport participation rates compared to youth with other disabilities, including emotional, developmental, physical/motor, or behavioural problems (27% for ASD vs. 41% for other disabilities; Blanchard, Gurka, & Blackman, 2006) and to typically developing peers (27% for ASD vs. 77% for peers; Potvin, Snider, Prelock, Kehayia, & Wood-Dauphinee, 2013; Healy, Haegele, Grenier, & Garcia, 2017). Given that youth with ASD show a decline in physical activity with age and may be at risk for health problems due to physical inactivity (Pan & Frey, 2006), greater research into the personal and contextual correlates of sport involvement is needed (Grandisson, Tétreault, & Freeman, 2012). Personal factors reflect an individual's 'intrinsic

characteristics' while contextual factors represent the 'physical or social' components of an individual's environment (Grandisson et al., 2012). The current study sought to identify the associations of sport involvement characteristics in youth with both ASD and ID and youth with ID alone. Characteristics of sport involvement were operationalized through frequency (e.g., how often an individual participates), diversity (e.g., number of sports involved in), and positive social experiences while in sport (e.g., learned to work with others in a group, made a new friend; Eime, Young, Harvey, Charity, & Payne, 2012; Holt, Kingsley, Tink, & Scherer, 2011).

There are many personal factors that may have an impact on sport involvement. Age is negatively associated with physical activity in youth with ASD (Memari et al., 2012) and with ID (Robertson & Emerson, 2010), akin to what is reported in the general population (Levinson & Reid, 1991). In youth with and without disabilities, males are more physically active than females (Frey, Stanish, & Temple, 2008; Lorenzi, Horvat, & Pellegrini, 2000; Robertson & Emerson, 2010), and this may translate to their degree of involvement more broadly. For instance, male athletes with ID in Special Olympics are more likely to be involved in team sports that require many athletes and a high degree of physical exertion than are female athletes with ID (Gillespie, 2009). For youth with ASD and ID, it is particularly relevant to consider how social communicative and practical components of adaptive behaviour can influence involvement in sport (Buttimer & Tierney, 2005; Grandisson et al., 2012), given the greater impairments in these domains compared to the general population (APA, 2013), and that limited social communication abilities can hinder participation in sport through negatively impacting interactions with peers or coaches (Ferguson & Shapiro, 2016). Similarly, the presence of maladaptive behaviour, such as self-injury or aggression, can further limit participation in social

sport activities that have a significant emphasis on group work and team building (LaFontana & Cillessen, 2002).

There are several contextual factors that could have an impact on sport involvement, and may be even more important to consider than personal characteristics (Coster et al., 2012). The availability and adequacy of resources, such as finances or equipment, are instrumental to facilitating participation in home, school, and community activities, including in sports (Coster et al., 2012; Pan & Frey, 2005). Youth with ASD and with ID often require considerable environmental supports and adaptations to the environment to enable meaningful inclusion (Darcy & Dowse, 2013), such as ensuring sufficient ratio of support staff to meet individualized needs, promoting inclusion within teams and activities, and providing appropriate activities for varying ability levels. Parent and coach support may also represent a set of contextual influencers on sport involvement, as strong social networks have been found to contribute to sport participation for individuals with ID (Robertson & Emerson, 2010). In typically developing youth, parents' attendance at games and support for sport, including providing transportation and playing with the child outside of sport, can positively affect child motivation (Keegan, Spray, Harwood, & Lavalley, 2010), and thus result in an increased frequency of sport participation (Alexandris, Tsorbatzoudis & Grouios, 2002). Similarly, a positive coach-athlete relationship is a consistent predictor of positive athlete development in typically developing youth (Vella, Oades, & Crowe, 2013). To date, no study has examined how contextual variables relate to sport involvement in youth with both ASD and ID.

More research is needed to understand how personal and contextual variables impact sport involvement for youth with ASD and ID. Special Olympics (SO) is the largest multi-sport organization for individuals with ID in the world, and thus serves as an ideal organization for

studying characteristics of sport involvement. Considerable research has examined SO participation and related outcomes in youth with ID (e.g., Gillespie, 2009; Grandisson et al., 2012; McConkey Dowling, Hassan, & Menke, 2013; Weiss & Bebko, 2008), though none on different characteristics of involvement (i.e. frequency, diversity, and positive social experiences) in SO for youth with both ASD and ID, despite such youths' participation as athletes in the organization (Harada, Siperstein, Parker, & Lenox, 2011; Hutzler, Oz, & Barak, 2013).

### **The Current Study**

The purpose of the current study was to compare characteristics of sport involvement (frequency, diversity, positive social experiences) in athletes with ASD+ID compared to athletes with ID alone. We hypothesised that youth with both ASD+ID would show less frequent, diverse, and positive social experiences compared to a comparison group of athletes without ASD. We also explored the personal and contextual correlates of such involvement, and whether these variables would explain why youth with ASD+ID would be less involved than their peers. We expected that personal (i.e., age, gender, sociocommunicative and adaptive behaviour) and contextual variables (i.e., resources, parent attendance, and parent and coach support) would be related to sport involvement for both youth with ASD+ID and with ID alone, and that differences in these variables would explain lower level of sport involvement in youth with ASD.

## **Methods**

### **Participants**

A total of 409 parents of individuals with ID involved in SO Ontario completed an online survey (a response rate of approximately 15%). All athletes were required to be registered in SO Ontario in the 2011-2012 season, and had a parent reported clinical diagnosis of ID or a



diagnosis associated with ID (e.g., Down Syndrome), by a licensed health professional. Parents also reported on whether their child in SO had any additional clinical diagnoses, including ASD (29.4%,  $n = 120$ ). Although a reporting bias is possible when using parent reports, other studies have used similar processes for verifying developmental disability with parent report surveys (e.g., Totsika, Hastings, Emerson, Lancaster, & Berridge, 2011; Weiss & Burnham Riosa, 2015). All athletes were between 11 and 23 years of age at the start of the study. As shown in Table 1, athletes were on average 17 years of age ( $SD = 3.05$ ) and 64% were male ( $n = 261$ ). Parents reported on child cognitive ability by responding to a question about how well their child could independently complete four tasks (e.g., read and understand common signs) using a 4-point Likert scale (0 = *Not well at all* to 3 = *Very well*). This scale was originally used in a national study of adolescents who received special education services in the U.S. (National Longitudinal Transition Study – 2; NLTS2) and has been used with parents of individuals with ASD (Mazurek, Shattuck, Wagner, & Cooper, 2012; Weiss & Burnham Riosa, 2015). Athletes had an average score of 1.36 ( $SD = .81$ ), with no difference between youth with ASD+ID and those with ID alone. More males ( $n = 94$ ) were reported to have a diagnosis of ASD than females ( $n = 26$ ;  $p < .001$ ), but no other demographic differences between groups were noted. On average, parents were approximately 49 years of age ( $SD = 6.10$ ), with 81% ( $n = 331$ ) being mothers.

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Insert Table 1 here

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## Measures

### Characteristics of Sport Involvement.

**Frequency.** The frequency of sport involvement was rated by parents for the past 12 months, on a 6-point response scale (1 = *Never* to 6 = *Several times a week*). The frequency scale was adapted from the 4-H Study, a project which aimed to understand the emergence of healthy developmental growth in youth (Lerner et al., 2005). The scale has been previously used in a study of thriving in SO athletes (Weiss & Burnham Riosa, 2015).

**Diversity.** Parents also reported on the total number of sports that their child participated in over the past 12 months (sport diversity), which ranged from 0 to 9 sports in the full sample ( $M = 2.21$ ,  $SD = 1.54$ ). Similar frequency and diversity questions have been used in a recent study in youth with ASD (Healy et al., 2017).

**Positive social experiences.** Positive social experiences in sport were measured using social items from a lab-developed measure adapted from the Youth Experiences Survey (YES 2.0; Hansen & Larson, 2005), called the Youth Experience Survey – Special Olympics edition (YES-SO). The YES-SO is comprised of 12 items that describe youths' perceived gains from participation in Special Olympics; seven of which inquire specifically about social gains: learned to work with others in a group, learned about helping others, became more connected with our community, has improved relationships with adults, had the opportunity to act as a leader, better at receiving feedback, and made a new friend. Parents rated how much they agreed with each statement using a 4-point Likert scale (0 = *Not at all* to 3 = *Yes definitely*), with an average social sport experience score of 1.68 ( $SD = .77$ ; ranging from 0 to 3). In the overall sample, the social subscale had excellent internal consistency (Chronbach  $\alpha = .91$ ) and strong intraclass correlations (single measures = .58, average measures = .91). Other studies of children with ASD have used

similar parent-report methods for assessing children's engagement in community activities (e.g., Ehrmann, Aeschleman & Svanum, 1995; Wong, Lam, Leung, Ho, & Au-Yeung, 2014).

### **Personal factors.**

***Social communication abilities.*** Social ability was assessed using a brief social scale employed in other studies with parents of individuals with ASD (Mazurek et al., 2012) and originally taken from the NLTS-2. Parents responded to four items about social situations (e.g., How often does your child seem confident in social situations), using a 4-point Likert scale (0 = *Never* to 3 = *Very often*). Communication ability was assessed using a 3-item scale (e.g., uses spoken language; based on a one-item language scale by Mazurek et al., 2012) with a 4-point Likert scale (1 = *Cannot do at all* to 4 = *Has no trouble*). The social and communication items were combined to reflect the ASD characteristic of sociocommunicative impairments, with higher scores indicating a greater degree of sociocommunicative competence (range = .29-3, *Median* = 1.71, *M* = 1.71, *SD* = .63) in the full sample, with an internal consistency of  $\alpha = .84$  for the current study.

***Daily living skills.*** The Waisman Activities of Daily Living Scale was used as a measure of the level of independence an individual with developmental disabilities (including ASD) has in typical daily activities (e.g., grooming; Maenner et al., 2012). Parents completed 17 items about their child's ability to complete a task for a range of activities, each on a 3-point scale (0 = *Does not do at all* to 2 = *Independent or does on own*). Reports of daily living skills ranged from 0 to 34, with a mean of 20.95 (*SD* = 6.29) and an internal consistency of  $\alpha = .91$  in the current study.

***Behaviour problems.*** The Strengths and Difficulties Questionnaire (Goodman, 1997) was used as a measure of behavioural problems and has been used in other studies of individuals with

ASD (e.g., Findon et al., 2016). Parents were asked to answer each question about their child based on the previous six months or the last school year using a 3-point Likert scale (0 = *Not true* to 2 = *Certainly true*). The 25 items are divided into five subscales with five items in each. For the purposes of the study, only the subscales relating to behaviour were included: Hyperactivity (e.g., “constantly fidgeting or squirming”) and Conduct Problems (e.g., “often lies or cheats). Severity of conduct problems ranged from 0 to 7, with a mean score of 1.57 ( $SD = 1.62$ ) and an internal consistency of  $\alpha = .62$ , while the severity of hyperactivity ranged from 0 to 10, with a mean score of 5.00 ( $SD = 2.44$ ) and an internal consistency of  $\alpha = .76$ .

### **Contextual factors.**

*Adequacy and availability of resources.* The Participation and Environment Measure for Children and Youth (PEMICY; Coster et al., 2012) was developed to measure involvement and associated environmental factors of youth with disabilities (including children with ID and with ASD). The current study used the environmental questions to measure the adequacy and availability of environmental resources and support for SO. Parents responded to a question about whether certain factors were available and/or adequate to support their child’s participation in SO (7 items; e.g., access to transportation, enough time/money) using a 4-point scale (1 = *Not needed* to 4 = *Usually no*). Parents were also asked a question about whether certain factors help or make it harder for their child to participate in SO (9 items; e.g., physical layout, cognitive demands), using a 4-point scale (1 = *Not an issue* to 4 = *Usually makes harder*). A total score was obtained by summing the 16 items, with higher scores reflecting a higher quality and availability of environmental resources. Reports on the child’s resources ranged from 30 to 48, with a mean score of 43.27 ( $SD = 4.17$ ) and an internal consistency of  $\alpha = .77$ .

***Coach relationship.*** To assess the youth's relationship with their coach(es), parents were asked to rate how much they agree with four statements (e.g., child likes coach(es)) using a 7-item Likert scale (1 = *Strongly disagree* to 7 = *Strongly agree*). The scores in the current study ranged from 4 to 28 for the child's relationship with their coach(es), with a mean score of 18.69 ( $SD = 4.27$ ) and an internal consistency of  $\alpha = .64$ . Similar methods of assessing the coach-athlete relationship have been used in typically developing research (e.g., Barnett, Smoll, & Smith, 1992).

***Parent attendance & instrumental support.*** Attendance and instrumental support were measured separately. Parents and caregivers reported on their own attendance at practices, with five response options (0 = *Never*, 1 = *Up to 25% of the time*, 2 = *25-50%*, 3 = *51-75%*, 4 = *76-100% of the time*). The scale had a mean score of 3.16 ( $SD = 1.31$ ). They also described how often they provided instrumental support for their child's participation in sport (5 items; e.g., play with child in sport, provide transportation) on a 5-point response scale (0 = *Never* to 4 = *Daily*), with a mean score of 10.26 ( $SD = 4.64$ ) and an internal consistency of  $\alpha = .80$ . Other studies of youth with ASD have used comparable parent-report methods for examining parent involvement in their child's activities or program (Solish & Perry, 2008).

## **Procedure**

The present study was part of a larger study of SO athletes and their families. The parents and caregivers of every SO Ontario athlete registered between the ages of 11 and 23 years in 2012 ( $N = 2800$ ) were contacted via SO Ontario mailing lists and local SO organizations and invited to participate in a paper and pencil or online survey about SO involvement. A modified approach to the Dillman recruitment method (2000) was used, which consisted of contacting

participants via mailing postcards, letters, and sending email reminders about the survey. Parents gave informed consent to take part in the research before starting the survey.

### **Data Analysis**

The participants were divided into two groups based on diagnoses (i.e., ASD+ID or ID alone). To address the first objective, and as a result of different rates of males and females in the two groups, three ANCOVAs were conducted to test for significant differences in characteristics of sport involvement for youth with ASD+ID compared to youth with ID alone, after controlling for gender. Second, if the prior analysis determined that there was a difference between groups, regression analyses using the PROCESS macro (Hayes, 2012) were conducted to determine whether the personal and contextual factors (age, sociocommunicative and adaptive behaviour, resources, parent attendance, and parent and coach support) mediated the relationship between ASD status and characteristics of sport involvement. Preacher and Hayes' (2008) bootstrapping procedure (1000 bootstrap samples) generated 95% confidence intervals, which were used to test the indirect effects of the mediation model. Confidence intervals that did not include zero indicated a significant mediator within the model. If ASD status was not related to the characteristic of sport involvement, then standard regressions were calculated to identify significant personal and contextual correlates.

### **Results**

Due to significant skewness values ( $p < .001$ ), the daily living skills and coach relationship variables were transformed using a square root transformation. The problem behaviour - conduct problems and resources variables each had two univariate outliers that exceeded the possible range of critical z-scores ( $z > 3.29, p < .001$ ); therefore, these cases were not included in further analyses. As shown in Table 2, many of the factors were related to one

another, with the bivariate correlations all within the acceptable range for collinearity and able to be included in multivariate analyses (Tabachnick & Fidell, 2007).

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Insert Table 2 here

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### **Characteristics of Sport Involvement for Youth with ASD+ID Compared to Youth with ID Alone**

There were no significant main effects of ASD status for sport frequency,  $F(1, 404) = .35, p = .55$  or diversity,  $F(1, 406) = .22, p = .64$ . The covariate of gender was significantly related to sport diversity,  $F(1, 406) = 5.75, p = .02$ . A third ANCOVA for positive social experiences showed that although gender was not a significant covariate, there was a significant main effect of ASD status,  $F(1, 393) = 10.23, p = .001$ , with youth with ID alone having higher scores for positive social experiences compared to youth with ASD+ID,  $t(396) = 3.20, p = .001$ .

### **Correlates of Characteristics of Sport Involvement**

Multiple regression analyses were performed to identify correlates of characteristics of sport involvement, separately for youth with ASD+ID, and ID alone, with all personal and contextual factors entered in the model. There were three significant correlates of sport frequency for youth with ASD+ID: Child age,  $\beta = .18, p = .03$ , coach-athlete relationship,  $\beta = .47, p < .001$ , and parents' attendance at practices,  $\beta = .23, p = .01$ , in an overall model that accounted for 41% adjusted variance,  $F(10, 84) = 7.43, p < .001$ . For youth with ID alone, availability and adequacy of resources,  $\beta = .16, p = .01$ , coach-athlete relationship,  $\beta = .30, p <$

.001, and parents' attendance at practices,  $\beta = .20, p = .001$ , together accounted for 26% adjusted variance,  $F(10, 213) = 8.95, p < .001$ .

A second set of regression analyses were used to examine sport diversity for youth with ASD+ID, and ID alone, including all personal and contextual factors. For youth with ASD+ID, there were three significant correlates of sport diversity: Coach-athlete relationship,  $\beta = .23, p = .02$ , parents' attendance at practices,  $\beta = .25, p = .02$ , and parents' instrumental support of sport,  $\beta = .22, p = .03$ , accounting for 19% of the variance,  $F(10, 86) = 3.30, p = .001$ . For youth with ID alone, only the coach-athlete relationship was associated with sport diversity,  $\beta = .23, p = .001$ , accounting for 7% adjusted variance,  $F(10, 213) = 2.71, p = .004$ .

A multiple mediation analysis was then calculated to test whether personal and contextual variables explained the difference in positive social experiences between youth with ASD+ID compared to youth with ID alone. Given the dichotomous coding of gender and the higher ratio of males in the ASD sample, gender was included as a covariate. As shown in Figure 1, ASD status was a significant correlate of sociocommunicative abilities ( $p < .001$ ), hyperactivity ( $p < .001$ ), availability and adequacy of resources ( $p < .001$ ), and coach relationship ( $p < .05$ ). In addition, sociocommunicative abilities ( $p < .01$ ), coach-athlete relationship ( $p < .001$ ), and parent instrumental support ( $p < .05$ ) were significant correlates of positive social experiences. As shown in Table 3, the total effect of ASD status on social sport experiences was significant,  $t(332) = -2.69, p = .01$ . Specific indirect effects indicated that sociocommunicative abilities (indirect effect =  $-.91, SE = .25, 95\% CI [-1.44, -.44]$ ), coach-athlete relationship (indirect effect =  $-.63, SE = .27, 95\% CI [-1.19, -.13]$ ) and availability and adequacy of resources (indirect effect =  $-.22, SE = .13, 95\% CI [-.55, -.01]$ ), mediated the relationship between ASD status and social sport experiences.



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Insert Table 3 and Figure 1 here

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### **Discussion**

To our knowledge, this is the first study to investigate characteristics of sport involvement in youth with both ASD and ID. Although rates of sport participation have been found to be lower in youth with ASD compared to youth with other disabilities (Blanchard et al., 2006) and typically developing youth (Potvin et al., 2013), we found no group differences for sport frequency (e.g., how often individual participates) or sport diversity (e.g., number of sports involved in) in a sample of youth already participating in sport. One reason may be the unique approach to sport involvement that SO employs to support adaptive behaviours so that individuals with developmental disabilities can be involved. Several factors within SO, such as the availability of practical support and adapted equipment, and the knowledge of coaching staff, are key to scaffolding sport involvement for youth with unique developmental considerations (Grandisson et al., 2012). The findings from the present study suggest that, with supports in place, youth with ASD+ID who are involved in SO participated in as many sports, and as often, as their peers with ID without ASD.

Parents reported that youth with ASD+ID had fewer positive social experiences in sport compared to youth with ID alone. While the tailored supports of SO may be helpful in ensuring that youth with ASD+ID can participate, the accommodations may not bridge the gap when it comes to benefitting from the same social gains as their peers without ASD. Social deficits are a core characteristic among individuals with ASD, including impaired social communication skills and a poor understanding of social norms (APA, 2013). These types of social challenges can

make it difficult for youth with ASD to engage in group settings, as they are less likely to engage with others and may not be as responsive to social bids (Sigman & Ruskin, 1999). Similarly, in the typically developing literature, sport involvement may not always facilitate positive social experiences. Youth athletes have also reported negative peer interactions, greater stress, and higher rates of social exclusion (Hansen, Larson, & Dworkin, 2003; Larson, Hansen, & Moneta, 2006; Wilkes & Côté, 2010). Coaches and parents can consider the potential differences in social experiences for youth with ASD who are involved in sport and facilitate positive integration for youth who struggle with the social aspects of team involvement.

The second goal of the current study involved a closer examination of the characteristics of sport involvement by investigating how they relate to personal and contextual variables. Personal factors were not significant correlates of sport frequency or diversity for youth with ASD+ID or ID alone, which may reflect the adaptive scaffolding, or supported inclusion, often put in place in SO programming (Grandisson et al., 2012). At the same time, lower sociocommunicative ability was associated with less positive social experiences in sport for youth with ASD+ID. These findings are in line with previous ID research, which has shown that positive sport participation and inclusion is moderated by an individual's level of adaptive behaviours (Buttimer & Tierney, 2005; Grandisson et al., 2012). Taking into account the sociocommunicative deficits associated with an ASD diagnosis, it follows that youth with ASD+ID would have more challenges engaging in team-based activities and benefitting from social experiences than youth with ID alone, and that this personal characteristic may be particularly relevant for youth with ASD. Future research could examine whether youth with ASD+ID are more likely to engage in individual or team-based sports, given the core social and communication deficits associated with an ASD diagnosis.

Several contextual factors were associated with sport involvement, including adequacy and availability of resources, coach-athlete relationship, and parent attendance and support. Higher levels of adequate and available resources were related to more frequent sport involvement, after controlling for personal factors, in the group of youth with ID alone. Broadening investigations of resources to participation beyond the common barriers of scheduling conflicts and lack of transportation (Beart, Hawkins, Kroese, Smithson, & Tolosa, 2001; Darcy & Dowse, 2013), to include physical layout, sensory qualities, and social demands, is particularly relevant for youth with developmental disabilities, given the range of deficits in cognitive, social and communication abilities.

The coach-athlete relationship was a correlate in both groups for sport frequency and diversity, and a partial mediator for the relationship between ASD status and social sport experiences. The findings from the current study highlight the importance of the relationship between youth and their coach, such that better relationships are related to a greater range and more frequent involvement in sports, and social sport experiences. Further, youth with ID alone (particularly males) had better social sport experiences than youth with ASD+ID, which may be due to their respective relationships with coaches. Particularly for youth with ASD+ID who struggle with social and behavioural challenges, having a coach who is able to provide appropriate support is critical for maintaining active involvement and ensuring that youth have similar positive social experiences to their peers.

Parental attendance and instrumental support of sport were associated with sport frequency and diversity in both groups. Parent instrumental support was also found to be related to positive social experiences. These findings draw attention to the value of parent support for youth engagement in sport. Many researchers within the ASD field support the notion that

parents are the most valuable and effective factor for promoting positive changes in a child's wellbeing and behaviour (McAleese, Lavery, & Dyer, 2014; Panerai, Ferrante, & Zingale, 2002). Parent attendance at sport practices may have a positive influence on how many sports a child with ASD is involved with, and how often they are involved in sporting practices and events. This relationship may also be bi-directional, with greater parent attendance related to the number of sports in which a child participates.

### **Limitations**

There are a number of limitations to this research. Despite certain advantages associated with survey-based research, such as cost and efficiency, there remains a potential for a response and sample bias. Like most survey research in the field of developmental disabilities, the current study relied solely on parent report, with mothers being the majority of responders (80%), and results may not be generalizable to all family situations. Similarly, given the low number of females in the ASD sample (22%) and the increasing knowledge of differing needs in this population (e.g., Foggo & Webster, 2017), the findings may not be representative for all young females with ASD. Alternative data sources, using additional perspectives and measures, would be valuable in future studies to lessen the effect of any shared method variance. Second, the study was cross sectional in nature and results do not indicate causality or directionality. While adaptive behaviours may lead to improved sport involvement, it is also possible that youth with more positive social experiences develop better behaviours. Similarly, contextual factors, such as parent support and coach-athlete relationship, may improve in youth who have better sport experiences, as caregivers recognize the positive effects of sport on the child and become more motivated to support involvement. Third, although the SO sample offers a valuable opportunity to better understand the factors that contribute to optimized sport involvement, the study is

unable to offer insights on enhancing engagement of non-participants, given that the sample is made up of youth with ASD and ID who already engage in sports.

### **Conclusions and Implications for Practice**

Taken together, the current study offers important implications for community sport settings, as well as for future research on sport involvement for youth with ASD. A better understanding of the factors related to sport is essential for allowing families, service providers, and policy makers to improve sport involvement for youth with ASD. Athletes with ASD+ID did not differ in sport frequency or diversity compared to athletes with ID alone in this SO sample, supporting the notion that an adapted physical activity program for athletes with ID can also enable athletes with ASD+ID to participate. At the same time, youth with ASD+ID did have fewer positive social experiences in sport compared to youth with ID alone in this SO sample. These findings are concerning, since youth with ASD are not gaining the same beneficial sport experiences as their peers, despite similar diversity and frequency of involvement. Greater understanding of the distinction between the frequency and the quality of sport experiences is needed in future sport research for youth with ASD and ID.

Contextual factors were associated with sport frequency and diversity, while both personal and contextual factors were associated with positive social experiences in sport. These results are encouraging, as they provide several areas for intervention to improve sport involvement and social experiences for youth with ASD+ID. Providing adequate support in sport for individuals who lack sociocommunicative skills may allow youth to participate more regularly or try sports that are new and challenging. Further, improving access to necessary resources, such as support staff for teams and logistical supports, may encourage more regular participation by youth with ASD+ID. Future research is needed on additional factors that may

influence sport experiences and on the beneficial role that sport can play in the lives of individuals with ASD and ID.

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**Table 1.** Comparisons of demographic variables in youth with ASD and ID.

Variables	<i>M (SD)/%</i>			<i>t-test/<math>\chi^2</math> (df)</i>
	Full sample ( <i>N</i> = 409)	ASD+ID ( <i>N</i> = 120)	ID alone ( <i>N</i> = 289)	
Parent age	49.39 (6.14)	49.63 (5.74)	49.34 (6.26)	-.44 (387)
Child age	17.20 (3.05)	16.88 (3.27)	17.35 (2.95)	1.40 (407)
Child gender (males)	63.8%	78.3%	57.8%	15.51 (409)***
Cognitive ability	1.36 (.81)	1.47 (.87)	1.32 (.79)	-1.66 (404)
Time in SO (years)	5.01 (3.50)	4.63 (3.22)	5.16 (3.60)	1.34 (385)

\*\*\**p* < .001



**Table 2.** Correlation analyses of characteristics of sport involvement, personal factors, and contextual factors.

	Sport Diversity	PSE	Socio- comm.	DLS	Hyper.	Conduct	PEMCY	Coach	Attend.	Instr.
Sport Frequency	.55***	.40***	.08	.20***	-.13*	-.06	.25***	.40***	.24***	.21***
Sport Diversity		.28***	.03	.11*	-.06	.00	.09	.26***	.08	.16**
PSE			.35***	.31***	-.24***	-.18***	.31***	.55***	.09	.24***
Sociocomm.				.38***	-.24***	-.09	.30***	.20***	.07	.15**
DLS					-.30***	-.01	.28***	.12*	-.01	.09
Hyperactivity						.37***	-.21***	-.20***	-.01	-.04
Conduct							-.16**	-.14**	-.00	-.02
PEMCY								.20***	.10*	.03
Coach									.08	.11*
Attendance										.21***

*Note.*  $N = 354$  to  $407$ ; PSE = Positive Social Experiences; Sociocomm = Sociocommunication abilities; DLS = Daily living skills; Hyper = Hyperactivity; Conduct = Conduct problems; PEMCY = Availability and adequacy of resources; Coach = relationship with coach(es); Attendance = Parent attendance; Instr = Parent instrumental support

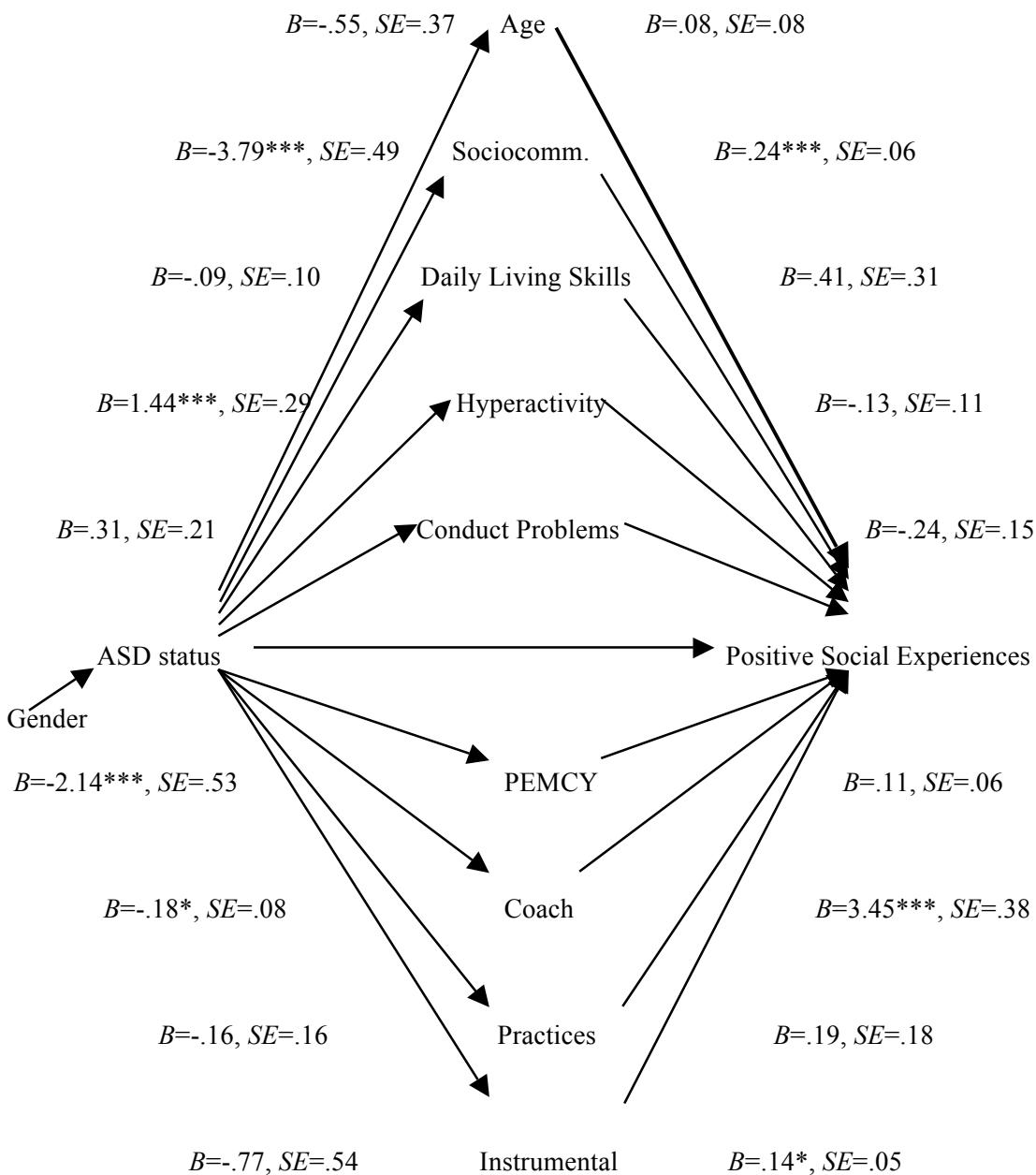
\* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

**Table 3.** Total, direct, and indirect effects of multiple mediation analysis of positive social experiences (PSE).

	Total and direct effects			
	<i>B</i>	<i>S.E.</i>	<i>t</i>	<i>p</i>
Total effect of ASD on PSE	-1.70	.63	-2.69	.008
Direct effect of ASD on PSE	.54	.56	.95	.34
Bootstrap results for indirect effect				
	Point estimate	SE	95% CI	
Total indirect effect	-2.23	.48	[-3.18, -1.29]	
Age	-.04	.06	[-.24, .02]	
Sociocomm.	-.91	.25	[-1.44, -.44]	
DLS	-.04	.06	[-.26, .03]	
Hyperactivity	-.19	.17	[-.58, .12]	
Conduct	-.07	.08	[-.31, .02]	
PEMCY	-.22	.13	[-.55, -.01]	
Coach	-.63	.27	[-1.19, -.13]	
Attendance	-.03	.05	[-.23, .02]	
Instrumental	-.11	.09	[-.34, .02]	

*Note.* *B* = unstandardized regression coefficient; *SE* = standard error; Number of bootstrap samples = 1000; *CI* = confidence interval; *Sociocomm* = Sociocommunication abilities; *DLS* = Daily living skills; *Hyper(activity)* = Hyperactivity; *Conduct* = Conduct problems; *PEMCY* = Availability and adequacy of resources; *Coach* = relationship with coach(es); *Attendance* = Parent attendance; *Instrumental* = Parent instrumental support

**Figure 1.** Multiple mediation analysis of positive social experiences with personal and contextual mediators operating in parallel ( $N=331$ ).



Note.  $B$  = unstandardized regression coefficient;  $SE$  = standard error; Sociocomm = Sociocommunication abilities; PEMCY = Availability and adequacy of resources; Coach = relationship with coach(es); Practices = Parent attends practices; Instrumental = Parent instrumental support

\* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

Chapter Three: Study 2 - Psychosocial Outcomes Associated with Sport Involvement for Youth with Autism Spectrum Disorder and Intellectual Disabilities

Participation in sport can have a positive impact on the lives of individuals with intellectual disabilities (ID) in many ways, including the development of various social, emotional, and physical abilities (Carmeli, Orbach, Zinger-Vaknin, Morad, & Merrick, 2008; Dykens & Cohen, 1996; Marks, Sisirak, Heller, & Wagner, 2010). Previous research on athletes with ID indicates that sport participation is associated with improvements in internalizing and externalizing problems (Özer et al., 2012; Rosegard et al., 2001). Benefits of sport for youth with ID also extend to an individual's self-esteem, social competency, and social inclusion, as well as improvements in physical health and healthy lifestyle habits (Castagno, 2001; Dykens & Cohen, 1996; Grandisson et al., 2012; Marks et al., 2010). Yet despite the potential benefits of involvement in sport, little research exists on individuals with ID who also have autism spectrum disorder (ASD). The positive effects of sport participation are particularly important in this population as people with ASD have higher rates of social isolation and experience fewer opportunities than other individuals with ID alone or with emotional/behavioural disabilities (Orsmond, Shattuck, Cooper, Sterzing, & Anderson, 2013; Rotheram-Fuller, Kasari, Chamberlain & Locke, 2010).

There is some evidence that youth with ASD may benefit from sport, though this is drawn from research on physical activity or very short-term sport interventions. There are many positive outcomes associated with physical activity for youth with ASD, including improved motor performance (e.g., strength, endurance, flexibility) and social skills (e.g., social awareness and motivation, peer relations; Sowa & Meulenbroek, 2012); however, the crossover among the activity constructs makes it unclear whether typical sport outcomes differ from those seen in other activities (e.g., physical activity-specific

but not sport *per se*). A few studies have assessed the psychosocial outcomes specifically for individuals with ASD involved in physical activity programs. For example, social functioning was assessed before and immediately after a 12-week therapeutic horseback-riding program in children with ASD (ages 5-10 years) compared to a wait-list control group, and authors reported improved social motivation, inattention, and distractibility (Bass, Duchowny, & Llabre, 2009). Participation in a 10-week swimming exercise program was similarly associated with improvements in social behaviours, including social competence and anti-social behaviours for youth aged 6-9 years with ASD, employing a within-subject baseline-treatment phase design (Pan, 2010). Another study examined the psychosocial outcomes associated with participation in a short-term surf camp for 11 youth with ASD, which included an orientation for learning social skills, and two days of surfing and group activities (Cavanaugh, 2010). Measures completed by youth, parents and volunteer staff showed improvements from directly pre to post intervention in several positive psychosocial constructs, including social competence, social skills, and self-concept. One study also involved evaluating a week long multi-sport camp intervention with girls with ASD (ages 8-11 years; Guest et al., 2017). Following participation, youth showed an improvement in parent-reported motor and social skills, and in physical self-perceptions.

Although previous ASD research provides valuable information about the benefits of physical activity and sport interventions, there are several limitations to generalizing these results to what may be expected to occur if youth were participating in a typical sport context. First, while these studies highlight some of the psychosocial outcomes associated with physical activity interventions for youth with ASD, reliance on short-term

therapeutic physical activity programs may not accurately represent involvement in typical sport environments. The described programs lack the nature of competition, a defining element of sport, and aim to improve specific psychosocial behaviours for youth with ASD, whereas typical sport programs do not have an intervention focus. Further, these short-term interventions last for a fixed amount of time, which prevent youth from continuing involvement as they would in a naturally occurring sport context (Bass et al., 2009; Cavanaugh, 2010; Pan, 2010). Also, although there are many benefits to physical activity and sport interventions, previous research in the general population has suggested additional benefits of sport involvement for youth, such as improved body image and athletic competence (Abbott & Barber, 2011; Ference & Muth, 2004). Assessing involvement in a typical sport setting could provide valuable information about the usefulness of ongoing sport programs that are more accessible for youth with ASD.

A second consideration is how to measure sport involvement and experiences in this population. While many studies solely examine whether or not individuals participate in sport, more specific characteristics of sport involvement, such as diversity (e.g., number of sport activities involved in) and frequency (e.g., how often one participates) should also be considered, as they are related to athlete engagement and beneficial health outcomes (Ferron, Narring, Cauderay, & Michaud, 1999; Halldorsson, Thorlindsson, & Sigfusdottir, 2014). The positive social experiences of sport involvement (e.g., made a new friend, learned to work with others in a group) may also be valuable to consider. Considering how youth experience their sport involvement, rather than just how often they participate, could extend previous research and help to provide a greater understanding of the psychosocial outcomes associated with sport.

Third, given the continuous nature of typical sport participation, it is important to consider how psychosocial variables may change over a longer period that better reflects the reality of regular sport participation, as typical sport offers opportunities for continuous involvement and long-term athlete development (Banack, Bloom, & Falcão, 2012). The previously described research examined psychosocial behaviours following brief periods of sport involvement (i.e., a number of weeks), and longer participation outcomes were not studied (Bass et al., 2009; Cavanaugh, 2010; Pan, 2010). A focus on the role of long term sport involvement to target psychosocial outcomes in youth with ASD is particularly needed, given that individuals with ASD and ID have more challenges with peer relationships, community involvement, and emotional and behavioural health compared to those with ID alone (Orsmond et al., 2013; Rotheram-Fuller et al., 2010; Solish, Perry & Minnes, 2010; Taheri, 2015; Totsika, Hastings, Emerson, Lancaster, & Berridge, 2011). Given the comparable work in athletes with ID alone indicating that sport participation is associated with improvements in psychosocial difficulties (Grandisson, Tétrault, & Freeman, 2012; Özer et al., 2012; Rosegard, Pegg, & Compton, 2001), identifying similar relationships for youth with ASD could lead to new approaches for improving their social and emotional well-being. However, even in the ID literature, longitudinal work is limited and does not evaluate the role of ongoing engagement in sport in the improvement of psychosocial difficulties.

Finally, although previous research has examined the development of positive psychosocial variables in physical activity and sport interventions, the primary focus has been on a reduction in psychosocial difficulties. Investigating the role of typical sport participation in the development of strengths for youth with ASD could lead to new



approaches for improving their social, emotional, and behavioural well-being. Strength-focused interventions aim to enhance positive skills, outcomes, or functioning of an individual or group by building confidence and competence (Epstein, 2000; Sabalauskas, Ortolani & McCall, 2014). The assessment of health and well-being for individuals with disabilities has historically used a deficit model, in which well-being is explained by the absence of problems and disorder (Dykens, 2006; Park & Peterson, 2008). In contrast, the framework of positive psychology emphasizes a strength-based approach, with Epstein and colleagues (2002) describing five domains of behavioural and emotional strength relevant to children and youth: Interpersonal, intrapersonal, affective, family relationships and school functioning. These specific areas of psychosocial functioning have shown strong validity in children and adolescents (Mooney, Epstein, Ryser, & Pierce, 2005), and can be targeted as outcomes in interventions for youth with and without disabilities alike (Keenan, 2012; Wisner, 2009).

A recent cross-sectional study compared sport involvement and positively and negatively oriented psychosocial variables in three groups of individuals with ID: athletes in Special Olympics (SO), in limited (non-SO) sports, and not involved in sport, though it is unknown whether any of these individuals also had ASD (Crawford, Burns, & Fernie, 2015). In addition to lower levels of stress, youth who participated in sport had greater self-esteem and quality of life, particularly for those involved in SO, which suggests a positive role for sport in the development of psychosocial strengths in youth with developmental disabilities. To date, no studies have investigated the role of typical sport involvement in the development of psychosocial strengths in youth with ASD.

*Current study*

In the current study, we investigated how characteristics of sport involvement (frequency, diversity, positive social experiences) were related to psychosocial difficulties over a one-year period among athletes with ASD and ID (ASD+ID) and ID alone (Objective 1). We investigated group differences in psychosocial difficulties, and addressed three specific gaps in the literature: 1) the use of short-term physical activity interventions rather than ongoing sport programs in previous ASD research; 2) the limited way that sport involvement has been measured (e.g., only considering whether or not an individual participates in sports); and 3) the focus on short time periods for sport related outcomes. We hypothesized that a) greater sport involvement at Time 1 (more frequent, diverse, and positive social experiences) would be related to larger reductions in psychosocial difficulties over time, and that b) greater psychosocial change would be seen for youth with ID alone compared to youth with ASD+ID, due to the latter group's level of sociocommunicative impairment.

We also compared psychosocial strengths and difficulties in three groups of youth using a cross-sectional design: athletes with ASD+ID, athletes with ID alone, and youth with ASD+ID who did not participate in sports (Objective 2). Objective 2 also included an examination of sport outcomes in youth with ASD and ID, but built on the first objective by addressing two remaining gaps in the literature: 1) the lack of positively-oriented psychosocial variables in previous sport research for youth with ID and 2) the lack of knowledge around the role of sport in psychosocial outcomes for youth with ASD+ID. It was hypothesized that psychosocial strengths would be greatest in youth involved in sports, with athletes with ID alone showing the greatest strengths, followed

by athletes with ASD+ID, and lastly youth with ASD+ID who were not involved in sports. It was expected that the opposite pattern between groups would be present for psychosocial difficulties.

## Methods

### Participants

The two Special Olympics (SO) groups (ASD+ID, ID alone) were based on an original pool of 303 parents of youth with ID between the ages of 11 and 21 years ( $M = 17.09$  years,  $SD = 3.10$ ) who completed an initial survey and agreed to be contacted for future studies. The athletes were required to be registered in the SO Ontario 2011-2012 season, and had a clinical diagnosis of ID or a diagnosis associated with ID (e.g., Down Syndrome) given by a licensed health professional. Others have used a similar parent report approach for verifying intellectual and developmental disabilities (e.g., Totsika, Hastings, Emerson, Lancaster, & Berridge, 2011; Weiss & Burnham Riosa, 2015). A total of 121 participants (40% of the Time 1 sample) completed the Time 2 survey, one year later. There were no demographic differences (i.e., age, gender, income, cognitive ability, sociocommunicative ability, adaptive behaviour, percentage with ASD diagnoses) between those who completed Time 2 and those who did not ( $p$ 's  $> .05$ ). Also, the groups did not differ on the baseline psychosocial difficulties, specifically emotional, hyperactivity, conduct and peer problems ( $p$ 's  $> .05$ ). However, Time 2 survey completers were involved in sport more frequently,  $t(296) = -2.87, p = .01$ , with more sport diversity,  $t(298) = -3.23, p = .001$ , and had more positive social experiences ( $t(284) = -2.37, p = .02$ ) compared to those who did not complete the survey at Time 2.

After removing cases based on exclusion criteria (i.e., outside of the age range, missing or incomplete questionnaires), the final SO sample consisted of 115 individuals, with 35 youth also having a diagnosis of ASD (30.4%). At baseline, this sample was comprised of 77.4% mothers ( $n = 89$ ), with a mean age of 49.31 years ( $SD = 6.28$ ), and the majority of the participants were White/Caucasian (93%,  $n = 107$ ). The majority of athletes were male (66.1%,  $n = 76$ ), on average 17.21 years of age ( $SD = 3.05$ ; Table 1).

A third group consisted of a sample of 58 youth with ASD+ID who did not participate in SO or other sport activities. On average, the youth who did not participate in sport were 16.84 years of age ( $SD = 3.30$ ) and the majority were male (74.1%,  $n = 43$ ). Parents of this group were primarily mothers (91.4%,  $n = 53$ ), with a mean age of 48.86 years ( $SD = 6.18$ ) and the majority of the sample was White/Caucasian (93.1%,  $n = 54$ ).

As shown in Table 1, the three groups did not differ in age ( $p = .74$ ), gender ( $p = .52$ ), cognitive ability ( $p = .08$ ), or adaptive behaviour ( $p = .98$ ). Differences in sociocommunicative abilities were noted between the groups ( $F(2, 170) = 14.36, p < .001$ ), with post hoc analyses revealing that both groups of youth with ASD+ID had lower sociocommunicative scores (athletes:  $M = 1.37, SD = .52$ ; no sport:  $M = 1.45, SD = .60$ ) compared to the group with ID alone ( $M = 1.90, SD = .59$ ), with no differences in sociocommunicative ability noted between the two ASD groups ( $p = .51$ ). Given the core deficits in social and communication skills which underlie a diagnosis of ASD (APA, 2013), it was expected that youth with ASD would have lower scores on this measure, but have comparable scores on cognitive ability.

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Insert Table 1 here

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## Measures

### Comparison of Youth Characteristics.

The current study used brief cognitive, sociocommunicative (Mazurek et al., 2012), and adaptive behaviour (Maenner et al., 2012) measures for the purpose of assessing group similarities. Functional cognitive ability was assessed using a scale from a national study of adolescents who had received special education services in the U.S. (National Longitudinal Transition Study – 2; NLTS2): Using a 4-point Likert scale (0 = *Not well at all* to 3 = *Very well*), parents were asked about how well their child could independently complete 4 tasks (e.g., read and understand common signs). This scale has previously been used with parents of individuals with ASD and with ID (Mazurek et al., 2012; Weiss & Burnham-Riosa, 2015). Sociocommunicative skill was represented by four social and three communication items that were combined, where higher scores reflected greater skill. The social scale consisted of four items about social situations (e.g., How often does your child... seem confident in social situations; joins groups without being told to; make friends easily; start conversations rather than waiting for others to initiate), and parents responded about their child on a 4-point Likert scale (0 = *Never*, 1 = *Sometimes*, 2 = *Often*, and 3 = *Very often*). Communication abilities were assessed using a 3-item scale that asked parents how well their child uses spoken language, understands spoken language, and carries on a conversation, based on a single item language scale by Mazurek et al. (2012). Parents responded about their child on a 4-

point Likert scale (0 = *Cannot do at all*, 1 = *Has a lot of trouble*, 2 = *Has a little trouble*, 3 = *Has no trouble*).

Adaptive behaviour was measured using the Waisman Activities of Daily Living Scale (Maenner et al., 2012). The 17-item scale addresses everyday activities, such as grooming, household chores, and dressing, and parents responded about their child's ability to complete the tasks on a 3-point scale (0 = *does not do at all*, 1 = *does with help*, 2 = *independent or does on own*).

### **Characteristics of Sport Involvement.**

**Frequency.** Parents reported on their child's frequency of sport involvement on average, over the past 12 months, on a 6-point response scale (1 = *Never* to 6 = *Several times a week*), which was adapted from the 4-H study that evaluates youth participation in clubs and groups (Lerner et al., 2005). At baseline, the majority of athletes participated in sports a few times per week (42%), followed by 28% of athletes who participated once per week.

**Diversity.** Parents also described the total number of sports that their child participated in over the past 12 months, which ranged from 0 to 9 sports ( $M = 2.67$ ,  $SD = 1.73$ ) at baseline.

**Positive social experiences.** To measure positive social experiences in sport, parents responded to seven items inquiring about social gains in SO (e.g., made a new friend; learned to work with others in a group) that were taken from a 12-item lab-developed measure, called the Youth Experience Survey – Special Olympics edition (YES-SO). The YES-SO was adapted from the Youth Experiences Survey (YES 2.0; Hansen & Larson, 2005), which is used to describe youths' developmental experiences in

an organized activity. Based on their child's recent involvement in sports, parents were asked to rate how much they agreed with the statements on a 4-point Likert scale (0 = *Not at all*, 1 = *A little*, 2 = *Quite a bit*, 3 = *Yes definitely*). The average social experience score was 1.81 (SD = .74; ranging from 0 to 3) and the subscale had strong internal consistency (Cronbach  $\alpha$  = .90). This scale has been used with youth with ID and ASD and shown excellent reliability and strong intraclass correlation (Ryan et al., 2017). Similar parent-report measures have also been used to assess participation in community activities for youth with ASD (e.g., Ehrmann, Aeschleman, & Svanum, 1995; Wong, Lam, Leung, Ho, & Au-Yeung, 2014).

**Psychosocial Difficulties** (SDQ; Goodman, 1997). The Strengths and Difficulties Questionnaire was used as a measure of emotional and behavioural problems for children with ASD and ID. Parents were asked to answer each question about their child based on the previous 6 months or the last school year using a 3-point Likert scale (0 = *Not true*, 1 = *Somewhat true*, 2 = *Certainly true*). The 25 items are divided into five subscales with five items in each, including Emotional Symptoms (e.g., "Often unhappy, down-hearted or tearful"), Hyperactivity (e.g., "constantly fidgeting or squirming"), Conduct Problems (e.g., "often lies or cheats"), Peer Problems (e.g., "has at least one good friend", reverse scored), and Prosocial (e.g., "considerate of other people's feelings"). The prosocial subscale was used as a measure of psychosocial strength in addition to the others listed below. The internal consistency was moderate for all of the scales, ranging from  $\alpha$  = .63 (Conduct and Peer problems) to .85 (Prosocial). This measure has been used widely with youth with ID and ASD and shown strong psychometric properties (e.g., Findon et al., 2016; Salayev & Sanne, 2017; Simonoff et al., 2013).

**Psychosocial Strengths** (BERS-2; Epstein & Sharma, 1998). The Behavioural and Emotional Rating Scale was used as a measure of psychosocial strengths at Time 2. Parents were asked to read each statement and rate the extent that the characteristic represented the child on a 4-point Likert scale (0 = *Not at all like my child*; 1 = *Not like my child*; 2 = *Like my child*; 3 = *Very much like my child*). The 52 items are divided into 5 subscales: Interpersonal Strengths (e.g., considers consequences of own behaviour), Family Involvement (e.g., maintains positive family relationships), Intrapersonal Strengths (e.g., demonstrates a sense of humor), School Functioning (e.g., completes school tasks on time) and Affective Strengths (e.g., acknowledges painful feelings) and a total score that provides the single summary score. Reports on the child's strengths had a mean score of 1.08 ( $SD = .52$ ) and an internal consistency of  $\alpha = .97$ . The BERS-2 has been used as a measure of parent-reported strengths in youth with other developmental disabilities (Keenan, 2012), though not yet for those with ASD. Others have also used parent report to evaluate strengths in youth with ASD (e.g., Colavita, Luthra, & Perry, 2014; Sabapathy et al., 2017).

### **Procedure**

This study was part of a larger online study of families of SO athletes. Parents of youth in SO were recruited through SO Ontario mailing lists and local SO organizations. Families who were interested in participating were forwarded a link to complete the online survey. Participants gave informed consent prior to taking part in the research, and those who indicated interest were contacted one year later to complete a similar Time 2 survey. Parents of youth with ASD+ID who were not involved in sports were contacted to complete a similar Time 2 survey via local and provincial ASD and ID organizations



to compare with SO athletes. This group was only recruited for the cross-sectional component of the study.

### **Data Analysis Procedure**

Preliminary analyses were used to examine the baseline differences in youth with ASD+ID compared to youth with ID alone. Independent samples *t*-tests compared the two groups on characteristics of sport involvement (sport frequency, diversity, and positive social experiences) and psychosocial difficulties at baseline. In addition, repeated measures analyses of variance (ANOVAs) were used to examine whether the two groups (ASD+ID and ID alone) differed in psychosocial difficulties over time.

To address the first objective, regression analyses were conducted to determine whether greater sport involvement at baseline was predictive of more positive changes in psychosocial difficulties over a one-year period (Objective 1a), after controlling for length of time involved in SO. A moderation analysis was also conducted to determine whether the change was greater for youth with ID alone compared to youth with ASD+ID (Objective 1b). Moderation analyses are used to examine how the effect of the independent variable (sport involvement) on the outcome variable (psychosocial difficulties) varies while considering the value of a third moderating variable (ASD status; Jaccard et al., 2006). The first block included the three characteristics of sport involvement (frequency, diversity, positive social experiences), length of time involved in SO, and a psychosocial difficulty at baseline (emotional, hyperactivity, conduct, and peer related problems were all entered in separate regressions as the outcome variable). The second block included group status (ASD+ID vs. ID alone), and the third block included the interactions between ASD and each sport variable (i.e., ASDxSport

frequency, ASDxSport diversity, ASDxPositive social experiences). Interaction terms were calculated for all four regression analyses (i.e., emotional, hyperactivity, conduct, and peer related problems), and all sport related and psychosocial difficulty variables were centered prior to analyses. Simple slopes were reported for significant interactions.

A multivariate analysis of variance (MANOVA) was calculated to determine whether psychosocial strengths and difficulties differed among athletes with ASD+ID, athletes with ID alone, and youth with ASD+ID not involved in sport (Objective 2). Posthoc analyses were used to determine how the groups differed from each other.

## Results

### **Objective One – Characteristics of Sport Involvement as Predictors of Psychosocial Difficulties**

Significant skewness ( $p < .001$ ) was noted for emotional and conduct symptoms, so the variables at both time points were transformed using a square root transformation. No univariate or multivariate outliers were observed. Bivariate correlations are shown in Table 2, with many of the variables related to each other and within an acceptable range for collinearity (Tabachnick & Fidell, 2007).

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Insert Table 2 here

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**Preliminary Analyses: Baseline Differences in Youth with ASD+ID compared to Youth with ID Alone.** Independent samples t-tests compared characteristics of sport involvement at baseline between youth with ASD+ID and youth with ID alone. As shown in Table 3, there were no significant differences between the

two SO groups for sport frequency ( $p = .96$ ), sport diversity ( $p = .84$ ), or positive social experiences ( $p = .50$ ), and youth did not differ in their length of time involved in SO ( $p = .11$ ). Psychosocial difficulties at baseline differed between groups; specifically, youth with ASD+ID had greater emotional, conduct, hyperactivity, and peer related problems than youth with ID alone (all  $p$ 's  $< .05$ ).

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Insert Table 3 here

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**Psychosocial Difficulties Over Time.** Repeated measures ANOVAs were used to examine whether youth with ASD+ID and youth with ID alone differed in psychosocial difficulties over time, with ASD status (ASD+ID vs. ID alone) as a two-level between subject factor, and Time (Time 1 & Time 2) as a two-level within subject factor. Main effects of Time were found for all psychosocial difficulties; specifically, a decrease in emotional,  $F(1, 85) = 160.95, p < .001, partial \eta^2 = .65$ , and hyperactivity problems,  $F(1, 83) = 11.47, p = .001, partial \eta^2 = .12$ , and an increase in conduct,  $F(1, 86) = 57.09, p < .001, partial \eta^2 = .40$ , and peer problems,  $F(1, 84) = 23.27, p = .001, partial \eta^2 = .22$ . A trend towards significance was also noted for a main effect of ASD status for peer problems,  $F(1, 84) = 3.82, p = .05, \eta_p^2 = .04$ , with greater peer problems in the ASD+ID group ( $M = 5.30, SD = 2.32$ ) compared to the ID alone group ( $M = 5.03, SD = 1.61$ ). No Time X ASD Status interactions were observed.

**Characteristics of Sport Involvement as Predictors of Psychosocial Difficulties Over Time.** Multiple regression analyses were performed to investigate whether characteristics of sport involvement at baseline (sport frequency, diversity, and

social sport experiences) predicted changes in psychosocial difficulties over time, and whether ASD status moderated the relationship. All analyses controlled for Time 1 psychosocial difficulties and the length of time involved in SO. Separate regression analyses were run for each psychosocial difficulty variable (emotional, conduct, hyperactivity, and peer related problems). For conduct problems, the only significant predictor was the baseline measure of conduct problems,  $\beta = .27, p = .03$ . Table 4 presents the final models for emotional, hyperactivity, and peer problems where at least one significant interaction was found.

For emotional problems, baseline scores predicted emotional problems at Time 2,  $\beta = .72, p < .001$ , with no significant predictors noted for characteristics of sport involvement, length of time involved in SO, or ASD status. However, in the final model, ASD status moderated the relationship between sport diversity and emotional problems ( $p = .05$ ; Figure 1), such that greater sport diversity was associated with greater emotional problems in youth with ASD+ID. A simple slope analysis revealed that the effect of sport diversity on emotional problems was not significant for youth with ASD+ID,  $\beta = .72, p = .09$ , or ID alone,  $\beta = -.21, p = .34$ .

For Time 2 hyperactivity problems, length of time involved in SO was a significant predictor,  $\beta = -.23, p = .04$ . Baseline hyperactivity scores, characteristics of sport involvement, and ASD status did not significantly predict hyperactivity at Time 2. In the final model, ASD status significantly moderated the relationships between sport frequency and hyperactivity problems ( $p < .01$ ), sport diversity and hyperactivity problems ( $p < .01$ ), and positive social experiences and hyperactivity problems ( $p = .04$ ). Specifically, more frequent and positive social experiences in sport were associated with

lower hyperactivity problems, while more diverse involvement was related to greater hyperactivity problems in youth with ASD+ID. The effects of sport frequency,  $\beta = -1.23$ ,  $p = .001$  (see Figure 2), diversity,  $\beta = 1.29$ ,  $p < .001$  (see Figure 3), and positive social experiences,  $\beta = -.19$ ,  $p = .01$  (see Figure 4), on hyperactivity problems were significant for youth with ASD+ID, but not for ID alone ( $p = .32-.95$ ).

For peer problems at Time 2, positive social experiences emerged as a significant sport predictor,  $\beta = .33$ ,  $p = .03$ , while baseline peer problems, length of time involved in SO, and ASD status were not significant predictors. In the final model, ASD status moderated the relationship between sport frequency and peer problems ( $p = .03$ ), with more frequent sport involvement being associated with lower levels of peer problems. Again, the effect of sport frequency on peer problems was significant for youth with ASD+ID,  $\beta = -1.08$ ,  $p = .009$ , but not for youth with ID alone,  $\beta = .009$ ,  $p = .97$  (see Figure 5).

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Insert Figures 1 to 5 and Table 4 here

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### **Objective Two – Psychosocial Strengths and Difficulties**

A univariate outlier ( $> 3.29$  SD) was noted for each conduct problems and interpersonal strengths, with significant skewness values ( $p < .001$ ). The two outliers were removed from further analyses.

For Objective 2, psychosocial strengths and difficulties were compared in three groups: athletes with ASD+ID, athletes with ID alone, and youth with ASD+ID who

were not involved in sport. The groups were comparable on functional cognitive ability, sociocommunicative abilities, and adaptive behaviour, and a MANOVA was used to examine psychosocial outcomes across groups. A main effect of the groups was found for strengths overall,  $F(2, 111) = 7.77, p < .01, \text{partial } \eta^2 = .12$ , with post hoc analyses revealing that athletes with ID alone had greater scores for strengths compared to athletes with ASD+ID and youth with ASD+ID who were not involved in sport. A similar pattern was found for the specific strengths (see Table 5), including interpersonal strengths, intrapersonal strengths, affective strengths, family relationships, and prosocial functioning, while no difference among groups was noted for school functioning ( $p = .52$ ).

A main effect of group was also found for overall psychosocial difficulties,  $F(2, 111) = 11.41, p < .001, \text{partial } \eta^2 = .17$ , with greater difficulties observed in youth with ASD+ID who were not involved in sport compared to both groups of athletes. Similarly, youth with ASD+ID who were not in sport had greater emotional, conduct, and peer problems compared to both groups of athletes (see Table 5). In addition, athletes with ID alone had lower hyperactivity scores compared to both groups of youth with ASD+ID.

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Insert Table 5 here

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## **Discussion**

This is one of the first studies to examine psychosocial variables associated with sport involvement in youth with ASD+ID. While previous research has assessed the psychosocial outcomes related to physical activity or sport interventions in this

population, the potential benefits of typical involvement in sport have not previously been examined in youth with ASD.

### **Objective One – Characteristics of Sport Involvement as Predictors of Psychosocial Difficulties Over Time**

Youth with ASD+ID did not differ from youth with ID alone in characteristics of sport involvement (frequency, diversity, positive social experiences) and length of time involved in SO. Given the additional support needs associated with a diagnosis of ASD, it may be expected that youth with ASD+ID would be less likely to participate in sports (Darcy & Dowse, 2013); however, our findings suggest that for athletes who completed both time points, youth with ASD+ID did not differ from their peers with ID alone in many aspects of their sport engagement. Conversely, when examining athletes who completed only the first time point, youth with ASD+ID had fewer positive social experiences compared to their peers with ID alone, using the same sport experiences measure (Ryan, Fraser-Thomas, & Weiss, 2017). One difference with the current study may be the longitudinal approach, which may have created a bias in the self-selection of participants, as those families who agreed to participate in ongoing sport-related research reported more positive social experiences, as well as more frequent and diverse sport involvement. Others have reported that, although youth with ASD+ID and youth with ID alone do not differ in their frequency and diversity of community participation, youth with ASD+ID have lower levels of involvement in many of the community activities they participate in, which is due in part to the social demands associated with the activities (Tint, Maughan, & Weiss, 2017). Although the current findings suggest comparable patterns of involvement in sport between groups, additional support may still be needed

to ensure that youth are able to participate in sport in a meaningful way and are supported through the demands of social or group engagement.

Consistent with hypotheses, athletes with ASD+ID had greater psychosocial difficulties at baseline compared to athletes with ID alone; specifically, greater emotional, conduct, hyperactivity, and peer-related problems were reported for athletes with ASD+ID. Further, ASD status moderated the relationships between characteristics of sport involvement and three psychosocial difficulty variables: emotional problems, hyperactivity, and peer problems over time. Of particular interest, a number of effects emerged specific to athletes with ASD+ID that were not evident for peers with ID alone. Youth with ASD+ID who were engaged in more frequent sport participation showed reductions in hyperactivity and peer problems over time, while no similar association with sport frequency was observed for youth with ID alone. Similarly, youth with ASD+ID with more positive social experiences in sport had fewer hyperactivity problems over time, with no association noted for athletes with ID alone. These results are in line with hypotheses and previous work for youth with ID that highlights the role of sport participation in the improvement of psychosocial difficulties (e.g., Goodwin, Fitzpatrick, Thurmeier, & Hall, 2006; Özer et al., 2012). Among other benefits, involvement in sport for youth with ID has been associated with improved social competency, positive behaviours with peers, and a reduction in problem behaviours (Dykens & Cohen, 1996; Özer et al., 2012; Riggen & Ulrich, 1993). More frequent and positive involvement in sports for youth with ASD may provide greater opportunities to develop their social and behavioural capacities in a supportive learning environment (Özer et al., 2012).



At the same time, for youth with ASD+ID who participated in a broader range of sports, greater emotional and hyperactivity problems were noted over time. These findings were unexpected given the positive relationship found between sport diversity and positive outcomes in the typically developing literature (Donaldson & Ronan, 2006; Steptoe & Butler, 1996). Studies have suggested that diverse sport involvement can lead to greater self-knowledge, emotional regulation, academic achievement, and physical activity in adulthood (e.g., Hansen, Larson, & Dworkin, 2003; Mäkelä, Aaltonen, Korhonen, Rose, & Kaprio, 2017; Sziraki, 2012). There may be additional factors for youth with ASD that impact the path from sport diversity to the development of emotional and behavioural problems, which are not applicable to youth without ASD. Being exposed to various sport settings and coaches, or having to try multiple teams before finding their sport of interest, may add to the sociocommunicative stress often experienced by youth with ASD, exacerbating emotional problems in youth with ASD (White & Roberson-nay, 2009). In the general population literature, there is growing concern around overscheduling children in multiple activities and associated difficulties with academic achievement, sense of belonging in school, loneliness, and depression (Knifsend & Graham, 2012; Randall & Bohnert, 2012); research in the ASD+ID population could examine similar potential outcomes associated with overprogramming children with ASD. Alternatively, the association between sport diversity and psychosocial difficulties could be conceptualized in the opposite direction, such that parents of youth with ASD who have greater emotional or hyperactivity symptoms may seek a greater diversity of sports to engage in. Emotion regulation skills used within a team setting have been associated with athlete enjoyment and commitment in the general

population, suggesting potential benefits for youth with emotional difficulties (Tamminen, Gaudreau, McEwen, & Crocker, 2016). Further, parents of youth who are experiencing emotional or behavioural problems may seek a variety of resources in an attempt to meet their child's needs in new ways (Ruffolo, Kuhn, & Evans, 2006), and our findings (e.g., diverse teams, coaches, etc) may reflect this process unfolding in a sport setting.

### **Objective Two – Psychosocial Strengths and Difficulties**

Differences among the three groups were observed for psychosocial strengths, including interpersonal, intrapersonal, affective, family relationships, and prosocial functioning. Results did not support the hypothesis that the ASD+ID groups (athletes and no sport) would differ from each other in psychosocial strengths. Instead, both groups had lower scores for strengths compared to athletes with ID alone, highlighting the role of an ASD diagnosis, rather than sport participation, in the development of strengths. Indeed, previous studies have identified greater positive outcomes, such as thriving and psychological wellbeing, in youth with ID alone compared to those with ASD+ID (Biggs & Carter, 2016; Weiss & Burnham Riosa, 2015). Weiss and Burnham Riosa (2015) also found sociocommunicative ability to explain part of the variance in thriving between the two groups, such that having a diagnosis of ASD was associated with lower sociocommunicative ability, which was related to lower levels of thriving. There may also be a shared construct between the strengths measure and youth's sociocommunicative abilities, with some of the items including concepts of language, relationships with others, and appropriate reactions to social and emotional situations. Given the low levels of sociocommunicative abilities in both groups of youth with

ASD+ID compared to youth with ID alone in the current study, it is not unexpected that these strengths would be less developed in youth with ASD. Social skills programs that are tailored for youth with ASD (e.g., Laugeson, Frankel, Gantman, Dillon, & Mogil, 2012) may be a necessary first step in building the knowledge, skills, and social responsiveness needed to further develop emotional and behavioural strengths.

Consistent with hypotheses, youth with ASD+ID who were not involved in sport had greater psychosocial difficulties including emotional, conduct, and peer problems, than both groups of athletes (ASD+ID, ID alone). These results are in line with previous work in the ID and general population literature, with some authors noting benefits associated with participation in sport, such as reduced stress and problem behaviours, greater self-esteem, and improved wellbeing and quality of life (e.g., Carmeli et al., 2008; Crawford et al., 2015; Marks et al., 2010; Özer et al., 2012; Tint, Thomson, & Weiss, 2017). These findings offer additional support for the use of sport as a positive avenue for improving psychosocial difficulties in youth with ID. Alternatively, the current results may point to the fact that youth with ID who have fewer psychosocial difficulties are better able to participate in sports than those with many psychosocial problems.

Hyperactivity problems were greater in both groups of youth with ASD+ID (both athletes and those not involved in sport) compared to youth with ID alone. A diagnosis of ASD significantly increases the odds of hyperactivity in youth with ID (Totsika et al., 2011), with one study reporting that youth with ASD+ID are more than five times as likely to meet criteria for clinical hyperactivity levels compared to youth with ID alone (Bradley & Isaacs, 2006). Overall, the current findings reflect previous literature

suggesting that youth with ASD+ID have greater emotional and behavioural difficulties compared to youth with ID alone (e.g., Totsika et al., 2011).

### **Limitations**

There are several limitations to the research findings. First, the current study used a sample of participants who were already involved in SO, which may have created a sampling bias, as those involved in SO may have different experiences from those who do not participate in SO. Further, there was a bias in the self-selection of participants at Time 2, with those participants being involved in sport more frequently, with more sport diversity and having more positive social experiences. Also, mothers of youth already involved in SO comprised the majority of respondents, therefore the results may not generalize to all families or all youth with ASD and ID. Second, the diagnosis of ID and ASD was based on parent report and was not additionally evaluated for the current study, however, strict guidelines around the qualifications for a clinical diagnosis were used (e.g., IQ score, developmental onset, diagnosed by licensed health professional). Although a reporting bias may occur with parent report surveys, others have used similar processes to ascertain diagnoses of children with developmental disabilities (e.g., Daniels et al., 2011; Kogan et al., 2009; Totsika et al., 2011; Weiss & Burnham Riosa, 2015). Third, while the three groups of participants were comparable on several criteria (e.g., age, gender, adaptive behaviour, cognitive ability), there may be additional differences to consider between groups that were not measured in the current study, such as family support or proximity to practices and events. Fourth, given the cross-sectional nature of the analyses and the possible bi-directional manner of the relationships, longitudinal research on the directionality of these relationships would be beneficial in future studies

to provide the best support for youth with ASD and ID during their social engagement in sport.

### **Conclusions**

The current findings demonstrate that sport involvement is associated with psychosocial outcomes over time for youth with ASD and ID, with the nature of the relationship depending on whether or not the youth has a diagnosis of ASD. More frequent and positive social involvement in sport may be associated with lower hyperactivity and peer problems in youth with ASD+ID, while more diverse involvement in sport may be related to greater psychosocial difficulties. In addition, the results highlight an association between ASD diagnosis and psychosocial strengths, while sport involvement was a stronger indicator of psychosocial difficulties in youth with ID. Youth with ASD+ID, regardless of their sport involvement, had lower levels of psychosocial strengths than athletes with ID alone. As such, sport programmers should strive to provide opportunities and support for the development of psychosocial strengths among youth with ASD+ID. Further, sport involvement may be a positive intervention for reducing psychosocial difficulties in youth with ASD+ID, and could be encouraged in youth with ASD who struggle with emotional and behavioural problems. Future research on the individual and environmental factors associated with psychosocial strengths and difficulties in sport is needed to develop effective strategies for improving positive participation and wellbeing in youth with ASD and ID.

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**Table 1.** Demographic variables in athletes with ASD+ID and ID alone, and youth with ASD+ID not in sport.

Variables	<i>M (SD)/%</i>				<i>F (df)</i>
	Full sport sample ( <i>N</i> = 115)	ASD+ID in sport ( <i>n</i> = 35)	ID alone in sport ( <i>n</i> = 80)	ASD+ID not in sport ( <i>n</i> = 58)	
Child age	17.21 (3.05)	17.09 (3.32)	17.26 (2.94)	16.85 (3.13)	.30 (2, 170)
Child gender (males)	66.1%	68.6%	65.0%	74.1%	.65 (2, 170)
Cognitive ability	1.39 (.80)	1.50 (.93)	1.35 (.73)	1.68 (.96)	2.53 (2, 167)
Sociocomm. ability	1.74 (.62)	1.37 (.52)	1.89 (.60)	1.45 (.60)	14.36*** (2, 170)
Adaptive behaviour	1.25 (.34)	1.24 (.35)	1.26 (.34)	1.26 (.46)	.02 (2, 169)

\*\*\**p* < .001

**Table 2.** Correlations among characteristics of sport involvement and psychosocial difficulties at Time 1 in full sport sample (athletes with ASD+ID and ID alone).

	Sport Diversity	PSE	Emotional problems	Conduct behaviour	Hyperactivity	Peer problems
Sport frequency	.61**	.48**	.04	-.07	-.11	-.19
Sport diversity	-	.23*	-.08	-.01	.03	-.15
PSE		-	.02	-.25**	-.34**	-.22*
Emotional problems			-	.43**	.40**	.50**
Conduct problems				-	.38**	.45**
Hyperactivity					-	.39**

*Note.*  $N = 115$ ; PSE = Positive Social Experiences

\* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

**Table 3.** Differences in sport related variables for youth with ASD+ID compared to youth with ID alone at baseline.

Variables	<i>M (SD)</i>		<i>t</i> -test
	ASD+ID	ID alone	
Patterns of sport participation			
Sport frequency	2.91 (1.16)	2.92 (1.16)	.06
Sport diversity	2.43 (1.27)	2.38 (1.26)	-.20
Positive social experiences	12.17 (5.55)	12.91 (5.01)	.67
Length of time in SO	4.50 (3.44)	5.79 (4.00)	1.59
Psychosocial difficulties at Time 1			
Emotional problems	1.79 (.75)	1.29 (.86)	-3.12**
Conduct problems	1.08 (.80)	.76 (.77)	-2.02*
Hyperactivity problems	5.68 (2.28)	4.59 (2.47)	-2.27*
Peer problems	4.57 (2.05)	3.00 (2.25)	-3.66**

\* $p < .05$ , \*\* $p < .01$

**Table 4.** Final models for multiple regression analyses for emotional, hyperactivity, and peer problems in full sport sample (athletes with ASD+ID and ID alone).

Psychosocial difficulty	Variable entered	<i>B</i>	<i>SE</i>	$\beta$	<i>t</i>
Emotional ( <i>N</i> = 77)	Constant	.88	.37		2.38*
	Baseline	1.94	.23	.72	8.30***
	Time in SO	.01	.05	.02	.27
	Frequency	-.01	.25	-.01	-.06
	Diversity	-.21	.21	-.11	-.96
	PSE	.04	.05	.09	.84
	ASD	.03	.44	.01	.07
	FREQxASD	-.37	.47	-.10	-.79
	DIVxASD	.92	.46	.25	2.00*
	PSExASD	-.19	.10	-.20	-1.86
Hyperactivity ( <i>N</i> = 71)	Constant	-.71	.31		-2.25*
	Baseline	.12	.08	.18	1.55
	Time in SO	-.09	.04	-.23	-2.05*
	Frequency	.09	.22	.06	.39
	Diversity	.18	.18	.14	1.00
	PSE	-.003	.04	-.01	-.07
	ASD	-.27	.38	-.08	-.72
	FREQxASD	-1.32	.42	-.51	-3.17**
	DIVxASD	1.12	.39	.45	2.85**
	PSExASD	-.19	.09	-.29	-2.16*
Peer problems ( <i>N</i> = 72)	Constant	-.05	.37		-.12
	Baseline	.04	.09	.05	.43
	Time in SO	-.03	.05	-.07	-.63
	Frequency	.10	.27	.01	.03
	Diversity	-.30	.22	-.21	-1.32
	PSE	.12	.05	.33	2.21*
	ASD	-.05	.46	-.01	-.10
	FREQxASD	-1.19	.48	-.38	-2.26*
	DIVxASD	.55	.47	.20	1.17
	PSExASD	-.05	.10	-.07	-.45

*Note.* *N* = 115; Baseline = T1 psychosocial variable; Time in SO = Length of time in SO; PSE = Positive Social Experiences; FREQxASD = Interaction of sport frequency and ASD status; DIVxASD = Interaction of sport diversity and ASD status; PSExASD = Interaction of positive social experiences and ASD status

\**p* < .05 \*\**p* < .01 \*\*\**p* < .001

**Table 5.** Psychosocial strengths and difficulties across groups of youth with ASD+ID and ID alone.

	Groups ( <i>Mean, SD</i> )			<i>F</i> (df)	Comparison	Effect size ( <i>partial η</i> <sup>2</sup> )
	ID alone ( <i>n</i> = 49) <sup>a</sup>	ASD+ID ( <i>n</i> = 21) <sup>b</sup>	ASD+ID no sport ( <i>n</i> = 44) <sup>c</sup>			
Psychosocial strengths	2.03 (.43)	1.70 (.62)	1.64 (.54)	7.77**	a > b, c	.12
Interpersonal	2.05 (.56)	1.77 (.71)	1.56 (.66)	7.23**	a > c	.12
Intrapersonal	2.12 (.52)	1.72 (.67)	1.56 (.60)	11.03***	a > b, c	.17
Affective	2.32 (.52)	1.86 (.67)	1.80 (.53)	12.16***	a > b, c	.17
Family relationships	1.56 (.12)	1.44 (.20)	1.39 (.21)	11.68***	a > b, c	.17
School functioning	1.48 (.54)	1.28 (.74)	1.43 (.73)	.66		.01
Prosocial functioning	1.53 (.48)	1.20 (.66)	1.22 (.60)	4.90**	a > b, c	.08
Psychosocial Difficulties	.74 (.23)	.76 (.20)	.95 (.25)	11.41***	a, b < c	.17
Emotional	.51 (.53)	.54 (.49)	.99 (.54)	10.79***	a, b < c	.16
Conduct problems	.37 (.33)	.27 (.31)	.55 (.31)	6.87**	a, b < c	.11
Hyperactivity	.83 (.47)	1.10 (.50)	1.10 (.49)	4.48*	a < b, c	.08
Peer problems	.56 (.42)	.81 (.35)	1.10 (.42)	20.78***	a, b < c; a < b	.27

\**p*<.05, \*\**p*<.01, \*\*\**p*<.001

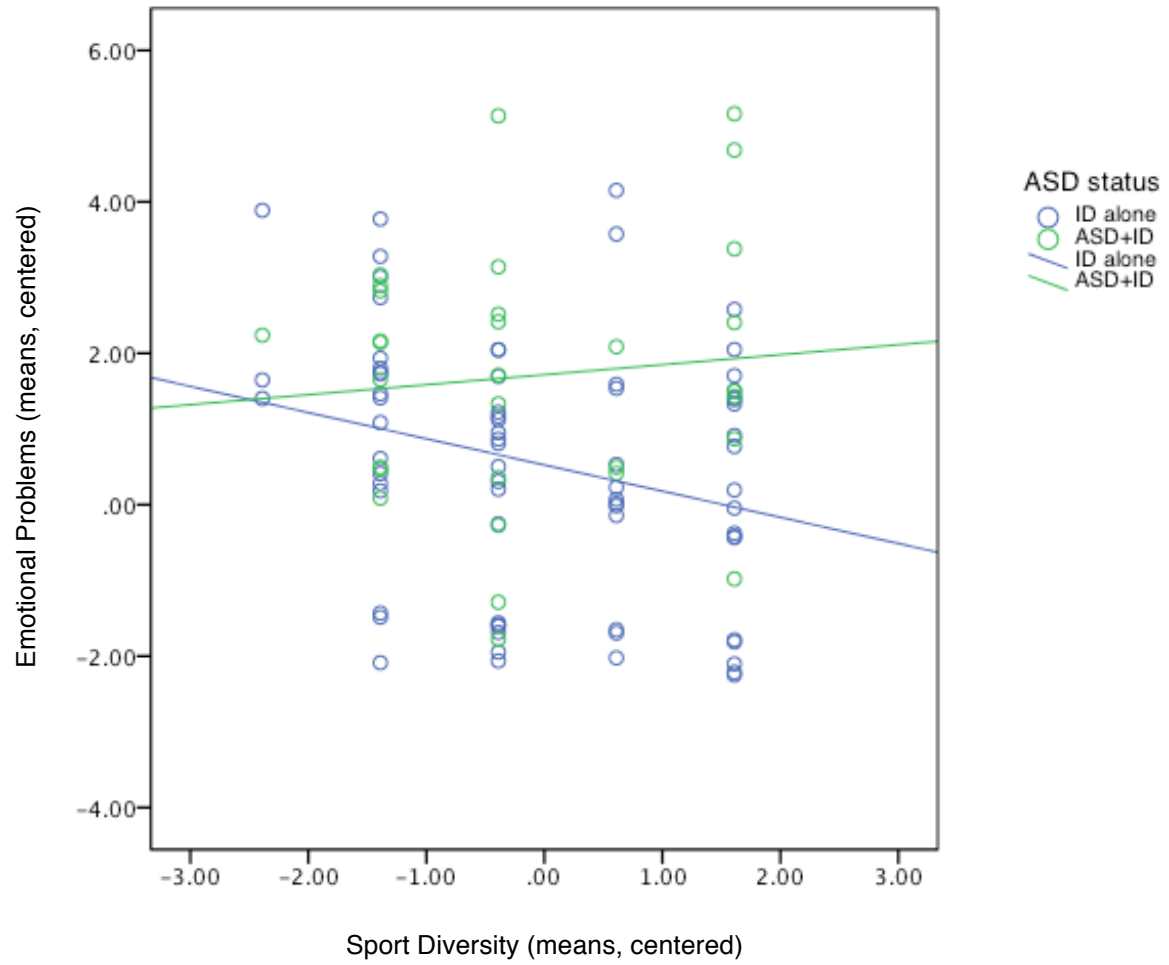


Figure 1. Emotional Problems (means, centered) for the ASD Status by Sport Diversity Interaction.

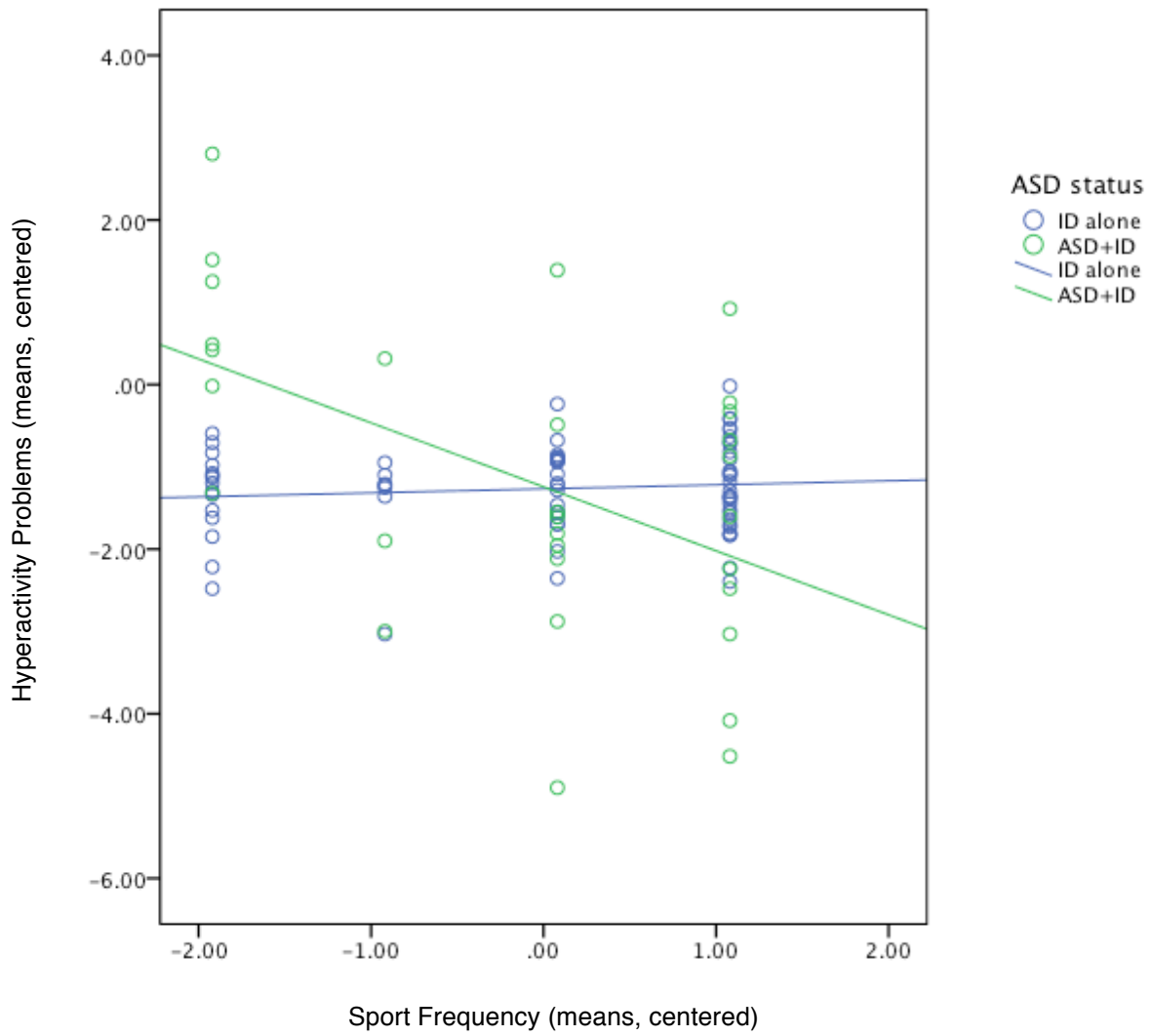


Figure 2. Hyperactivity Problems (means, centered) for the ASD Status by Sport Frequency Interaction.

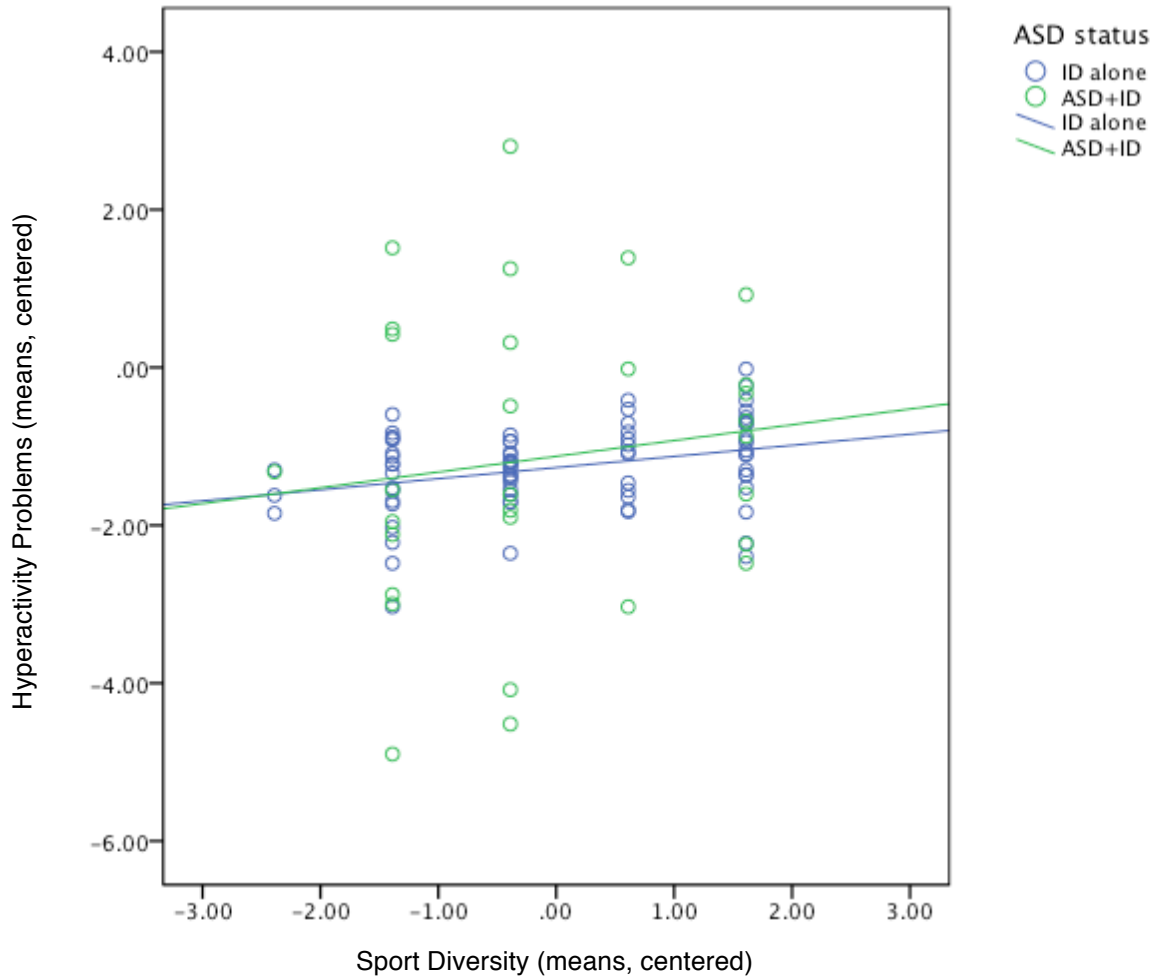


Figure 3. Hyperactivity Problems (means, centered) for the ASD Status by Sport Diversity Interaction.



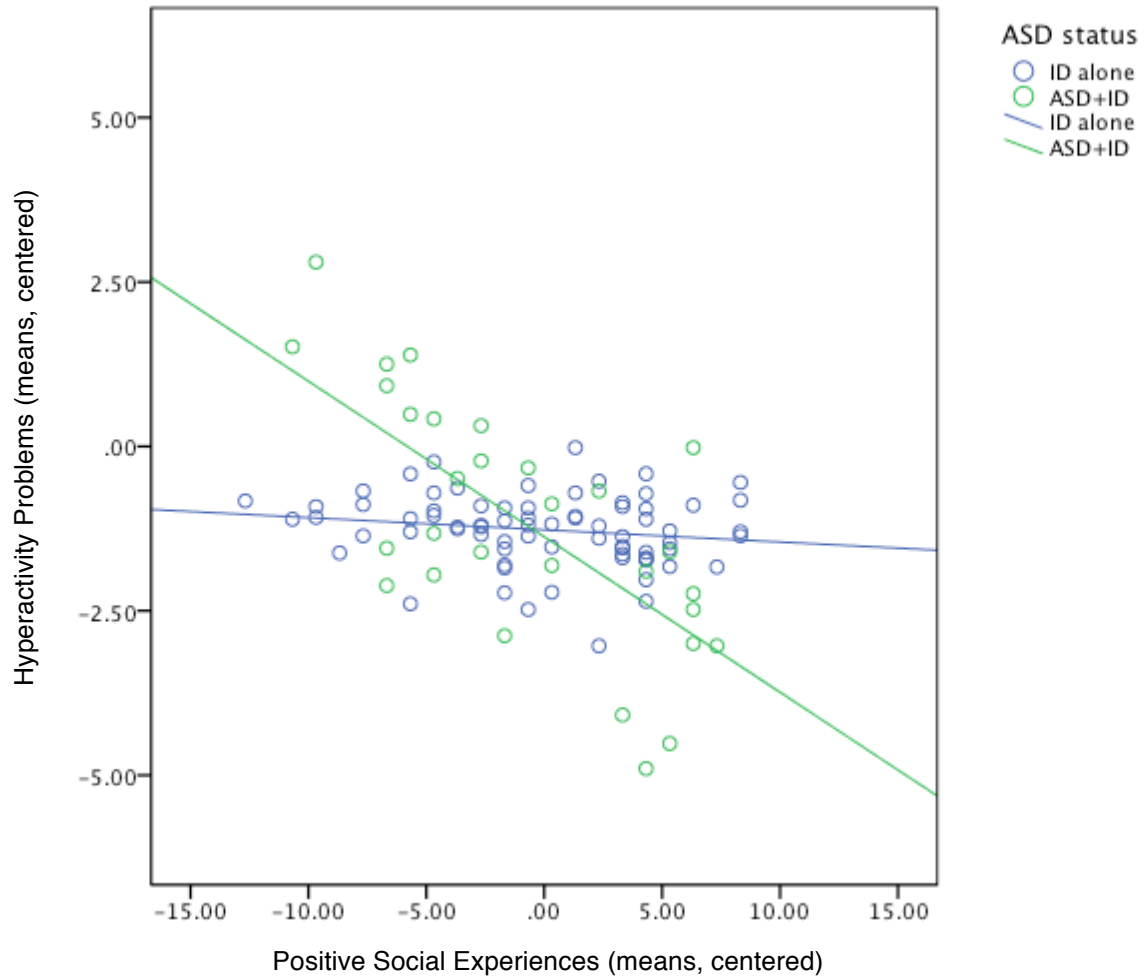


Figure 4. Hyperactivity Problems (means, centered) for the ASD Status by Positive Social Experiences Interaction.

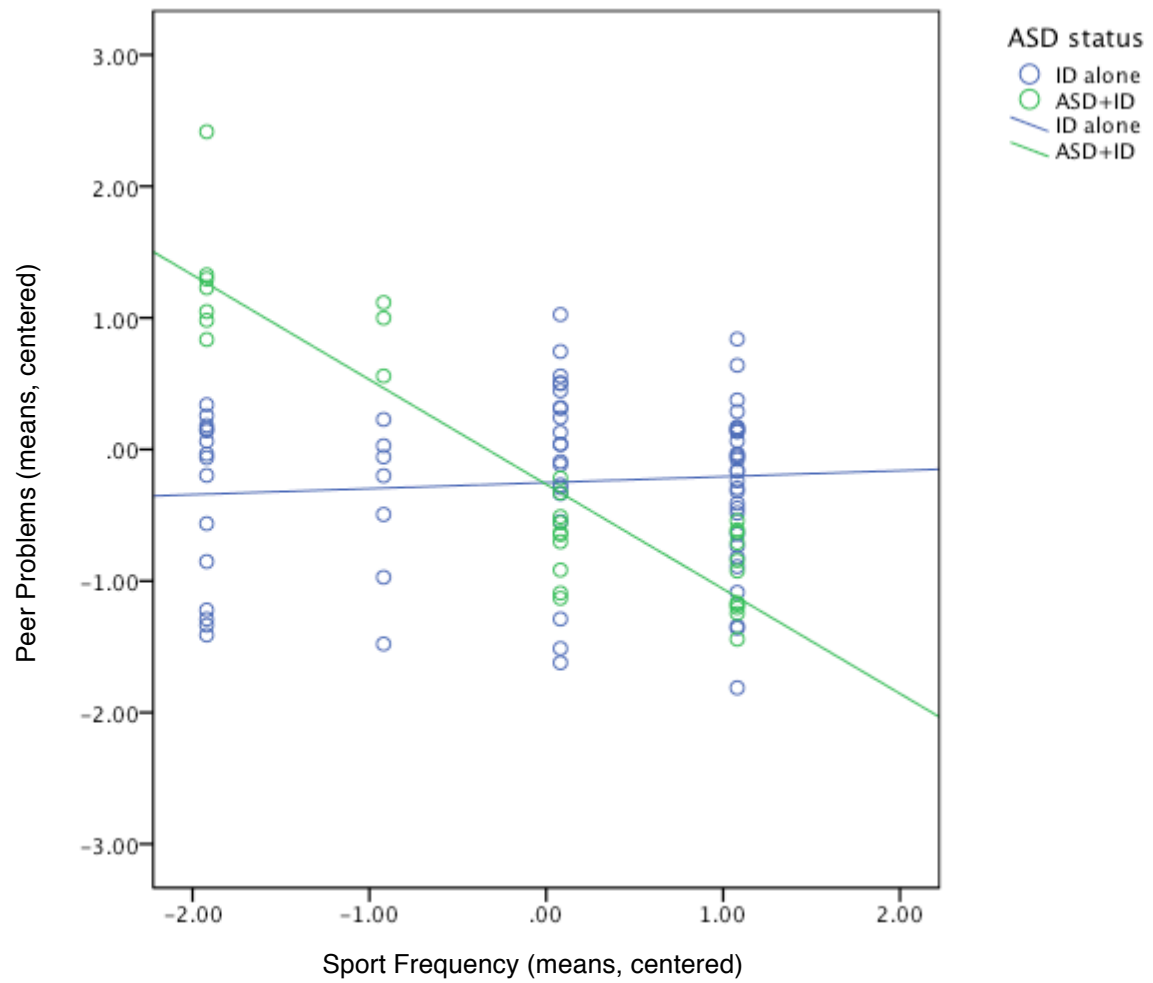


Figure 5. Peer Problems (means, centered) for the ASD Status by Sport Frequency Interaction.

## Chapter Four: General Discussion

The ultimate goal of the current research was to develop an understanding of sport involvement and experiences for youth with ASD+ID through two related studies as no previous work has examined sport participation in this population. Study 1 examined the characteristics of sport involvement in youth with ASD+ID compared to youth with ID alone and explored the personal and contextual correlates of involvement. In Study 2, we examined how characteristics of sport involvement in youth with ASD+ID were related to psychosocial strengths and difficulties. Longitudinal analyses examined how sport involvement was related to psychosocial difficulties over a one-year period and comparisons across three groups of youth (athletes with ASD+ID, athletes with ID alone, and youth with ASD+ ID who did not participate in sports) investigated differences in psychosocial strengths and difficulties. The discussion below includes a detailed summary of the research findings, an integration of the broader implications from both studies, and explores the study limitations and directions for future research.

### **Study 1**

The aim of the first study was to examine characteristics of sport involvement (frequency, diversity, positive social experiences) in athletes with ASD+ID compared to athletes with ID alone. A sample of 409 parents of youth with ID involved in SO completed an online survey and analyses of co-variance (ANCOVAs) were used to examine the role of ASD status in patterns of sport involvement. Although youth with ASD+ID did not differ from youth with ID alone in their frequency or diversity of sport participation, positive social experiences in sport were greater for athletes with ID alone compared to those with ASD+ID. While the supportive nature of SO fosters a comparable

level of participation in sport for youth with ASD, the social gains from their involvement are not on par with their peers without ASD. These findings are concerning as they suggest that even in a program where supports are in place, youth with ASD have more challenges socially. The social and communication difficulties associated with an ASD diagnosis can make successful integration into social or group settings a challenge, with one study noting that almost half of youth and young adults with ASD (46%) have no reciprocal friendships, attributed to deficits in social skills that continue through adolescence (Orsmond, Krauss, & Seltzer, 2004). Youth with ASD may require greater support from coaches, sport staff, and parents in order to succeed in positive social integration in sport. Given that SO aims to meet the needs of all athletes with ID, more specific ASD-related training may be necessary for coaches and staff to meet the social and communication needs of athletes with ASD with a similar success rate of their peers with ID alone.

We also explored the personal and contextual correlates of sport involvement to examine whether these variables would explain why youth with ASD+ID have different experiences compared to youth with ID alone. In partial support of the hypotheses, socio-communicative abilities, the coach-athlete relationship, and resources partially explained why youth with ASD+ID had fewer positive social experiences than their peers with ID alone. These findings are consistent with the broader ID literature which indicates that positive engagement depends on the youth's level of adaptive behaviours, environmental supports, and strong social networks (Buttimer & Tierney, 2005; Darcy & Dowse, 2013; Grandisson et al., 2012; Robertson & Emerson, 2010). These findings offer multiple venues for communities and policy makers to improve the social experiences of youth

with ASD+ID in sport, through social skills building, specialized coach training, and increasing accessibility to necessary resources and supports for youth and their families.

## **Study 2**

The main purpose of the second study was to examine how characteristics of sport involvement are related to psychosocial outcomes in youth with ASD+ID involved in Special Olympics (SO) using two primary objectives. For the first objective, a sample of 115 parents from Study 1 completed a Time 2 survey one year later and multiple regression analyses investigated whether sport involvement at baseline predicted psychosocial difficulties over time and whether the findings differed for youth with ASD+ID compared to peers with ID alone. Characteristics of sport involvement (i.e., frequency, diversity, social experiences) were related to changes in psychosocial difficulties over a one-year period, with the relationships dependent on the specific sport characteristic, outcome variable, and ASD status. Specifically, more frequent and social sport involvement was related to decreased hyperactivity and peer problems in youth with ASD+ID, but not in youth with ID alone. This finding is in line with hypotheses, such that greater involvement was expected to predict better psychosocial outcomes over time (Ozer et al., 2012; Rosegard, Pegg, & Compton, 2001). However, contrary to expectations, more diverse sport participation was associated with greater psychosocial difficulties, specifically greater emotional and hyperactivity problems. Little is known about the factors involved in sport participation for youth with ASD; therefore, additional factors, such as communication or sensory processing deficits, may be involved in these pathways (APA, 2013; Tseng, Fu, Cermak, Lu, & Shieh, 2011). Alternatively, there may

be a need to include youth with greater psychosocial difficulties in more diverse sports to support their developing needs in a variety of ways.

To address the second objective of Study 2, 115 participants who were involved in the first objective of Study 2 reported on their child with ID (35 with ASD); a comparable sample of 58 parents of youth with ASD who did not participate in sport were also included. A multivariate analysis of variance (MANOVA) was used to examine whether psychosocial strengths and difficulties differed among the three groups (athletes with ID alone, athletes with ASD+ID, and youth with ASD+ID not involved in sport). In terms of strengths, athletes with ID alone had greater strengths overall compared to all youth with ASD+ID, with similar patterns emerging for specific strengths including interpersonal strengths, intrapersonal strengths, affective strengths, family relationships, and prosocial functioning. These findings are in line with hypotheses, such that youth with ID alone who are involved in sport appear to be faring better in terms of psychosocial strengths than youth with ASD, regardless of sport involvement. These results suggest an important association between ASD status and psychosocial strengths, which is comparable to previous research highlighting sociocommunicative deficits as a reason for the low levels of thriving in youth with ASD compared to peers with ID alone (Weiss & Burnham Riosa, 2015). While additional research is needed to understand the specific pathways to greater psychosocial strengths, continued emphasis on building social and language skills in youth with ASD through social skills programs may encourage positive growth and social interactions in a youth's life (Laugeson, Frankel, Gantman, Dillon, & Mogil, 2012).

For psychosocial difficulties, youth with ASD who were not involved in sport had more difficulties overall than both groups of youth involved in sport. Additionally, youth with ASD who were not in sport had greater specific psychosocial difficulties compared to athletes, including emotional, conduct, and peer problems. Further, as expected, athletes with ID alone had fewer difficulties, specifically with hyperactivity problems. The findings are in line with hypotheses and consistent with research in both the ID and general population literature, which shows beneficial outcomes through sport participation (Crawford, Burns, & Fernie, 2015; Dykens & Cohen, 1996; Marks, Sisirak, Heller, & Wagner, 2010; Özer et al., 2012). The results also lend support to previous work highlighting the association between ASD status and psychosocial difficulties. Finally, the findings suggest a tiered approach to psychosocial difficulties in youth with SO, such that both sport participation and a diagnosis of ID alone are beneficial and together they show additional positive outcomes.

### **Integration of Broader Implications**

The overarching goal of this research was to gain a comprehensive understanding of how youth with ASD+ID are involved in sport and how psychosocial outcomes are impacted by their involvement. Findings from these studies suggest that youth with ASD+ID in sport differ from their peers with ID alone in several ways, including their positive social experiences in sport, psychosocial difficulties, and behavioural and emotional strengths. For youth with ASD+ID, social interactions and experiences are often challenging, given their considerable difficulties with social communication (APA, 2013). Larger group activities, such as participating in sport, can be additionally demanding for youth with ASD who have deficits in social abilities, including limited

reciprocity, difficulty forming and maintaining relationships, and a lack of awareness around nonverbal social behaviours (APA, 2013; Shattuck, Orsmond, Wagner, & Cooper, 2011). Indeed, adolescents with ASD experience significant barriers to social participation, with peer experiences typically taking place one-on-one or at home rather than in a community setting (Shattuck et al., 2011). There is a clear need for greater services and social supports within the communities to foster involvement for youth with ASD and to improve support for youth with ASD who are already engaged in sport but who still lack positive social experiences. Targeted interventions may assist in developing their fundamental social and communication skills (McDonald & Machalicek, 2013), although additional support may be required to help youth with ASD successfully generalize their skills to sport and team-based settings. Possible strategies may include training athletes in diverse skills with various behavioural examples and having others (e.g., coach, parent, peers) cue opportunities to use the acquired skills in new settings (Radley et al., 2014).

Psychosocial strengths and difficulties were influenced by ASD status and whether or not the youth participated in sport, which is consistent with previous ID research (Crawford et al., 2015; Totsika et al., 2011; Weiss & Burnham Riosa, 2015) and builds on the limited knowledge of youth with ASD+ID in sport. While participation in sport offers many benefits for youth with ID (e.g., Dykens & Cohen, 1996; Grandisson et al., 2012), an important finding from this research suggests that youth with ASD may not obtain the same positive outcomes as their peers with ID alone. An individual's behavioural, language, and social capabilities may promote or hinder successful integration into sports (Buttimer & Tierney, 2005; Grandisson et al., 2012), although



practical support from the community, sport agencies, and families of youth with ASD can also play a role in building positive sport outcomes. Promoting healthy and active communities and training coaching staff on athlete differences may encourage families to seek social involvement in sport based settings (Grandisson et al., 2012).

### **Limitations**

Several limitations should be noted from the current studies. Survey-based research was used in both studies, which creates a potential for response and sample bias. The majority of the samples were mothers who were reporting on their sons, therefore the findings may not be generalizable to all youth with ID or other combinations of parents and youth (e.g., father and son; Totland et al., 2013). Self-report responses from youth could be a valuable next step in sport research with previous studies suggesting that adolescents with ASD are able to report on their personal experiences in a reliable and valid manner (Shipman, Sheldrick, & Perrin, 2011).

Additionally, while the studies examined a broad age range (youth ages 11 to 23 years), there may be different patterns of sport participation for younger children (under 11 years) or adults (over 23 years). The studies may represent predictors and outcomes of sport participation during this specific developmental period but they may not be applicable to other age ranges. In particular, future research should investigate the correlates of sport involvement in younger children and older adults with ASD+ID when physical activity levels may be different (Hilgenkamp, Reis, van Wijck, & Evenhuis, 2012; Pan & Frey, 2006).

Finally, it is important to consider that these findings are contextualized in a sport program with extensive supports designed specifically for youth with ID; the current

findings do not speak to sport participation among youth with ID alone or youth with ASD+ID in mainstream sport programs. Further research is needed to understand involvement in mainstream or integrated sport programs for youth with ID, as it may provide knowledge around benefits for athletes with and without disabilities (Grandisson et al., 2012).

### **Future Directions**

Based on the differences in sport participation and psychosocial outcomes between youth with ASD+ID and their peers with ID alone, an important future direction would be to address the specific social and communication needs of this population to improve their experiences while they engage in sports. One direct method of supporting youths' needs in sport would be to provide more specialized learning opportunities for coaches of youth with ASD+ID. Although coaches of SO teams often complete courses related to team building and skill development, the majority of coaches report that learning from mentors and coaching peers is the ideal method for gaining knowledge about coaching youth with ID (MacDonald, Beck, Erickson, & Côté, 2016). Employing a broader approach to training and education may allow for coaches to develop support skills that are related to the specific needs and abilities of their athletes. For example, encouraging senior level coaches to provide guidance to new coaching staff around an individual teammate's social and communication difficulties could foster better support and resources for youth to integrate within their team. Future research in this area could examine whether direct support around sociocommunication needs influence the social sport experiences of youth with ASD+ID. Further, given that the current study looked

only at youth with ASD+ID in a SO setting, future studies could also seek to understand how to support youth with ASD without ID in a sport setting.

Given the greater psychosocial difficulties and lower levels of psychosocial strengths in the ASD+ID groups compared to their peers with ID alone, another area for future work would be to focus on improving these areas within a sport setting. Previous work evaluating physical activity programs in youth with ASD has shown beneficial outcomes in reducing inattention, distractibility, and hostile and aggressive behaviours, as well as improving social competence, social skills, and self-concept (Bass, Duchowny, & Llabre, 2009; Cavanaugh, 2010; Pan, 2010). Attempting to build these psychosocial skills through team-based activities or one-on-one mentoring within a typical sport setting could allow for ongoing opportunities to practice positive and appropriate social behaviours with peers with ID. Further, given that these findings speak only to experiences within a specialized SO program developed specifically for youth with ID, it could also be beneficial to understand experiences of youth with ASD in integrated sport contexts with typically developing youth. Future evaluations of these activities may offer important information around skill development and psychosocial outcomes in widely accessible multisport organizations for individuals with ASD+ID.

## **Conclusions**

Results from the present studies show that youth with ASD+ID differ from youth with ID alone in sport involvement and outcomes. Youth with ID alone had greater social sport experiences compared to peers with ASD+ID, with sociocommunicative abilities explaining these differences in groups. In addition, youth with ID had lower psychosocial difficulties and greater psychosocial strengths than youth with ASD+ID. Sport

involvement also played a role in the development of psychosocial difficulties, such that youth with ASD+ID who were not involved in sport had greater difficulties than those who were involved. Overall, these findings are the first to highlight the discrepancy in sport involvement and outcomes for youth with ASD+ID compared to their peers without ASD. Developing ASD specific resources and supports for coaches, teams, and families should be considered in sport settings to help foster more positive and healthy sport engagement for youth with ASD+ID.

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