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School-Based Physical Activity Levels and Quality of Physical Education Participation Experiences of Children with Physical and Sensory Disabilities Living in British Columbia, Canada

Aleksandra Jevdjevic [1,*], Kelly P. Arbour-Nicitopoulos [2], Kathleen A. Martin Ginis [1,3,4] and Christine Voss [4,5,*]

[1] School of Health and Exercise Sciences, University of British Columbia, Kelowna, BC V1V 1V7, Canada; kathleen_martin.ginis@ubc.ca
[2] Faculty of Kinesiology and Physical Education, University of Toronto, Toronto, ON M5S 1A1, Canada; kelly.arbour@utoronto.ca
[3] Department of Medicine, Division of Physical Medicine & Rehabilitation, University of British Columbia, Vancouver, BC V5Z 2G9, Canada
[4] Centre for Chronic Disease Prevention and Management, University of British Columbia, Kelowna, BC V1V 1V7, Canada
[5] Department of Pediatrics, University of British Columbia, Vancouver, BC V6H 3V4, Canada
* Correspondence: aleks.jevdjevic@ubc.ca (A.J.); christine.voss@ubc.ca (C.V.)

Abstract: This mixed-methods study examined school-based physical activity (PA) and the quality of physical education (PE) experiences for children with physical or sensory disabilities. The participants included 10 children (4 girls, 6 boys) with a mean age of 10 years, 5 of whom had sensory disabilities, and 5 of whom had physical disabilities. PA was measured using accelerometry over a 7-day period. Semi-structured interviews explored the children's experiences in PE classes. Interview data were deductively coded using the Quality Participation Framework to identify examples of autonomy, belongingness, challenge, engagement, mastery, and meaning. On average, children engaged in 17 min per day (standard deviation (SD) = 16) of moderate-to-vigorous-intensity physical activity (MVPA) during school, and 5 min of MVPA (SD = 6) during PE classes. Most children did not meet the provincial policy of 30 min per day of school-based MVPA. Children reported both positive and negative examples of autonomy, belongingness, challenge, engagement, and mastery, and positive experiences of meaning. Overall, children with physical or sensory disabilities accumulate minimal MVPA during school and have mixed-quality participation experiences in PE. These insights can guide efforts to enhance both the quantity of school-based MVPA and the quality of participation in PE for children with disabilities.

Keywords: accelerometry; quality participation; pediatrics; belonging; mastery; autonomy; challenge; engagement; meaning

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1. Introduction

The 2022 Global Matrix of Para Report Cards on Physical Activity of Children and Adolescents with Disabilities [1] is a landmark publication in the field of adapted physical activity (PA). In addition to documenting low levels of PA, the report cards collectively highlight the significant gaps and disparities in PA research involving children and adolescents with disabilities, worldwide. Across the 14 participating countries/jurisdictions that participated in the report card project, nearly half (45%) of the report card indicators could not be graded due to insufficient data. Only 11 countries (79%) had sufficient data to grade the key indicator of Overall Physical Activity, that is, the percentage of children

and adolescents who meet the Global Recommendations on Physical Activity for Health, which recommend that children and adolescents accumulate at least 60 min of moderate-to-vigorous-intensity physical activity (MVPA) per day on average [1]. With less than one-third of children and adolescents with disabilities meeting this recommendation, the average grade was a D minus. Together, these data attest to the need for more PA data, services, opportunities, and policies for children and adolescents with disabilities.

Of relevance to the present study is that the Canadian Para Report Card [2] summarized and evaluated data from three national, representative data sets and one national survey of parents of children and adolescents with disabilities. The grade for the overall PA indicator was a D, indicating that the majority do not meet the Global Recommendations on Physical Activity for Health. Looking specifically at schools as a source of influence on PA, the grade was "incomplete" because there were no data, or because there were insufficient data available for five out of six benchmarks for the school indicator (e.g., % of schools where the majority (≥80%) of students are offered the mandated amount of physical education (PE); % of schools where the majority (≥80%) of students are taught by a PE specialist). Only one benchmark—the percentage of students receiving at least 150 min of PE per week—had sufficient data. For Kindergarten to Grade 8 students, estimates for this benchmark ranged from 20% to 38%. As with the results of the overall Global Matrix Para Report project, the Canadian report card authors noted the lack of national surveillance data on PA patterns during school and a need for research to better understand participation in PE by children and adolescents with disabilities.

Participation in PA during school, and participation in PE in particular, are important for promoting children's active lifestyles and overall well-being. In Canada, all provinces and territories have policies stipulating minimum daily PA and/or PE requirements for children [3]. For instance, in the province of British Columbia, schools must ensure that students from Kindergarten to Grade 9 engage in a minimum of 30 min of PA on school days (alternatively, students in Grades 8 and 9 can accumulate 150 min of PA weekly), regardless of whether students have a scheduled PE class [4]. We are aware of only one published study that estimated school-based PA time in Canadian children with any type of disability. This study reported data collected from a national survey of parents of 202 children with Autism Spectrum Disorder (ages 6–13 years). Based on the parents' self-reported estimates, children were engaged in MVPA during recess for an average of 86 (SD = 92) minutes per week and spent 120 min per week (SD = 88) in PE classes. The children's average enjoyment ratings of PE classes was M = 6.5 (SD = 2.6) on a 10-point scale, suggesting that many children did not have optimal PE participation experiences.

Bremer et al.'s study [5] provides much-needed preliminary data on school-based PA in children with some of the most prevalent forms of childhood disability in Canada (i.e., neurodevelopmental disabilities). We are unaware of any published studies of school-based PA in children with other types of disabilities in Canada. Research and data on the amount of PA performed at school and during PE are vital for evaluating whether children with disabilities fully benefit from school-based PA. In Canada, 3.7% of children and adolescents under 15 years old report having a disability, with 11% reporting having a physical disability [6], and approximately 10% reporting having a visual or hearing impairment [4]. Given the relative prevalence of these disability groups, the focus of the present study was on measuring in-school PA and PE participation in children with physical or sensory disabilities.

Building on Bremer et al.'s findings of low PE enjoyment ratings [5], we also explored the quality of children's PE experiences. Imms and colleagues have distinguished between a child's participation in activities (i.e., attendance) and that child's participation experiences (i.e., involvement) [7,8]. Attendance is defined as "being there" and the frequency and

range of activities in which the child participates. Involvement is defined as the experience of participating while in attendance, and may include elements of affect, motivation, social connection, and persistence. Similarly, within the context of adapted physical activity, the Quality Participation Framework (QPF) [9] emphasizes the significance of experiential aspects of PA participation for children, adolescents and adults with disabilities [6]. In the QPF [9], quality PA participation experiences are defined as when participants appraise their PA experiences to satisfy one or more of six values and needs—autonomy, belongingness, challenge, engagement, mastery and meaning. Quality PA participation experiences are positively related to subjective well-being [10] (SWB) and may promote long-term PA participation [9]. Hence, there is tremendous value in research to understand and improve the quality of PE participation experiences among children with disabilities.

We are aware of only one study [11] that explored the issue of PE participation experiences among children with physical disabilities in Canada, and no studies conducted in Canada involving children with sensory disabilities. In that study [11], researchers gathered data through focus group interviews, participants' drawings, and field notes to describe inclusive physical education experiences from the perspectives of nine elementary school-aged children (ages 10–12) with physical disabilities. Using thematic analyses, the authors found that participants experienced physical education as either *good days* or *bad days*. *Good days* were characterized as providing a sense of belonging, and opportunities to share in the benefits of PA participation and to demonstrate skills in front of classmates. These outcomes align with the QPF [9] elements of belongingness, meaning, and mastery, respectively. *Bad days* were characterized as days when the children's competence was questioned by their peers, when they experienced social isolation, or when their participation was inhibited by teachers, classmates, or the instructional space.

Despite a growing body of research on quality participation in various disability groups and PA contexts, no published studies have focused specifically on PE among children with physical or sensory disabilities in Canada yet. Without adequate information on both the quantity of school-based PA and the quality of PE, it is challenging to assess and improve the effectiveness of current policies and practises to promote equitable opportunities for school-based PA participation among students with disabilities. As a preliminary step toward addressing these knowledge gaps, the objectives of this study were to (1) measure the amount of time for which children with physical or sensory disabilities engage in MVPA while at school in general, and in PE in particular, and (2) to describe the children's PE participation experiences using the QPF [9].

2. Materials and Methods

2.1. Positionality Statement and Philosophical Approach

The first author is a white woman without a disability and a grade 1 to grade 12 PE teacher with experience working with children with disabilities in Europe. Her background in PE influenced the research questions given her belief in the importance of inclusivity. Neither the first author nor any the co-authors has lived experience as a child with a disability; however, each author has extensive experience interacting with children with disabilities and a deep understanding of the need for better inclusion in PA. Recognizing the significance of positionality, and the beliefs held by the authors, they engaged in self-reflection throughout the various phases of this project to identify and address potential biases that could have influenced the results.

This study is grounded in a constructionist philosophical approach, such that knowledge and meaning are constructed through social interactions and experiences. The authors' ontological stance aligns with the belief that reality is socially constructed and varies based on individual perspectives [12]. Their epistemological perspective emphasizes the im-

portance of understanding the subjective experiences of children with disabilities in PE settings. Through this constructionist lens, the researchers aimed to capture the diverse realities of the participants, acknowledging that their interpretations are influenced by their background and positionality.

2.2. Participants

In Canada, education falls under provincial jurisdiction, and children's in-school PA experiences vary tremendously across the country [13]. Therefore, we drew our sample from a single province: British Columbia. Inclusion criteria required participants to be between 7 and 12 years old, attend elementary school (public or private), and participate in PE. Children without disabilities and home-schooled children were excluded. Participants were recruited by sending emails to participants in a previous study and to provincial disability organizations, advertising on the Research Engagement and Collaboration Hub British Columbia (REACH BC) website, social media postings, and distributing flyers in recreational facilities and BC Children's Hospital. Recruitment occurred over a single school year, and a total sample of 10 were recruited between November 2022 and May 2023.

2.3. Study Design and Study Protocol

A mixed-methods sequential explanatory study design was employed [14]. Quantitative data were collected and analyzed before qualitative data collection and analysis. The study protocol was approved by The University of British Columbia Behavioural Research Ethics Board (H22-00842). Interested volunteers contacted the first author and were provided with a written electronic form for caregiver consent and assent for children, along with a description of the study's purpose (to assess physical activity levels) and procedure (to wear a device for a week and partake in a virtual interview) written for a child's understanding. The consenting caregiver then completed a questionnaire that included items querying their child's age, self-identified gender, ethnicity, disability status, and school. Consent/assent forms and questionnaires were delivered and completed using the Qualtrics survey tool. Next, the study participants were mailed an accelerometer, an activity log, and an information sheet. The information sheet contained a photo of correct device placement and step-by-step instructions on how to wear the device and complete the log. In addition, contact information for a research coordinator was provided in case a participant required further assistance during data collection. Upon completion of the monitoring period, participants returned the device and logs to the research team by post. Semi-structured interviews were scheduled approximately one week later. The child was interviewed (with the caregiver present) regarding their experiences in PE. The goal was to explore the child's PE participation experiences and identify examples of the six quality participation elements. Interviews focused on PE in particular, rather than school-based PA participation in general, in order to keep the interview duration reasonable and to provide a consistent context across interviews, as all of the children participated in PE but may not have participated in other school-based forms of PA. Furthermore, the research team reasoned that information gleaned about children's PE experiences might lead to more actionable recommendations than information about school-based PA experiences in general.

2.4. Quantitative Measures

2.4.1. Accelerometry

An ActiGraph wGT3x-BT accelerometer (ActiGraph LLC, Pensacola, FL, USA) was used to measure the children's activity. This device, measuring 4.5 × 3.3 × 1.5 cm and weighing 19 g, records triaxial acceleration data. Devices were used in accordance with manufacturer's guidelines and initialized using the ActiLife software (Version 6.13.4) to

record data over a set period (sampling set at 30 Hz). Participants were instructed to wear the device on their right hip for seven continuous days during waking hours, removing it only for water-based activities like bathing and swimming.

2.4.2. Activity Log

Caregivers completed an activity log during the 7-day period when the ActiGraph device was worn. The log consisted of paper forms to record the exact time when the ActiGraph device was put on and taken off each day, and the start and end times of PE classes.

2.4.3. Accelerometry Data Processing

ActiLife 6 Version 6.13.4 was used to download, process, and analyze accelerometer data from raw GT3X files, converting them into .agd files using a 15 s epoch. The 15 s epoch and device placement on the hip were chosen to align with the calibration of cutpoints used to classify PA intensities [15]; in particular, they were chosen to capture the sporadic nature of children's activities [16]. Using the wear time validation function in ActiLife software, a day of data collection was considered valid if the participant wore the device for >600 min [17]. Non-wear time was defined as >60 min of zero activity counts, allowing up to 2 min of <100 counts per minute [17]. To be included in the analyses, participants were required to have four valid days of data including one weekend day [18]. PA intensity was classified using Evenson cutpoints, which are well validated for children [15]. Light physical activity (LPA) was defined as accelerometer counts between 100 and 2295 per minute, while moderate-to-vigorous physical activity (MVPA) was defined as counts of 2296 or more. ActiLife's Global Date and Time Filters were used to isolate PA during school hours based on the school bell schedule (obtained from the school's website), and the child's PE schedule reported in the activity log. The first author performed the accelerometer data processing steps and was not blinded to the study's purpose.

2.4.4. Interviews

The first author reviewed the activity log and accelerometer data before the interviews, as a method for preparing the interview questions. The interviews were conducted via an institutional Zoom account (Zoom Video Communications, San Jose, CA, USA; Version 5), with the parent present during the child's interview. Participants had the option to keep their cameras turned off during the interview. Eight children completed the interviews. Two participants were unable to complete the interview due to their vacation schedules and the difficulty in finding a mutually convenient time. Interviews were audio-recorded and automatically transcribed using Zoom's transcription feature. Interview guide had the following questions:

- What is your favourite activity during PE classes?
- Do you usually play with your friends?
- What sports/activities/games do you not like to play during PE classes? Why?
- What sport/activities/games would you like to play during PE classes?

2.5. Data Analysis

2.5.1. Quantitative Data Analysis

Data management and analysis were conducted using Statistical Product and Service Solutions (SPSS) version 28.0 (IBM, Chicago, IL, USA), and The R Project for Statistical Computing version 4.2.3, with the RStudio interface (Vienna, Austria). Each child's school-based MVPA time was calculated by averaging MVPA they performed during school hours, across all days on which they attended school during the 7-day data-collection period. Each

child's MVPA during PE classes was calculated by averaging their MVPA across all PE classes attended during the data collection period.

2.5.2. Qualitative Data Analysis

The first author reviewed the Zoom transcripts and corrected them for accuracy before analysis. The transcripts were analyzed deductively, using the QPF [9]. Statements were coded according to definitions of the six aspects of quality participation (autonomy, belongingness, challenge, engagement, mastery, and meaning) [19], which we adjusted for the PE context. The element of autonomy was defined as children's feelings of choice, control, and self-direction in PE. Belongingness was defined as the sense of connection, acceptance, and inclusion experienced by children in PE. The challenge element was defined as the perception of appropriate difficulty levels and opportunities for growth and skill development. Engagement referred to the level of interest, involvement, and active participation demonstrated by children during PE. Mastery pertained to the sense of accomplishment, progress, and competence experienced by children. Lastly, the element of meaning captured the extent to which children perceived value and relevance in their PE experiences. Deductive analysis was carried out with the support of a critical friend with experience analyzing interview data using the QPF [20].

3. Results

3.1. Participant Demographics

Participants' mean age was 10 years (SD = 2). Four participants identified as girls and the remainder as boys. Five participants had sensory disabilities, and five had physical disabilities. Six participants identified as white, one as South Asian, one as East Asian, one as Hispanic, and one participant did not specify. All participants attended public schools that aim to integrate children with physical and sensory disabilities alongside their peers. Participant characteristics are presented in Table 1. To protect participants' anonymity, we do not present characteristics of individual participants. All participants met minimum wear time requirements and all participants returned completed activity logs.

Table 1. Characteristics of children who participated in the study.

	Total Sample (*n* = 10)	**Children with Sensory Disabilities (*n* = 5)**	**Children with Physical Disabilities (*n* = 5)**
Gender (*n*)			
Girl	4	3	1
Boy	6	2	4
Age (years)	10 ± 2	9 ± 1	10 ± 2
Height (cm)	134 ± 21	138 ± 13	131 ± 29
Weight (kg)	35 ± 12	37 ± 9	33 ± 16

Note: Results reported as *n* or mean (M) ± standard deviation (SD).

3.2. Accelerometry-Measured Physical Activity

Participants wore accelerometers for an average of 780 min per day. Four participants had seven valid wear days (defined as days with at least 600 min of wear time), three participants had six valid days, one participant had five valid days, and one participant had four valid days. The accelerometer malfunctioned for one participant (P4), resulting in missing data across all wear days. This participant's data were excluded from the quantitative analysis, resulting in $n = 9$.

3.2.1. School-Based Moderate-to-Vigorous Physical Activity (MVPA)

The analysis was conducted based on the number of valid accelerometer wear days that were school days (i.e., 'valid school days'; see Table 2). During school hours, children spent an average of 17 (SD = 15) minutes per day experiencing MVPA while at school. Three participants met or exceeded the provincial government policy of 30 min per day of school-based MVPA.

Table 2. School-Based Moderate-to-Vigorous Physical Activity.

	School Time (Min/Day)	Valid School Days (*n*)	School MVPA (Min/Day)
P1	376	5	19
P2	360	5	15
P3	355	4	14
P4	—	—	—
P5	343	4	0
P6	400	5	37
P7	355	5	33
P8	384	4	1
P9	395	5	37
P10	405	3	0
Mean	375	4	17
SD	23	1	15

MVPA—moderate-to-vigorous physical activity. SD—standard deviation. Data for P4 were unavailable due to accelerometer malfunction.

3.2.2. Moderate-to-Vigorous Physical Activity (MVPA) During Physical Education

During the week of data collection, five participants had one PE class, three participants had two PE classes, one participant had no PE classes (the classes were cancelled for in-school holiday activities), and the accelerometer malfunctioned for one participant. Caregivers reported PE classes to be scheduled for an average of 46 min (SD = 10) in duration (see Table 3). The eight children who had at least one PE class engaged in an average of 5 min of MVPA (SD = 5) during PE.

Table 3. Moderate-to-Vigorous Physical Activity (MVPA) During Physical Education.

	PE Scheduled (Min/Class)	PE Scheduled (Times/Week)	PE Actual (Times/Week)	MVPA during PE (Min/Class)
P1	40	2	1	10
P2	60	3	1	0
P3	35	1	1	6
P4	—	2	—	—
P5	30	5	1	0
P6	49	1	2	9
P7	—	3	0	—
P8	45	2	2	0
P9	55	5	2	11
P10	50	2	1	0
Mean	46	2	1	5
SD	10	1	1	5

MVPA—moderate-to-vigorous physical activity. SD—standard deviation. PE—physical education. PE was cancelled the week of testing for P7. Data for P4 were unavailable due to accelerometer malfunction.

3.3. Quality Participation Experiences in PE

The deductive analysis provided insights into and examples of how children did and did not experience the six elements of quality participation during PE. For five of the six elements (all elements except meaning), children provided examples of situations linking the element to both positive and negative participation experiences. The following sections present quotes that exemplify these experiences. Quotes are presented with pseudonyms along with the participant's gender (G = girl; B = boy), age, and type of disability in parentheses.

3.3.1. Autonomy

In the context of PE, positive autonomy experiences were described in situations when children had the opportunity to engage in physical activities of their choice while maintaining control over their participation. For instance, Meghan (G, 9, sensory disability) described a positive autonomy experience when she had freedom to select a preferred activity: "Sometimes teacher gives us a choice. You can choose a gym period and lead it. You can do it with a partner. I was doing soccer". In contrast, Ryan (B, 11, physical disability) recounted the negative experience of never being allowed to choose a sport he wanted to play: "Normally the sport we do is by like class vote. . .most of the kids, everyone except me chooses dodge ball. And they never said, Okay, let's let Ryan pick a game". Callie (G, 8, physical disability) explained that if a teacher gave too much autonomy, and not enough instruction, this was a negative experience. She expressed frustration with the lack of guidance for activities that were not adapted to her abilities: "If it is running, then the teacher says 'just try your best'. Like I can't run with them, I'm much slower than anyone else".

3.3.2. Belongingness

For Meghan (G, 9, sensory disability), inclusion and connection were positive motives for participating in PE: "Sometimes I participate in PE just because I want to be part of the game". In contrast, Callie (G, 8, physical disability) explained how her classmates' efforts to include her could be a negative experience when they did not understand or acknowledge her participation limitations and preferences: "They kind of motivate you to do it, but then it's hard for me when they don't understand that sometimes I don't want to play, and I get really tired". Jordan (B, 11, physical disability) felt disconnected from his classmates because he did not share the same interests: "The kids in my class really like dodgeball. I'm the only one who does not like dodgeball". For Jordan, PE was a negative experience because he had different activity preferences than his classmates: "Most of the time I do not enjoy being in PE. . .I'm the only one in the class that likes pickle ball. I think that my class thinks it's like a sport for old people".

3.3.3. Challenge

Positive experiences of challenge were reflected in children's descriptions of receiving support or opportunities for skill improvement. For example, Sara (G, 9, sensory disability) shared how her PE teacher gave her extra attention on a badminton skill: "Sometimes when we are practicing badminton and the footwork, our teacher helps the kids who are not really doing so good with it". Negative experiences of challenge were described by a child who could not keep up with an activity and had insufficient time to develop skills: "We only do basketball for three weeks and there is not enough time for me to practice". This quotation came from Ryan (B, 11, physical disability).

3.3.4. Engagement

Positive engagement experiences reflected children's interest, involvement and enjoyment during PE. Jordan (B, 11, physical disability) talked about a PE class activity where he and a partner made a fitness station for Kindergarten students: "I enjoyed doing it, and also the little kids thought it was fun. Me and [my partner] . . . We found it really fun too". One of Brandon's (B, 8, sensory) favourite PE activities was dodgeball. He described in great detail, many variations of dodgeball (e.g., bench dodgeball, doctor dodgeball) and his different roles in those games. His enjoyment seemed to stem from the variety and his involvement: "I played a bunch [of dodgeball games]. I love Doctor Dodge!" In contrast, Jordan (B, 11, physical disability), shared that he did not enjoy playing soccer in PE because he did not have an opportunity to fully participate: "I think it might be because everybody needs to be like always crowding the ball. And you never really have a chance to kick it". For Jake (B, 12, physical) interest in a given activity boiled down to having a sense of mastery: "I'm not good at it so I don't really have an interest".

3.3.5. Mastery

Positive mastery experiences were characterized by situations where children had confidence in their abilities to perform, or at least try, an activity. For example, Callie (G, 8, physical disability) shared how she felt capable to try an activity after her teachers adapted the activity and encouraged her: "They get it and try to adapt it. They might say 'Oh [Callie] you can try and do this in your chair'. And I am like, Okay, I can try it!". In contrast, Jordan (B, 11, physical disability) described feeling badly and quitting an activity because he could not master the rules: "I used to get upset in PE class because... I wasn't able to learn the rules of anything...I had to like just sit on the bench for the rest of PE. . .I said I'm gonna sit for the entire thing, like I just want to stop".

3.3.6. Meaning

There were almost no expressions from the children about the importance or value placed on PE. Ryan (B, 11, physical disability) valued participating in PE activities in order to improve his skills and stay active with friends: "When I feel I am not on the same skill level as my friends, I just keep pushing myself because I want to stay active and be with my friends". Children did not provide any examples of negative experiences of meaning.

4. Discussion

This mixed-methods study assessed school-based MVPA, MVPA during PE, and quality participation experiences in PE classes among children with physical or sensory disabilities who live in the Canadian province of British Columbia. A notable finding is the relatively low level of compliance with the daily PA requirements outlined by the Ministry of Education in British Columbia. Of the nine children for whom we had accelerometry data, only three met the provincial policy of 30 min of MVPA during school days [3]. This finding suggests that there are challenges in implementing and ensuring adherence to daily PA policies for children with physical or sensory disabilities. No other studies have measured PA among children with physical or sensory disabilities within the context of daily PA school policies in Canada. Our findings underscore the need for further evaluation of PA, in children with disabilities, across all of Canada's provinces and territories [2].

A second key finding is that participants engaged in an average of just 5 min of MVPA during a typical PE class. It is important to note that this study contained a small sample of children in British Columbia, assessed over a 7-day period, and their data may not generalize to peers in other schools and PE classes. Nevertheless, our results align with data from other jurisdictions (e.g., Hong Kong) [21] and raise concerns regarding

the amount of MVPA this group of children accumulate during PE. Greater attention and efforts are needed to support their active participation. Furthermore, two participants did not have any PE during the data collection week due to in-school holiday celebrations. This observation underscores the need to critically examine the prioritization of PE for all children.

School-based PE is the most common environment for school-aged children with disabilities to learn about and engage in PA [22,23]. PE teachers play a crucial role in supporting the participation of students with disabilities [22]. However, different physical educators will have different pedagogical approaches. For instance, Haegele and Hodge [24] suggested that physical educators who are influenced by the medical model of disability (i.e., disability is caused by a defect within a person and needs to be fixed), as opposed to the social model of disability (i.e., disability is caused by the interaction between a persons' limitations and physical and social barriers, and the barriers need to be removed) may attribute low participation to the student rather than to the student's environment. Teachers who take a medical view of disability may be less likely to incorporate activity and equipment modifications, personalized instruction, and comprehensive support to facilitate the child's full and effective participation in PE. Grenier (2011) has emphasized that by moving beyond a child's medical profile and focusing on their unique abilities and strengths, teachers can gain valuable insights that lead to more positive and engaging experiences for students [25]. Teacher training workshops can also be effective for increasing teachers' knowledge, skills and confidence to include children with disabilities in PE [26]. By focusing on what the child can do and adapting activities accordingly, teachers can create an inclusive and empowering PE environment. This approach ensures that PE activities are modified to accommodate medical needs, such as adjusting certain activities and exercises, and therefore prevents potential health risks while still promoting physical activity.

Through interviews, we gathered information that shed light on the quality of the children's participation experiences during PE. Our findings suggest that children with physical or sensory disabilities experience the elements of quality participation in both positive and negative ways. In particular, we identified both positive and negative examples of experiences of autonomy, belongingness, challenge, engagement and mastery. No previous research has used the QPF [9] to examine the quality of participation in PE among children with physical or sensory disabilities. However, our findings are consistent with the results of a qualitative study of adults with physical disabilities who also reported experiencing most QPF [9] elements in both positive and negative ways [20]. For instance, the experience of autonomy gives participants a sense of control and choice over their PA. Autonomy experiences are typically linked to more positive affective and behavioural outcomes of PA participation [27]. However, some students with disabilities may only be able to participate under conditions of low autonomy, i.e., when there is a high level of structure or when the activity is well controlled to adapt to their abilities. Without such conditions, autonomy might result in the child being excluded from participation, as reported by the child in our study who received autonomy-supportive advice to 'try your best' during a running activity. This observation aligns with Lawrason and Martin Ginis' [20] finding that autonomy was considered a negative experience when it left the person sidelined from full participation. Together, these findings suggest that for people with disabilities, autonomy in PA contexts is not always beneficial. In the context of PE, teachers must be flexible to the autonomy needs of students with disabilities, as these needs will vary across students and situations.

Mastery is another element associated with positive and negative experiences in the present study, and in a study of adults with physical disabilities [20]. In both studies, participants shared positive PA experiences of feeling competent and capable. Likewise, children

with physical disabilities described 'good days' in PE as days when they demonstrated competence in front of classmates [11]. But they also expressed frustration when they could not live up to standards designed for people without disabilities. These experiences are examples of externalized ableism [28], whereby people with disabilities are compared to, or expected to meet the standards of, non-disabled people. Likewise, challenge was experienced positively when children had opportunity to develop their skills, and negatively when those opportunities were thwarted [11]. These negative experiences may indicate internalized ableism, whereby children with disabilities put pressure on themselves to achieve the same level of performance as their peers without disabilities. Teachers must be aware of the risk of ableism in PE settings and take steps to mitigate these risks, for instance by setting individualized goals for students, and supporting and reinforcing progress toward those goals.

Belongingness was identified as an important motive for children's PE participation. The sense of belongingness experienced by children with disabilities during PE is a critical element that significantly impacts their overall participation and enjoyment [11,29], There may also be times when a child feels uncomfortably pressured to join an activity, by peers who are trying to include the child, but who do not understand the child's limitations. Children with disabilities may also feel a sense of disconnect from their peers if they do not share the same activity interests. Understanding the social dynamics within a PE class may help teachers to maximize the inclusion of children with disabilities, while minimizing any unintended negative consequences of social pressure to participate.

The element of 'meaning' was discussed just once, and in a positive context. This observation suggests that children with disabilities do not think a lot about the benefits of PE participation; however, consistent with previous findings [11], they can find purpose and significance in PE, despite experiencing challenges. Perhaps by taking steps to foster a sense of meaning in PE, teachers could create more fulfilling and inclusive PE experiences. Strategies to develop meaning can include working toward a self-identified goal that holds personal significance to the child, or contributing toward a group's common goal or activity, through cooperative learning activities.

Study Limitations

One study limitation is the possibility of selection bias. Given our study's advertised focus on PA, participants may have been more physically active or motivated to engage in PA compared with non-participants. A second limitation pertains to the use of accelerometers to measure PA. Accelerometry is valuable for providing information about PA duration and intensity, but has limitations in capturing specific types of activities. Activities such as cycling, swimming or wheeling, as well as movements like walking uphill or carrying a load, may not be effectively captured by accelerometers. This limitation is particularly relevant for individuals who rely on wheelchairs for mobility, as the intensity of their PA may be underestimated, resulting in an incomplete representation of their PA time and intensity. In our study, the infrequent removal of devices during PA based on participant logs occurred outside of school (soccer, swimming) and therefore did not impact school- and PE-based PA results. Furthermore, while it is considered a strength that this study was conducted under free-living conditions, there is ultimately no way of knowing whether participants wore the devices as instructed. Another limitation is that while we focus on children living in one province, because PA policies differ across Canadian provinces, our findings may not be generalizable to children living in other jurisdictions. And finally, while our sample size is consistent with sample sizes in similar studies [11], we did not reach the point of a priori thematic saturation [30]. With additional sampling, we would likely have

obtained a greater range of positive and negative examples of the quality participation elements, and perhaps even negative examples of the meaning element.

5. Conclusions

In our sample of children with physical or sensory disabilities, accelerometry data showed that the majority did not meet the British Columbia daily PA recommendations within school settings. Two children did not have any PE classes in the week of testing, and those who did recorded an average of just 5 min of MVPA. Children reported both positive and negative examples of autonomy, belongingness, challenge, engagement and mastery experiences in PE, and just positive examples of meaning during PE. Together, these data speak to the need for greater attention to ensure children with disabilities fully participate in school-based PA and that PE is structured to provide quality participation experiences.

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