2022

Instructors' perspectives of social and motor influences on participation in children with Autism Spectrum Disorder

Danielle Salters
University of Windsor

P. Camila Rios
University of Windsor

Sara Scharoun Benson
University of Windsor

Instructors' perspectives of social and motor influences on participation in children with Autism Spectrum Disorder

Danielle Salters, P. Camila Rios, & Sara M. Scharoun Benson, Ph.D.

Department of Kinesiology, University of Windsor, 401 Sunset Ave, Windsor, ON Canada, N9B3P4

Citation: Salters, D., Rios, P.C., & Scharoun Benson, S. M. (2022). Instructors' perspectives of social and motor influences on participation in children with Autism Spectrum Disorder. Research Quarterly for Exercise and Sport, 93:3, 467-478 DOI: 10.1080/02701367.2020.1864260

Corresponding Author: Sara M. Scharoun Benson, PhD., Assistant Professor, Department of Kinesiology, University of Windsor, 401 Sunset Ave, Windsor, ON Canada, N9B3P4, sara.scharoun@uwindsor.ca, Office: 519-253-3000 x. 4994, Fax: 519-973-7056, ORCID: 0000-0002-3329-6392

Abstract

Participation is key to childhood development and is essential for health and well-being; yet children with Autism Spectrum Disorder (ASD) participate less in social and physical activities compared to their typically developing peers and little is known about how social and motor challenges impact participation patterns. The current research garnered experiential insights of the quality and quantity of participation, through the lens of instructors (N = 9) working with a child or children with ASD. Semi-structured qualitative interviews were conducted to capture a comprehensive and informative profile of how social and motor functioning of children with ASD influence involvement in social and physical activities. Thematic analysis revealed consistent viewpoints in four main areas: (1) Viewpoints extend beyond the World Health Organization definition of participation; (2) Participation depends on who is involved; (3) Although motivation, confidence, and competence in social/motor domains underlie participation, social challenges were perceived as the greatest barrier; (4) While acknowledging the benefits of participation, it is necessary to be cognizant of the required supports. Throughout these themes, the notion of heterogeneity was made very clear. Collectively, perspectives offer descriptive insight which may be useful when designing opportunities for participation in social and physical activities among children with ASD.

Keywords: Qualitative; Social Skills, Motor Skills; Social and Physical Activities

Introduction

Participation is a critical aspect of child development, health, and well-being (Anaby et al., 2014; WHO, 2002); however, children with disabilities are less likely to participate in daily activities at home, school, and in the community (Kaljača et al., 2019; King et al., 2013; Shattuck et al., 2011). One of the most common neurodevelopmental disorders, Autism Spectrum Disorder (ASD) is characterized by atypical communication and social skills (American Psychiatric Association, 2013). Although expressions are heterogeneous in nature (Church et al., 2000; Lombardo et al., 2019), challenges typically include pragmatics in language, (American Psychiatric Association, 2013), social orienting and joint attention (Dawson et al., 2004), social reciprocity, and reading social cues (Church et al, 2000). A desire for routine, limited interests, and stereotyped, repetitive, or restricted behaviours are also defining characteristics of ASD (American Psychiatric Association, 2013). These features significantly influence socialization and participation among individuals with ASD within all aspects of life.

In comparison to peers who are typically developing, participation levels are generally lower, and children with ASD engage in a less diverse range of activities (Askari et al., 2014; Eglison et al., 2018; Lamash et al., 2020; Little, et al., 2014; Shattuck et al, 2011; Simpson et al., 2018, 2019; Taheri et al., 2016). Of particular concern, children and adolescents with ASD reportedly spend more time engaging with screen-based media (e.g., computer games, television, and video; Mazurek & Wenstrup, 2013) compared to unstructured and recreational activities, after school peer socialization and physical activities (e.g., sports teams and clubs) (Egilson et al., 2018; Hilton et al., 2008; Hochhauser & Engel-Yeger, 2010; Little et al., 2014; Potvin et al., 2013; AUTHOR et al., 2017). With age, there is a notable decline in participation in social and physical activities; therefore, sedentary activities are more prevalent in adolescents with ASD

compared to their typically developing peers (Ketcheson et al., 2017; Ratcliff et al., 2018; Simpson et al., 2019).

The activities children with ASD chose to engage in may be influenced by underlying motor challenges (Pusponegoro et al., 2016). Movement facilitates opportunities to engage in social activities; therefore, developing motor skills establishes an important foundation for social development (Leonard & Hill, 2014). Although not included in diagnostic criteria, motor deficits have been acknowledged in individuals with ASD (for reviews see Fournier et al., 2010; Gowen & Hamilton, 2013; Hocking & Caeyenberghs, 2017; Sacrey et al., 2014). These challenges emerge early in life (Teitelbaum et al., 1998), and the rate of motor skill development is delayed relative to typically developing children; therefore, the gap in motor skill proficiency increases with age in children with ASD (Lloyd et al., 2014). Although not all children with ASD show motor deficits, it is estimated approximately 79% of children face some sort of motor challenge (Pusponegoro et al., 2016). It has also been reported that poor motor competence can result in decreased social functioning (and vice versa), while the inverse is also true (Liu et al., 2019; MacDonald et al., 2013; Ohara et al., 2020; AUTHOR et al., 2015).

The interaction between motor and social competence is associated with meaningful participation in different activities. A perspective piece (Holloway & Long, 2019) argues that children with ASD are less likely to participate in social and physical activities as a result of deficits in social skills, thus missing the opportunity to learn and develop motor skills through participation. Examining the interrelationship between social and motor skills on participation among children with ASD has only recently become a focus of research interest (Holloway & Long, 2019). The literature generally attributes differences in participation among children with

ASD to social skills (Little et al., 2014), despite the understanding that motor proficiency also influences participation (Pusponegoro et al., 2016).

The current research builds upon recent qualitative work which garnered descriptive insight of caregivers' perspectives of their children's motor and social skills, and how they impact participation (AUTHORS, 2020). Thematic analysis revealed a difference in how caregivers and children view participation; highlighted that participation levels among children with ASD are associated with the context; and demonstrated that caregivers view their children's social skills as a greater obstacle to participation compared to motor skills (AUTHORS, 2020). Together, findings offer important insight into experiential aspects of participation and the notion of ASD-specific participation (Arnell et al., 2018; Simpson et al., 2018).

Overview of Current Research

Children's participation is complex and multifaceted (Mancini et al., 2000), and interventions for children with ASD often require the combined efforts of a multidisciplinary team working in different settings. The purpose of the current research was to garner insight into experiential aspects of participation, through the lens of instructors working with a child or children with ASD. Semi-structured qualitative interviews were conducted to capture a comprehensive and informative profile of how social and motor functioning of children with ASD influence involvement in social and physical activities. Of specific interest was whether independent domains of function (i.e., social and motor skills) were of primary concern, or, if instructors acknowledged the bidirectional relationship between domains and were thus cognizant of combined influences on participation. This research was guided by a critical realist approach (Maxwell, 2012a), which:

> "combines a realist ontology (the belief that there is a real world that exists independently of our beliefs and constructions) with a constructivist epistemology

> (the belief that our *knowledge* of this world is inevitably our own construction, created from a specific vantage point, and that there is no possibility of achieving a purely "objective" account that is independent of all particular perspectives)" (p. vii)

This approach also accepts that people's subjective interpretation of their experiences are as equally real as physical materials and measurable objects. This study was embedded within a larger mixed-methods project. In addition to qualitative interviews with caregivers (AUTHORS, 2020), quantitative data was collected from participating families to examine relationships between motor function (with the Bruininks-Oseretsky Test of Motor Proficiency™, Second Edition; Bruininks, 2005), social function (using the Social Responsiveness Scale™, Second Edition; Constantino & Gruber), and participation patterns (with the Participation and Environment Measure – Children and Youth; Coster et al., 2011) of children with ASD. Recognizing that, in qualitative research, the analysis process considers both researchers' and participants' interpretations (Pietkiewicz & Smith, 2014), quantitative data were not reviewed until qualitative portions of the project were complete.

This research was guided by a design which "recognizes the importance of interconnection and interaction among the different design components" (Maxwell, 2012b, p. 3). The interactive model has five components organized in an interconnected, yet flexible, hourglass structure. The top of the hourglass demonstrates the relations between purposes, conceptual context, and research questions (Maxwell, 2012b); extending previous work with caregivers, the present study gathered instructors' perspectives of social and motor skills among children with ASD, and how they contribute to participation in social (i.e., involving social functioning of the child, including: social awareness, cognition, communication, and motivation) and physical (i.e., involving motor functioning of the child, including: fine motor precision and integration, manual dexterity, coordination, balance, speed, agility, and strength) activities. The

bottom of the hourglass displays associations between research questions, methods, and validity (Maxwell, 2012b); like the previous investigation, we used semi-structured interviews to examine whether instructors were primarily concerned with motor skills, social skills, or if a bidirectional relationship between social and motor function was acknowledged.

Methods

Procedures

Ethical approval was obtained from the institutional research ethics board. Subsequently, the third author contacted child development centres and organizations across Southwestern Ontario to obtain site-specific approval for participant recruitment through various means (e.g., posters, flyers, listserv). Recruitment advertisements were also displayed on the departmental website, Facebook page, and around the university campus. Those individuals who were interested in the research contacted the third author to obtain additional information and schedule data collection.

Participants

This research included nine instructors (2 males, 7 females, ages 22 to 48, $M = 32.22 \pm 9.45$) who reported working in a variety of different roles with a child or children with ASD, including: Teacher, Academic Tutor, Applied Behaviour Analysis (ABA) Therapist, Intensive Behaviour Intervention Therapist (IBI), Supervising Therapist, Physical Therapist, Respite Worker, and Child Day Care Worker. Participants' length of experience working with children with ASD ranged from 1 year and 4 months to 10 years ($M = 4.87$, $SD = 3.42$). Six participants reported their current position working with children with ASD as their full-time profession; whereas one participant was employed elsewhere working with persons with other disabilities in a full-time capacity. Two participants were pursuing graduate degrees at the time of the

interview and were unsure if their career would include continued work with children with ASD. It is also important to note that one participant was also a parent of a daughter with ASD.

The third author conducted all interviews between September 2018 and 2019. While most interviews were phone-based (n=8), one participant visited the University campus (n = 1) for an in-person interview. Before data collection commenced, participants were assured of confidentiality, and informed they were free to skip questions or stop the interview at any time without consequence. With the participants' permission, interviews were digitally audio-recorded using a SONY ICD-PX370 recorder. Interviews ranged between 20 and 40 minutes. As a thank you for participating in the interview, a $10 gift card was provided.

Semi-structured interviews

This research is part of a larger mixed-methods project. As such, the semi-structured interview guide covered the same topics as recent work with caregivers (AUTHORS, 2020). Interview questions were similar, albeit posed in a manner to garner descriptive insight of instructors' experiences working with children with ASD, as opposed to caregivers. At the beginning of each interview, demographic information (i.e., age, sex) was acquired. No other sociodemographic information was collected, which was a limitation of this work. Participants were asked about their experiences working with a child or children with ASD (sample questions are listed in Table 1). To encourage in-depth and descriptive accounts of both current and past experiences, the probe "Has this changed at all over time? If so, why?" was posed after each question.

Table 1. Sample questions included in the semi-structured interview guide.

Question focus	Sample questions

Experiences working with a child or children working with ASD	"In what capacity do you work with a child or children with ASD?" "Is this your full-time profession?" "How long have you been working with a child or children with ASD?" "How often do you work with a child or children with ASD?" "What age range of children do you work with?" "What is the gender of the child or children you typically work with?" "Can you please describe how your time is typically spent with a child or children with ASD?"
Perceptions of the quality and quantity of participation among children with ASD	"Can you please describe participation patterns and levels of the child or children you work with?" "What activities does the child or children currently participate in when working with you?" "What factors influence participation for the child or children you work with?" "Do participation levels change at all over the time you spend working with individual or groups of children, and if so, why?" "Are you aware of activities the child or children participate in outside of time with you?" "Would you like to see the child or children participate in other activities with you and/or outside of time with you?"
Follow-up questions	"Can you please describe the child's/children's social/motor functioning?" "Does the child's/children's social/motor skills influence participation?"

As a means of transitioning into questions related specifically to our research question, participants were asked to define participation in their own words. After participants had the opportunity to express their perspectives on the topic, we provided the International Classification of Functioning, Disability, and Health definition of "involvement in a life situation" (WHO, 2002, p. 10) to ensure general agreement between researcher and participant, while encouraging contextually rich descriptions as we moved forward with interview questions. Building from these initial responses, we explored participants' experiences in more depth, and explored their perceptions of the quality and quantity of participation among children with ASD (Table 1). Participants were asked to elaborate and/or provide examples in such cases where a

yes/no response was elicited. Follow-up questions (Table 1) and probes (e.g., activity limitations, participation restrictions, changes over time) enabled us to garner perspectives of social (i.e., social awareness, cognition, communication, and motivation) and motor (i.e., fine motor precision/integration, manual dexterity, bilateral coordination, balance, running speed/agility, and strength) skills, the relationship between social and motor skills, and how skills influence participation among children with ASD. It is important to note that each interview included the same key topics of interests; however, as semi-structured interview guides afford flexibility, the order of questions varied based upon the individual responses of each participant.

Data Analysis

The first and second authors transcribed interviews verbatim. Subsequently, identifying information and language errors (e.g., like and um) were removed to help with readability and clarity of ideas within the manuscript. The first author used Nvivo 12 for thematically analysis, whereby transcripts were examined to familiarize the researcher with the data and facilitate an open-coding process. Consistent with our critical realist approach (Maxwell, 2012a, b), three specific questions (Srivastava & Hopwood, 2009, p. 78) guided data analysis: (1) “What are the data telling me?” (e.g., What are the interview data from instructors telling us about the motor and social skills of the child or children that they work with, and how they influence participation? Are participants offering similar or different perspectives?); (2) “What is it I want to know?” (e.g., Identifying whether instructors are concerned with motor functioning as a factor influencing participation for children with ASD, or if difficulties with social skills are of primary concern. In addition, elucidating whether instructors recognize the interrelationship between motor and social skills, and combined influence on participation?); and (3) “What is the dialectical relationship between what the data are telling me and what I want to know?” (e.g.,

What do interview data from instructors tell us?). We implemented a constant comparative method, such that data collection, transcription and analysis continued until saturation of themes and of relationships among them was achieved (Saunders et al., 2018). In other words, the aforementioned questions were repeated until a clear picture of instructors' perspectives was revealed (Srivastava & Hopwood, 2009). Upon completion of thematic analysis, the third author independently reviewed transcripts to ensure accuracy in codes and themes that resulted from interviews. The researchers met to discuss any potential discrepancies; however, no concerns were revealed.

Results

Thematic analysis demonstrated core consistencies among the perspectives of instructors: (1) Viewpoints extend beyond the World Health Organization (WHO) definition of participation; (2) Participation depends on who is involved in activity; (3) Although motivation, confidence, and competence in social and motor domains underlie participation, social challenges were perceived as the greatest barrier; (4) While acknowledging the benefits of participation, it is necessary to be cognizant of the required supports.

Generally, participants' perspectives and reflections on their experiences working with children with ASD demonstrated considerable similarities. Central to all discussions was the notion that ASD is characterized as a spectrum, meaning that while most children experience social and motor difficulties that influence participation, they are not standardized for all children, and will be experienced at varying degrees of severity. For example, as expressed by one participant: "[children with ASD have] very different skill acquisitions rates, which inevitably impacts their ability to perform those skills and some kind of participation" (P4). The following describes each of the four themes that emerged and highlights respective subthemes

that emerged. Similarities and differences in perspectives are outlined. Likewise, to help illustrate instructor perspectives representative quotations are included.

Viewpoints extend beyond the WHO Definition of Participation

As a guiding principle for the interviews, instructors were asked to define what participation meant in their own words. Descriptions were generally consistent with the International Classification of Functioning, Disability, and Health definition (i.e., "involvement in a life situation;" WHO, 2002, p. 10). For example, one instructor described participation as "actively engaging and being involved in an activity" (P2). However, participants also offered more elaborate descriptions of their experiences with children with ASD. For example:

> I think that especially in the line of work that we do, we would have a broad spectrum, description, or definition of what that would mean. So, it might mean following all of the instructions, doing all of the activities completely, or it might just mean getting in the room for that particular day. So, for some of our kids, just getting in the room while the other kids are doing the activity is a thing, at the beginning, of course the bar is always to get them to participate, to do everything, but sometimes that counts as yep they participated in that today, and you move the goal post for the next week or whatever. So yeah, I think it's very specific to the person that's participating. (P9).

As evidenced here, participants were cognizant of the notion that being involved may manifest differently among children with ASD.

Participation Depends on Who is Involved in the Activity

Consistent with the idea that participation is beyond the idea of simply being involved, participants described that children with ASD have clear preferences for who they will engage with. There was consensus that children with ASD, particularly those that are lower functioning, prefer activities that take place on a one-to-one basis rather than in a group. For example, "I would say they prefer one to one. I think that there's just a lower – low participation in more group work. Not sure why, but I think that – I think they mostly prefer one to one." (P5). In this

regard, instructors also agreed that children with ASD prefer to interact with older children or adults compared to their peers. For example, one participant expressed, “Definitely the adults in the room, for sure” (P9). Another similarly expressed, “I would say that typically in this population I find a lot that there is a deficit attending to peers” (P5). Underlying such preferences were descriptions of trust, comfort, and familiarity. For example:

> “I think participation can be characterized as a function of trust, in that situation, so, if they had trust in me and they knew that what we were doing was for the benefit of them, and they knew that we were teachers, then they were much more likely to be on board in what we were doing.” (P3)

Notwithstanding the previous, participants did admit it can take a long period of time for children with ASD to establish trust and become comfortable with new individuals in their environment: “after 6 months they were extremely comfortable with having me around, and they saw me as their teacher” (P7). Instructors collectively agreed that when the children were confronted with new staff members of the program, or other children were being a distraction, they were less likely to be engaged in the activity, “if there are new staff members, if there is a change in staff. Other students can be triggers” (P2). As children with ASD become more comfortable and familiar with the people around them, then opportunities to promote more activities and expand participation are afforded for instructors.

The concepts of comfort and familiarity were not only necessary for relationships with adult instructors, but also with developing peer relationships; over time, children with ASD were described as moving from working individually, to being more comfortable interacting with peers:

> “So, what I found was that when they became more familiar with one another they were more likely to interact with each other. Of course, that didn’t include everybody, but at the beginning of the year they were very to their own devices. The thing is the kids in the classroom, they were really all on opposite corners of

> the room and as they grew more and more familiar there was definitely more interaction." (P3)

Importantly, instructors acknowledged that, for some children with ASD, participation with peers only occurred when the expectations dictated that interaction was required, and others avoided group activities at all costs.

Although motivation, confidence, and competence in social and motor domains underlie participation, social challenges were perceived as the greatest barrier

Related to the notion of who children will engage with, instructors described how motivation, confidence, and competence in social and motor domains underlie participation patterns and preferences. Discussions were specific to each domain, and instructors also elaborated on the combined influence of social and motor skills on participation. When weighing social skills against motor skills, instructors generally perceived social challenges to play the biggest role in participation amongst children with ASD.

There was consensus that addressing social concerns was a priority for instructors: "I would say generally social skills are something that almost every kid is working on" (P5). Although some children with ASD were described by instructors as high functioning, with social deficits barely noticeable, most were described as demonstrating extreme challenges. Social awareness and the interpretation of social behaviours and cues were considered primary problem areas. For example, "there are some kids that are able to recognize them sometimes. But those are more the exceptions than the rule, in my opinion" (P3). Challenges with social communication and interaction were also discussed as an area of concern:

> "all of our kids I believe have stuff to say for sure, you can see it, but if they don't have a way of interacting or saying it, they might try one time, but if we don't see it, or that peer doesn't respond in a way that makes sense because they don't understand then they might not try again." (P9)

Children who were perceived to lack social competence and/or have lower levels of social confidence were described by instructors as less motivated to participate in social and group activities. Furthermore, instructors perceived that one unsuccessful attempt at social communication or interaction often discouraged a subsequent attempt at engaging in the same or similar activity.

Incorporating social skills into the daily routine and helping children develop the skills to interact was a goal for instructors, regardless of their specific role. Instructors described various ways to encourage children to engage with their peers and develop social skills. For example: "I think we do kind of contrived at first and then we try to make it a little more natural. But you can, like, reinforce it with edibles or other tangible reinforcement; but I think generally we try to do more natural reinforcement" (P5). Positive progressions were described over time as a result of carefully designed and implemented efforts; as children developed greater competence and confidence in social domains, they were more intrinsically motivated to participate in different capacities (i.e., in groups and with peers) and relied less on extrinsic rewards and motivators. For example, one instructor described:

> "I think for the most part there is a tendency to be more motivated for interaction with adults, simply because of what they can offer with keeping the kids engaged. Once they reach a certain point in their development that shifts, and they become more interested in peers. So they go through a progression of being focused on adult interaction to then being focused on interaction with kids who are a bit lower functioning or with less social skills than them, and they eventually they pin it again and they go more to a peer model that might be demonstrating a higher level of skill" (P4).

Another expressed, "But yeah, once they grasp that way to communicate, I guess, then they're interested for sure. Usually; Nothings for sure around here" (P9). Overall, instructors collectively agreed that addressing social skills is a critical component of any therapy or intervention program and are extremely beneficial for children with ASD.

In addition to challenges with social skills, instructors discussed functional delays in children's motor skills. While acknowledging motor skills are not part of the diagnostic criterion for ASD, statements along the lines of, "we'll go with awkward" (P1) were commonly expressed. Instructors noted lower levels of motor skill proficiency compared to typically developing children: "I see that there is a lack of body awareness a lot of the time. I would say in terms of physical development of motor skills, skills that organically or naturally for kids that are not on the spectrum don't come so naturally for kids on the spectrum" (P4). A key acknowledgment was the varying degree of deficit:

> "I find that on the lower end of the spectrum, who are more dependent and have more needs, I find their motor skills are definitely impaired more. From my experience, I think the impairment is coming from within the autism itself. They are more…not understanding how to do something, or how to participate in the activity, or their brain is so focused on the sensory environment around them, that they physically cannot do something." (I8)

Cognitive elements (e.g., planning) underlying the ability to perform both gross and fine motor skills were considered a key concern. Poor overall strength among children with ASD was also acknowledged; however, instructors questioned whether this may indeed be due to the lack of participation in physical activities, as opposed to a defining feature of children with ASD.

Compared to gross motor skill development, fine motor skills were collectively outlined as of great concern for instructors: "with the fine motor we're constantly working on it" (P1). Activities such as "handwriting, buttons, and zippers" (P8) were all highlighted. Discussions around motor coordination and planning were repeatedly emphasized and highlighted as a focus for fine motor skill intervention. For example, "we will teach those skills in a one-to-one basis and then move it kind of into independent activities type of program so they can do it on their own" (P5). Although instructors discussed positive outcomes, they acknowledged differences in the rate of progression. For example, one instructor expressed that "improvements vary in how

fast they were made and how great the changes were" (P3). Another described, "Definitely, improvement, but again, very, very slow movement. Even if it was every single day doing the same activities, it would take weeks and weeks at a time for them to master a skill" (P7).

As discussed earlier with reference to social skills, motivation was also a driving factor with motor skills, "If he feels he can't do it, then he won't" (P1). Participation, and the motivation to participate, was ultimately based on the confidence and competence that the child had with the motor skill and activity: "if they couldn't kick that soccer ball, they weren't playing soccer, no matter how hard we tried to get them to do that" (P3). Instructors discussed the frustration that children experienced when participating in physical activities in which they were not confident or competent; this was described as a major deterrent to participation.

Overall, instructors acknowledged that all children with ASD face similar challenges (i.e., relating to motivation, confidence, and competence) in both social and motor domains, albeit to varying degrees. Regardless of the role each participant assumed working with a child or children with ASD, there was consensus that social deficits served a greater barrier to participation compared to motor challenges. For example:

> I think it's definitely a combination, I think social would probably come up a little bit higher because they're not picking up on the social cues or the motivation to participate. But then they are delayed in the motor skills, then they aren't going to have the motivation or comfort level to participate. (P8)

Another instructor similarly described: "It's probably a combination of both, but I think the social one is probably the biggest one because they really need to understand what it is, remember what's expected of them, or pay attention to the cues to tell them how they can get the thing down" (P9).

While Acknowledging the Benefits of Participation, it is Necessary to be Cognizant of the Required Supports

Instructors saw increased opportunities for participation in extra-curricular activities as beneficial for children with ASD. For example, one participant stated, "I think getting them into activities outside of the classroom would benefit them a lot, just socially and confidence wise" (P6). Likewise, another expressed: "I think what would benefit them is a different range of activities… So not doing the same thing at the same place all year round would be beneficial" (P3). Instructors highlighted how the majority of children with ASD they work with depend on schedules and clear expectations to help guide and/or dictate behaviour. When expectations are consistently communicated and enforced across various aspects of life, children are more likely to excel and reap the benefits of participation.

Recognizing the benefits, participants also acknowledged specific factors that must be considered, and supports that must be in place, for meaningful participation to take place. For example, children with ASD enrolled in intensive programs may not have time for extra activities: "Most of my kids are with me for about 40 hours a week, so that doesn't give them a lot of extra time to run afterwards … I think it depends; it depends in the scope of their needs." (P4). Likewise, families may not have the means for anything "extra" (i.e., outside of school or publicly funded interventions and/or therapies):

> "Our population of students don't typically do that; I teach in a low socioeconomic area and we have a lot of in-the-grant families, refugees, so they don't necessarily have the knowledge or means to do that. … I don't think I've had a student that has participated in an outside activity in probably 5 years (P2)."

Finally, instructors generally discussed concerns over supports available for children with ASD:

> "Coming from what I know is available in the community, I think the choice of activities is really good, but I find that it's limiting because the kids don't necessarily have the support, and that the kids are going to need that one on one person to be able to participate, and the activities aren't necessarily providing that*"* (P8).

In addition to the potential one-to-one requirement, instructors reflected on how the environment and means of instruction must also be adjusted based on the unique needs of children with ASD. For example, one instructor explained:

> "Noise, like how noisy the environment is, how many people are in the physical space, does the physical space feel closed in, like how busy is the physical space, is there lots of things on the wall, how many people are issuing instructions, how fast the instructions come – sometimes you need to give somebody time to process what you said and if you start the next instruction right away they got to start again with the listening, the processing, and the understanding" (P9).

This highlights issues of accommodation, where instructors acknowledged organizing bodies may not have the resources to meet the needs of children with ASD, or they may not have the training necessary to include children with ASD in their programming. Instructors agreed that the array of challenges that children with ASD experience, and heterogeneity in how these difficulties manifest, makes it difficult to standardize intervention programs and inclusion opportunities.

Discussion

In the present research, we explored instructors' perspectives of social and motor skills among children with ASD and ensuing influence on participation. We were specifically interested in whether motor skills or social skills as independent domains of function were of primary concern, or, if instructors acknowledged the interrelationship between domains and were thus cognizant of combined influences on participation. Due to the semi-structured nature of interviews, instructors were free to express their opinions and share a narrative unique to their experiences working with children with ASD. This method of inquiry enabled us to reveal descriptive insight into the daily lives of children with ASD through the eyes of the instructors who support them in varying capacities.

Four overarching themes emerged from the data: (1) Viewpoints extend beyond the WHO definition of participation; (2) Participation depends on who is involved in activity; (3) Although motivation, confidence, and competence in social and motor domains underlie participation, social challenges were perceived as the greatest barrier; (4) While acknowledging the benefits of participation, it is necessary to be cognizant of the required supports. Together, the current findings complement related work from the perspectives of caregivers (AUTHORS, 2020); therefore, adding additional insight on a topic (i.e., the interrelationship between social and motor skills on participation among children with ASD) which is scarcely discussed in the literature (Holloway & Long, 2019). Each theme that emerged from interviews was rather consistent among participants. However, instructors' experiences did reflect the heterogeneity that is inherent to ASD, and thus a focus of literature (e.g., Lombardo et al., 2019). The following will offer additional detail to highlight these themes within existing research on the topic.

Viewpoints extend beyond the WHO definition of participation

When asked to define participation in their own words, instructors' descriptions were consistent with the definition of "involvement in a life situation" (WHO, 2002, p.10) provided by the WHO in the International Classification of Functioning, Disability, and Health (ICF). However, instructors also expressed that perceptions of what it means to be "involved" may differ for children with ASD; therefore, extending beyond the definition of participation listed in the ICF. Here, it is important to acknowledge that researchers generally report the WHO/ICF definition to be quite limited, highlighting that participation is a multidimensional construct (e.g., Cogan & Carlson, 2017; Hammel et al., 2008; Imms et al., 2017). For example, Hammel et al. (2008) have expressed that "there is no gold standard for ideal or optimal participation" (p.

1454). More recent work from Imms et al. (2017) suggests that participation is both a process and an outcome; therefore, their description includes, “attendance, defined as ‘being there’ and measured as frequency of attending, and/or the range of activities; and involvement, the experience of participation while attending” (p. 18). Likewise, Cogan and Carlson (2017) outlined three specific aspects of participation, including, performance (i.e., the execution of an activity), subjective experience (i.e., an individual’s perception in the specific context), and interpersonal connection (i.e., connection to other people in relation to the activity).

Recent literature has also discussed the idea of ASD-specific participation. Caregivers have admitted that they likely view participation differently than their young children (i.e., ages 5 to 9) with ASD (AUTHORS, 2020). Likewise, the notion of conditional participation (Arnell et al., 2018) has been proposed. Here, high functioning adolescents (ages 12-16 years) with ASD described five characteristics (freedom of choice, competence and confidence, motivation, adjustment to external demands, and predictability) that are necessary for participation in physical activities. Consistent with viewpoints from caregivers and adolescents with ASD, the current perspectives of instructors add important experiential insight into the complexity of participation for individuals with ASD in social and physical activities.

These varying approaches to understanding participation have exposed a need for a comprehensive theory of participation that acknowledges the multifaceted nature of participation in different contexts. It is important for instructors and other service providers to understand the varying factors that affect participation; community agencies should consider these factors in order to provide services that promote participation (King et al., 2013). Of particular importance, is the need for instructors and other service providers to understand how to differentiate opportunities in order to facilitate the participation of differently abled individuals.

Participation depends on who is involved in activity

As evidenced in findings from the current research, a key component of this complexity is the notion of who children with ASD prefer to participate with. Instructors described children's preference to participate in individual activities or engage one-on-one with an older child or adult; however, also admitted that connections took time to establish. Trust, comfort, and familiarity were described as key factors underlying the relationship between children and their instructors, and inevitably developing connections with peers as well. Related literature has noted that anxiety and fear associated with relationships are common in individuals with ASD (Brewster & Coleyshaw, 2014; Stanish et al., 2015). As such, activity enjoyment for children with ASD has been shown to increase with decreased interaction (Ayvazoglu et al., 2015; Potvin et al., 2014; Stanish et al., 2015). These findings demonstrate the need for the formulation of positive relationships with peers and other participants in order to promote active participation for children with ASD. It is important to recognize that these relationships may take an extended period of time to form (e.g., P7 stated a period of 6 months was needed before the child felt comfortable participating with them), and that relationships with other children of the same age or younger may take longer to establish.

Although motivation, confidence, and competence in social and motor domains underlie participation, social challenges were perceived as the greatest barrier

Consistent with previous work (Holloway & Long, 2019; AUTHORS, 2020), motor and social skill proficiency among children with ASD were perceived to be associated with participation restrictions and activity limitations. Instructors described how children with low perceived and/or actual social competence were often frustrated engaging in social activities; therefore, were discouraged or lacked motivation to participate. The same was said about motor

competence and participation in physical activities. Although the interplay between competence, confidence, and motivation was evidenced in discussion of both domains, when asked to weigh one against the other, there was consensus that social skills present a much greater barrier overall. This is consistent with caregiver reports (AUTHORS, 2020).

While motor capabilities were generally described as "awkward" due to deficient motor planning, coordination, and overall strength (Gowen & Hamilton, 2013; AUTHOR, 2016), instructors were primarily concerned with fine motor skill proficiency. This corroborates with caregivers' worries about fine motor skills involved with children's self-care and school performance (AUTHOR et al., 2015; AUTHORS, 2020). It was recently reported that there is a strong association between fine motor skills and social skills (Ohara et al., 2020). With respect to the social domain, instructors expressed specific concerns with social awareness, the interpretation of social behaviours, and social communication (APA, 2013).

Historically, early ASD interventions have been geared towards social function (MacDonald et al., 2013); only recently has motor function been a focus (MacDonald et al., 2013). When describing changes in function over time, instructors noted positive progression in social skills from primary engagement with adults, to lower functioning kids, and eventually peers with similar levels of function as confidence and competence increased. Notable improvements on the motor side were also reported, albeit recognizing that change in both domains is often quite slow.

While acknowledging the benefits of participation, it is necessary to be cognizant of the required supports

There was consensus among instructors that increased opportunities for participation in extra-curricular social and physical activities would indeed be beneficial. It is generally

understood that opportunities for cross-dimensional (i.e., social and motor) learning are critical, particularly for children with ASD; the most common opportunity for this type of learning takes place within physical activity contexts, where children have opportunities to practice social-communicative behaviours alongside their motor skills (Lee & Vargo, 2017). Notwithstanding the previous, instructors emphasized the fact that meaningful participation for children with ASD requires careful considerations and implementation of specific supports. This is consistent with previous reports. For example, when looking for opportunities for participation in physical activity, parents of adolescents with ASD have reported looking for groups that have desirable characteristics; typically, these include one-to-one programming, as there is often difficulty finding programs with the flexibility, time, and money to accommodate individual needs into community-based physical activity programs (Gregor et al., 2018).

Instructors in the current research similarly expressed that organizing bodies may not have the resources or training to accommodate children with ASD as there is no one-size-fits all approach. Frameworks have been proposed to promote participation among children with ASD. For example, Ashburner et al. (2014) describe six areas in their clinical reason framework. While the components of this framework are indeed in line with instructors' concerns (e.g., adapting tasks and/or the environment, using behavioural strategies, etc.), the authors acknowledge future research is needed to "substantiate the effectiveness" (p. 32) of their model. Literature to date has primarily focused on assessing participation levels, and the development and implementation of interventions to increase participation. Only recently have experiential aspects of participation among individuals with ASD (e.g., Arnell et al., 2018) been considered in this body of work.

Conclusion

Overall, findings from the current research add instructor perspectives to complement recent work with caregivers (AUTHOR, 2020) and a perspective piece on the bidirectional relationship between social and motor skills, and impact on participation (Holloway & Long, 2019). Four core themes revealed from semi-structured interviews add important insight regarding how children with ASD may view participation, the importance of who is involved, and the role of social and motor motivation, confidence, and competence. Likewise, findings support the notion that participation in social and physical activities is indeed beneficial, albeit must consider the unique needs of children with ASD. As this research was with instructors, future inquiries should consider the perspectives of children with ASD to help develop and implement interventions with more targeted solutions.

It is important to acknowledge limitations of this work. Beyond age and sex, no sociodemographic information was obtained. Likewise, we did not have ethics approval to provide specific details about our participants' role (or roles) working with children with ASD. While a list of roles was provided alongside a general range of experience length, it would have been beneficial to include a brief profile of each participant, and state which participant's quote was written in the manuscript. Future research in the area of social and motor participation of children with ASD should allow for analysis of perspectives based on additional sociodemographic factors (e.g., race, ethnicity, geographical location, etc.), as these additional factors will provide a more generalizable result.

What Does This Article Add?

Social skills may serve as a barrier to participation among children with Autism Spectrum Disorder (ASD); however, research examining participation patterns in social and physical activities is limited. It is argued that there is a bidirectional relationship between motor

and social skills development; yet, the association remains to be fully disentangled. From the perspective of instructors who work in varying capacities with children, this research adds important insight regarding the influence of social and motor skills on participation in ASD. The four themes that emerged demonstrate: (1) that perceptions of participation among children with ASD may differ from societal views; (2) who is involved in an activity matters; (3) while motivation, confidence, and competence in social/motor skills are important, social challenges were perceived as the greatest obstacle; (4) participation in social and physical activities is important; however, the unique needs of children with ASD must be considered. As research has typically been concerned with quantitative assessments of participation and interventions to increase participation levels, this work offers descriptive insight. Findings complement recent work with caregivers exploring experiential aspects of participation among individuals with ASD.

References

American Psychiatric Association (2013). Diagnostic and statistical manual (5th ed.). (DSM-5)). Arlington, VA: American Psychiatric Publishing.

Anaby, D., Law, M., Coster, W., Bedell, G., Khetani, M., Avery, L., & Teplicky, R. (2014). The mediating role of the environment in explaining participation of children and youth with and without disabilities across home, school, and community. *Archives of physical medicine and rehabilitation, 95*(5), 908-917. https://doi.org/10.1016/j.apmr.2014.01.005

Arnell, S., Jerlinder, K., & Lundqvist, L. O. (2018). Perceptions of physical activity participation among adolescents with autism spectrum disorders: A conceptual model of conditional participation. *Journal of Autism and Developmental Disorders, 48*(5), 1792-1802. https://doi.org/10.1007/s10803-017-3436-2

Ashburner, J. K., Rodger, S. A., Ziviani, J. M., & Hinder, E. A. (2014) Optimizing participation of children with Autism Spectrum Disorder experiencing sensory challenges: A clinical reasoning framework. *Canadian Journal of Occupational Therapy, 81*(1), 29-38. https://doi.org/10.1177/0008417413520440

Askari, S., Anaby, D., Bergthorson, M., Majnemer, A., Elsabbagh, M., & Zwaigenbaum, L. (2014). Participation of children and youth with autism spectrum disorder: A scoping review. *Review Journal of Autism and Developmental Disorders*, 2(1), 103–114. https://doi.org/10.1007/ s40489-014-0040-7

Ayvazoglu, N. R., Kozub, F. M., Butera, G., & Murray, M. J. (2015). Determinants and challenges in physical activity participation in families with children with high functioning autism spectrum disorders from a family systems perspective. *Research in Developmental Disabilities, 47*, 93–105. https://doi.org/10.1016/j.ridd.2015.08.015

Brewster, S., & Coleyshaw, L. (2011). Participation or exclusion? Perspectives of pupils with autistic spectrum disorders on their participation in leisure activities. *British Journal of Learning Disabilities, 39,* 284–291. https://doi.org/10.1111/j.1468-3156.2010.00665.x

Bruininks, R. H. (2005). *Bruininks-Oseretsky Test of Motor Proficiency, (BOT-2)*. Minneapolis, MN: Pearson Assessment.

Church, C., Alisanski, S., & Amanullah, S. (2000). The social, behavioral, and academic experiences of children with Asperger syndrome. *Focus on Autism and Other Developmental Disabilities, 15*(1), 12–20. https://doi.org/10.1177/108835760001500102

Cogan, A. M. & Carlson, M. (2017). Deciphering participation; An interpretive synthesis of its meaning and application in rehabilitation. *Disability and Rehabilitation, 40*(22), 2692-2703. https://doi.org/10.1080/09638288.2017.1342282

Constantino, J. N., & Gruber, C. P. (2012). *Social responsiveness scale (SRS)*. Torrance, CA: Western Psychological Services.

Coster, W., Bedell, G., Law, M., Khetani, M. A., Teplicky, R., Liljenquist, K., ... & KAO, Y. C. (2011). Psychometric evaluation of the Participation and Environment Measure for Children and Youth. *Developmental Medicine & Child Neurology*, *53*(11), 1030-1037. https://doi.org/10.1111/j.1469-8749.2011.04094.x

Dawson, G., Toth, K., Abbott, R., Osterling, J., Munson, J., Estes, A., & Liaw, J. (2004). Early social attention impairments in Autism: Social orienting, joint attention, and attention to distress. *Developmental Psychology*, *40*(2), 271-283. https://doi.org/10.1037/0012-1649.40.2.271

Egilson, S. T., Jakobsdóttir, G., & Ólafsdóttir, L. B. (2018). Parent perspectives on home participation of high-functioning children with autism spectrum disorder compared with a

matched group of children without autism spectrum disorder. *Autism*, *22*(5), 560-570. https://doi.org/10.1177/1362361316685555

Fournier, K. A., Hass, C. J., Naik, S. K., Lodha, N., & Cauraugh, J. H. (2010). Motor coordination in Autism Spectrum Disorderss: A synthesis and meta-analysis. *Journal of autism and developmental disorders*, *40*(10), 1227-1240. https://doi.org/10.1007/s10803-010-0981-3

Gowen, E., & Hamilton, A. (2013). Motor abilities in autism: a review using a computational context. *Journal of Autism and Developmental Disorders, 43*(2), 323–344. https://doi.org/10.1007/s10803-012-1574-0

Gregor, S., Bruni, N., Grkinic, P., Schwartz, L., McDonald, A., Thrille, P., … & Jachyra, P. (2018). Parents' perspectives of physical activity participation among Canadian adolescents with Autism Spectrum Disorder. *Research in Autism Spectrum Disorders*, *48*, 53-62. https://doi.org/10.1016/j.rasd.2018.01.007

Hammel, J., Magasi, S., Heinemann, A., Whiteneck, G., Bogner, J., & Rodriguez, E. (2008). What does participation mean? An insider perspective from people with disabilities. *Disability and rehabilitation*, *30*(19), 1445-1460. https://doi.org/10.1080/09638280701625534

Hilton, C. L., Crouch, M. C., & Israel, H. (2008). Out-of-school participation patterns in children with high-functioning autism spectrum disorders. *American Journal of Occupational Therapy*, 62, 554–563. https://doi.org/10.5014/ajot.62.5.554

Hochhauser, M., & Engel-Yeger, B. (2010). Sensory processing abilities and their relation to participation in leisure activities among children with high-functioning autism spectrum

disorder (HFASD). *Research in Autism Spectrum Disorders*, 4, 746–754. https://doi.org/10.1016/j.rasd.2010.01.015

Hocking, D. R., & Caeyenberghs, K. (2017). What is the nature of motor impairments in autism, are they diagnostically useful, and what are the implications for intervention?. *Current Developmental Disorders Reports*, *4*(2), 19-27. https://doi.org/10.1007/s40474-017-0109-y

Holloway, J. M., & Long, T. M. (2019). The interdependence of motor and social skill development: influence on participation. *American Physical Therapy Association,* 99(6):761-770. https://doi.org/10.1093/ptj/pzz025.

Imms, C., Granlund, M., Wilson, P., Steenbergen, B., Rosenbaum, P., & Gordon, A. (2017). Participation, both a means and an end: A conceptual analysis of processes and outcomes in childhood disability. *Developmental Medicine and Child Neurology*, 59, 16–25. https://doi.org/10.1111/dmcn.13237.

Kaljača, S., Dučić, B., & Cvijetić, M. (2019). Participation of children and youth with neurodevelopmental disorders in after-school activities. *Disability and Rehabilitation, 41*(17), 2036-2048. https://doi.org/10.1080/09638288.2018.1457092

Ketcheson, L., Hauck, J., & Ulrich, D. (2017). The effects of an early motor skill intervention on motor skills, levels of physical activity, and socialization in young children with autism spectrum disorder: A pilot study. *Autism*, *21*(4), 481-492. https://doi.org/10.1177/1362361316650611

King, M., Shields, N., Imms, C., Black, M., & Ardern, C. (2013). Participation of children with intellectual disability compared with typically developing children. *Research in Developmental Disabilities*, 34(5), 1854-1862. https://doi.org/10.1016/j.ridd.2013.02.029

Lamash, L., Bedell, G., & Josman, N. (2020). Participation patterns of adolescents with autism spectrum disorder compared to their peers: Parents' perspectives. *British Journal of Occupational Therapy*, 83(20, 78-87. https://doi.org/10.1177/0308022619853518

Lee, J., & Vargo, K. (2017) Physical activity into socialization: A movement-based social skills program for children with Autism Spectrum Disorder. *Journal of Physical Education, Recreation & Dance, 88*(4), 7-13. https://doi.org/10.1080/07303084.2016.1270788

Leonard, H. C., & Hill, E. L. (2014). Review: The impact of motor development on typical and atypical social cognition and language: A systematic review. *Child and Adolescent Mental Health, 19*(3), 163-170. doi:10.1111/camh.12055

Little, L. M., Sideris, J., Ausderau, K., & Baranek, G. T. (2014). Activity participation among children with autism spectrum disorder. *American Journal of Occupational Therapy, 68*(2), 177-185. https://doi.org/10.5014/ajot.2014.009894

Liu, T., Kaarengala, V., & Litchke, L. G. (2019). Motor competence and social function in children with Autism Spectrum Disorder. *Journal of Physical Education and Sport, 19*(1), 521-526. https://doi.org/10.7752/jpes.2019.01076

Lombardo, M. V., Lai, M. C., & Baron-Cohen, S. (2019). Big data approaches to decomposing heterogeneity across the autism spectrum. *Molecular Psychiatry*, *24*(10), 1435-1450. https://doi.org/10.1038/s41380-018-0321-0

Lloyd, M., MacDonald, M., & Lord, C. (2013). Motor skills of toddlers with autism spectrum disorders. *Autism*, *17*(2), 133-146. https://doi.org/10.1177/1362361311402230

MacDonald, M., Lord, C., & Ulrich, D. A. (2013). The relationship of motor skills and social communicative skills in school-aged children with Autism Spectrum Disorder. *Adapted Physical Activity Quarterly, 30*(3), 271-282. https://doi.org/10.1123/apaq.30.3.271

Mancini, M. C., Coster, W. J., Trombly, C. A., & Heeren, T. C. (2000). Predicting elementary school participation in children with disabilities. *Archives of Physical Medicine and Rehabilitation*, 81, 339-347. https://doi.org/10.1016/S0003-9993(00)90081-9

Maxwell, J. A. (2012a). *A realist approach for qualitative research*. Thousand Oaks: Sage publications.

Maxwell, J. A. (2012b). *Qualitative research design: An interactive approach* (Vol. 41). Thousand Oaks: Sage publications.

Mazurek, M. O., & Wenstrup, C. (2013). Television, video game and social media use among children with ASD and typically developing siblings. *Journal of Autism and Developmental Disorders*, *43*(6), 1258-1271. https://doi.org/10.1007/s10803-012-1659-9

Ohara, R., Kanejima, Y., Kitamura, M., & P Izawa, K. (2020). Association between Social Skills and Motor Skills in Individuals with Autism Spectrum Disorder: A Systematic Review. *European Journal of Investigation in Health, Psychology and Education*, *10*(1), 276-296. https://doi.org/10.3390/ejihpe10010022

Patton, M. Q. (2014). *Qualitative Research & Evaluation Methods* (4th Ed). London: Sage Publications

Pietkiewicz, I., & Smith, J. A. (2014). A practical guide to using interpretative phenomenological analysis in qualitative research psychology. *Psychological journal*, *20*(1), 7-14. https://doi.org/10.14691/CPPJ.20.1.7

Potvin, M.-C., Snider, L., Prelock, P., Kehayia, E., & Wood-Dauphinee, S. (2013). Recreational participation of children with high functioning autism. *Journal of Autism and Developmental Disorders*, 43, 445–457. https://doi.org/10.1007/s10803-012-1589-6

Pusponegoro, H. D., Efar, P., Soebadi, A., Firmansyah, A., Chen, H. J., & Hung, K. L. (2016). Gross motor profile and its association with socialization skills in children with autism spectrum disorders. *Pediatrics & Neonatology*, *57*(6), 501-507. https://doi.org/10.1016/j.pedneo.2016.02.004

Ratcliff, K., Hong, I., & Hilton, C. (2018). Leisure participation patterns for school age youth with autism spectrum disorders: Findings from the 2016 National Survey of Children's Health. *Journal of Autism and Developmental Disorders*, 48, 3783–3793. https://doi.org/10.1007/s10803- 018-3643-5

AUTHORS. (2020).

Sacrey, L.-A. R., Germani, T., Bryson, S. E., and Zwaigenbaum, L. (2014). Reaching and grasping in autism spectrum disorder: A review of recent literature. *Frontiers in Neurology* 5:6. https://doi.org/10.3389/fneur.2014.00006

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., ... & Jinks, C. (2018). Saturation in qualitative research: exploring its conceptualization and operationalization. *Quality & quantity*, *52*(4), 1893-1907. https://doi.org/10.1007/s11135-017-0574-8

AUTHOR. (2016).

AUTHOR. (2015).

AUTHOR. (2017).

Simpson, K., Adams, D., Bruck, S., & Keen, D. (2019). Investigating the participation of children on the autism spectrum across home, school, and community: A longitudinal study. *Child: Care, Health and Development*, 45(5), 681-687. https://doi.org/10.1111/cch.12679

762 Simpson, K., Keen, D., Adams, D., Alston-Knox, C., & Roberts, J. (2018). Participation of
763 children on the autism spectrum in home, school, and community. *Child: Care, Health and*
764 *Hevelopment*, *44*(1), 99-107. https://doi.org/10.1111/cch.12483
765 Shattuck, P. T., Orsmond, G. I., Wagner, M., & Cooper, B. P. (2011). Participation in social
766 activities among adolescents with an Autism Spectrum Disorder. *PLoS ONE, 6*(11), e27176.
767 https://doi.org/10.1371/journal.pone.0027176
768 Srivastava, P., & Hopwood, N. (2009). A practical iterative framework for qualitative data
769 analysis. *International Journal of Qualitative Methods*, *8*(1), 76-84.
770 https://doi.org/10.1177/160940690900800107
771 Stanish, H., Curtin, C., Must, A., Phillips, S., Maslin, M., & Bandini, L. (2015). Enjoyment,
772 barriers, and beliefs about physical activity in adolescents with and without autism
773 spectrum disorder. *Adapted Physical Activity Quarterly*, *32*, 302–317.
774 https://doi.org/10.1123/APAQ.2015-0038
775 Taheri, A., Perry, A., & Minnes, P. (2016). Examining the social participation of children and
776 adolescents with intellectual disabilities and autism spectrum disorder in relation to peers.
777 *Journal of Intellectual Disability Research*, 60(5), 435–443.
778 https://doi.org/10.1111/jir.12289
779 Teitelbaum, P., Teitelbaum, O., Nye, J., Fryman, J., & Maurer, R. G. (1998). Movement analysis
780 in infancy may be useful for early diagnosis of autism. *Proceedings of the National*
781 *Academy of Sciences*, *95*(23), 13982-13987. https://doi.org/10.1073/pnas.95.23.13982
782 World Health Organization. (2002). *International classification of functioning, disability and*
783 *health: ICF*. Geneva: World Health Organization.
784