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Participation and physical activity in a parkour recess program for children with autism spectrum disorder: A pilot study

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Received: 1st March 2024; Accepted: 6th December 2024; Published: 1st September 2026

Abstract: Children with autism spectrum disorder (ASD) are more at risk for lower levels of moderate to vigorous physical activity (MVPA) compared to peers without ASD. This study examined voluntary participation in parkour recess, which was tied to physical education, and MVPA in both settings between children with and without ASD in general education. Second-grade elementary school children (N = 87, mean age = 7 years, 36 girls, 51 boys), of which five children with ASD (2 girls, 3 boys), followed a 10-lesson unit parkour during physical education and could voluntary participate in 10 parkour recess sessions. Four out of five children with ASD participated regularly in parkour recess (80-100%). On average children with ASD had lower MVPA levels than their peers during physical education, while they achieved over 50% of MVPA during parkour recess. Connecting physical education content with organised recess sessions is a promising public health strategy for children with ASD.

Keywords: Physical education, parkour recess, school-based health, inclusion

Introduction

The World Health Organization (WHO) recommends that all children between the ages of five and 17, including those with disabilities, should engage an average of 60 minutes of moderate-to-vigorous physical activity (MVPA) per day across the week (WHO, 2020). However, more than 80% of children across several countries do not meet this recommendation (Guthold et al., 2020). Only 7% of 6 to 9-year-old typically developing children in Flanders (Belgium) accumulate 60 minutes of MVPA daily (Seghers et al., 2018). Children with disabilities, more specifically autism spectrum disorder (ASD), have low adherence to PA guidelines (Case et al., 2020; Healy et al., 2021; Li et al., 2022). Additionally, children with ASD were found to have significantly lower levels of MVPA compared to children without ASD (Rech et al., 2022). To the authors' knowledge, no Flemish data on PA levels for children with ASD are available. There is a pressing need for research in this domain since PA has been associated with multiple health benefits (Healy et al., 2018), such as a positive impact on social interaction, social skills, and motor skills for children with ASD (Chan et al., 2021; Huang et al., 2020; Hynes & Block, 2023; Sowa & Meulenbroek, 2012).

Although PA is an evidence-based practice which reduces stereotypic behaviours in children with ASD (Kasner et al., 2012; Lang et al., 2010; Petrus et al., 2008; Wong et al., 2015), PA levels of children with ASD are low (Liang et al., 2020). Furthermore, PA levels of all children start to decline during childhood (Farooq et al., 2018) and can track from childhood to adulthood (Telama, 2009). This underlines the importance of early interventions, preferably in schools. Based on multiple meta-analyses on the effect of PA

interventions for children with ASD it can be said that they benefit substantially on performance in executing manipulative and locomotor skills, skill-related fitness, social functioning/social interaction, communication, muscular strength, and endurance (Healy et al., 2018; Huang et al., 2020). However, interventions need to be targeted to the environment, the goal of the intervention and the needs of all children involved. For example, if the goal of the intervention is to promote social interactions, a training for the intervention facilitator is needed which is targeted at fostering an environment that promotes social interaction (Healy et al., 2018).

Physical activity at school

Schools are an important setting to address PA, since children with and without ASD spend a large part of their day at school (Pan, 2008). In 2009, the Belgian government ratified the United Nations (UN) Convention of the Rights of Persons with Disabilities, which includes provisions on the education of children and young people with disabilities, including the gradual realization of inclusive education (Onderwijs Vlaanderen, n.d.). Zhang and Griffin (2007) conceptualized inclusive education as "an educational placement where all children, including those with autism, are accepted and educated" (p. 33). In Flanders, physical education is offered in an inclusive way, which means that children with ASD are included in physical education lessons with students without ASD.

The Flemish standards for physical education emphasize the need for physical education to contribute to the development of a physically active lifestyle, which requires the development of motor skills (Iserbyt & Coolkens, 2018). These standards are backed up by the WHO that recommends school-age children should develop skills that can lead to lifelong participation in PA (WHO, 2022). Regarding PA during lessons, the U.S. Centre for Disease Control (CDC) and Prevention recommends that children should engage in at least 50% of MVPA during physical education (U.S. Department of Health and Human services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Division of Adolescent and School Health, 2010). This benchmark is also adopted in other studies which are carried out in Europe (Bailey et al., 2023). A review from Hollis et al. (2016) reported that this benchmark was not met for typically developing children in elementary schools, with children generating 34% MVPA during physical education. In several studies, differences in MVPA levels were reported between students with and without ASD. During inclusive physical education, PA levels of children with ASD ranged from 30-46% MVPA to 45-53% MVPA for students without ASD (Pan, 2008; Pan et al., 2011a; 2011b; 2015; Sandt & Frey, 2005). Pan et al. (2011a; 2011b; 2015) reported significant differences between children with and without ASD in secondary schools (age 12-17 years), with typically developing peers achieving higher MVPA levels (47% MVPA versus 33% & 53% versus 30%). Despite potential differences in MVPA for children with ASD compared to children without ASD in physical education lessons, the reality is that physical education lessons are only scheduled once or twice a week. Consequently, physical education alone does not meet children's health needs regarding PA.

School-wide approach to physical activity

Because promoting a physically active lifestyle is a key objective of physical education programs in schools (Rink & Hall, 2008), this goal applies to both children with and without ASD in Flemish schools. Consequently, physical education teachers should promote opportunities for all children to engage in skills learned during physical education in another setting (i.e., outside physical education), for example recess. One way to approach this is through the principle of generalization (Cooper et al., 2020). When children engage in behaviours in a setting that was different (e.g., recess) than the setting in which they were

learned (e.g., physical education) it is said that generalization has occurred. Generalization can be facilitated by connecting the content of physical education with PA programs during recess, which aligns with the Comprehensive School Physical Activity Program (CSPAP) (Carson & Webster, 2019). CSPAP is an approach in which five components are targeted to help children meet the 60 minutes of MVPA per day recommendation, namely: (1) physical education, (2) PA during school, (3) PA before and after school, (4) family and community engagement and (5) staff involvement. According to Webster et al. (2021), the goal of a CSPAP is threefold, namely (a) to implement high quality physical education; (b) creating opportunities for children to practice the skills learned in physical education; and (c) to support children in meeting the 60 minutes of MVPA per day.

Connecting physical education with recess

To date, several studies have assessed generalization by connecting the content of physical education with organised recess sessions in order to contribute to children's daily MVPA levels (Cheng et al., 2021; Coolkens et al., 2018a, 2018b; Iserbyt et al., 2022; Vanluyten et al., 2023b). Those studies had a similar design in that during physical education lessons, a certain content domain (e.g., parkour) was taught while at the same time organised recess sessions were scheduled. Those organised recess sessions had the same content as the physical education lessons and children could voluntarily participate. Coolkens et al. (2018) was the first to report that a lot of children (73%-82%) voluntary participate during parkour recess. High participation rates were found in other studies in elementary schools, with 70% to 77% of children voluntarily participating in the study of Cheng et al. (2021) and 64% in the study of Vanluyten et al. (2023b). Coolkens et al. (2018) and Cheng et al. (2021) focused on parkour recess sessions that were organised during the same weeks as parkour was taught in physical education (i.e., generalization phase). Vanluyten et al. (2023b) extended this work by also organising parkour recess sessions when the parkour lesson unit during physical education had ended (i.e., maintenance phase). More than half of the children kept participating during parkour recess and engaged in MVPA during 66% of the recess time. Furthermore, both Cheng et al. (2021) and Vanluyten et al. (2023b) reported MVPA levels of children during physical education. They found that children did not reach the 50% benchmark, with MVPA levels ranging from 37% to 47%. However, during the twenty-minutes parkour recess, children achieved higher MVPA levels (58%-76%). This highlights the potential and importance of connecting physical education and organised recess sessions for children's MVPA.

Study purpose

To date, however, there has been no investigation to assess generalization from physical education to recess in children with ASD. As noted, inclusive physical education strives for equal educational opportunities for children with and without disabilities, which is particularly relevant given that children with ASD are at increased risk for low levels of PA. Thus, it is worthwhile to investigate generalization of engagement in PA in children with ASD. Therefore, the purpose of this study was to investigate differences in voluntary participation during parkour recess and PA during physical education and parkour recess between children with and without ASD.

Materials and Methods

Participants and school setting

Eighty-seven second-grade elementary school children (mean age = 7 years, 36 girls, 51 boys) from four different schools in Flanders (Belgium) participated in this study. The schools were a convenience sample. Within this sample there were five children with ASD (2

girls, 3 boys): Hazel (girl) in school A, Kevin (boy) in school B, Oliver (boy) in school C, Sharon (girl) and Steven (boy) in school D (children names and schools were pseudonymized). In each school one second-grade class was selected, with at least one child with ASD. Since schools in Flanders have information on whether children are diagnosed with ASD, this information was used to determine how many children with ASD were present in each class, in accordance with the guidelines of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychology Association, 2013). Information from the schools contained no detailed description on the severity of ASD. There was only indicated that these children were diagnosed with ASD.

Class sizes averaged 22 children. A description of the participants in each class can be found in Table 1. In each school, one physical education teacher (2 female, 2 male) was involved with no prior experience in teaching parkour. Schools and teachers were selected based on the following criteria: a) willingness to participate in a four-hour "how to teach parkour" workshop, b) to teach a 10-lesson unit in parkour and c) having at least one child with ASD in their physical education class. Physical education was scheduled two times a week, for 50 minutes each.

Table 1. Information of the participants of the study

Group $n = 87$	School A	School B	School C	School D
Total children	20	23	22	22
Children without ASD	19	22	21	20
Children with ASD	1	1	1	2
Male	10	14	14	13
Female	10	9	8	9

ASD: Autism Spectrum Disorder

Study design

The study was an intervention study. Physical education teachers participated in a 4-hour workshop parkour. During this workshop teachers learned the parkour content from the perspective on how to perform parkour moves, how to teach them, how to recognize common mistakes and how to correct these (Vanluyten et al., 2023a). Teachers, parents and principals provided informed consent to participate in this study. The ethical committee at the first author's university gave approval to this study.

During the period that parkour was taught in physical education, the first series of five parkour recess sessions was organised during recess (i.e., generalization phase). Following the parkour unit in physical education, teachers continued teaching their regular curriculum during physical education. During that time, another five parkour recess sessions were organised (i.e., maintenance phase).

Physical education

Physical education teachers taught 10-lessons parkour during physical education. During this unit, children learned new parkour moves in order to clear various obstacles (Vanluyten et al., 2023a). The unit goal was to perform a parkour freestyle routine during the last lesson with movements learned during the lesson unit. During physical education student learning while engaging in MVPA is fostered, which aligns with the Flemish physical education standards. Children could choose to perform parkour moves of varying difficulty with fluent transitions between the moves. Children learned safe landings (e.g., on both feet), vaults (e.g., speedstep), wall movements (e.g., tik) and spins (e.g., palm spin) during station work. Typically, three stations were created in which the children could move on a

small circuit, where always one new movement was introduced. Near the end of the lesson children could rotate across all stations in the gymnasium by connecting the newly learned parkour moves (Vanluyten et al., 2023a). The allocated time for physical education lessons was 50 minutes; however actual lesson length ranged from 31 to 57 minutes with an average of 42 minutes per lesson.

Recess in Flemish schools

In Flanders, lunch recess is mandatory and should be at least 50 minutes, which includes the time needed to have lunch. However, there are no specific recess policies in Flanders. While school A and D provided children with 45 minutes of time on the playground, school B had 30 minutes and school C 70 minutes on the playground. All schools offered children small equipment (e.g., balls, jump ropes) and allowed children to engage in any activity they preferred. These activities could be card games, reading, chatting and sitting down or being physically active. Traditional recess was supervised by classroom teachers to ensure the safety of the children.

Parkour recess

All parkour recess sessions lasted 20 minutes and were organised once every two weeks according to the schedule of the schools. Parkour recess was organised by the children's physical education teacher in the school's gymnasium and the arrangement of equipment was similar to that of the physical education setting. No new parkour skills were taught during parkour recess. Children were invited to play in the gymnasium and use the equipment as they did during physical education lessons. At the end of the physical education lesson before a parkour recess session, the physical education teachers announced that a parkour recess session would take place. This invitation focused solely on the voluntary nature of children's participation in parkour recess and was standardized for all teachers. Children who chose not to participate could stay on the outdoor playground for traditional recess, like any other day during lunch recess.

Procedural fidelity

All physical education lessons and parkour recess sessions were supervised for reasons of procedural fidelity by trained observers. For physical education, it was assessed whether teachers taught content that was provided during the workshop. Also, observers assessed whether the teachers announced parkour recess the way they were trained to do. For parkour recess, observers assessed whether the teachers did not teach new content and whether they provided 20-minute sessions. For both physical education and parkour recess, observers recorded no deviations from the planned procedures.

Data collection

Data were collected from September 2020 through June 2021. Data were collected in two settings, namely physical education and parkour recess. All physical education lessons and parkour recess sessions were recorded on video. Based on video recordings MVPA of nine physical education lessons and 10 parkour recess sessions from each school were collected. The last physical education lesson was used for assessment and was not included in the data analysis.

Voluntary participation of all children in each parkour recess session was recorded by observers based on the video recordings. Systematic observation was used for the collection of MVPA (Cooper et al., 2020). MVPA during physical education and parkour recess was collected using the System for Observing Fitness Instruction Time (SOFIT) tool (McKenzie et al., 1992). Rowe et al. (1997) validated the SOFIT-tool for elementary school children. It uses a momentary time sampling procedure with a 6-second 'observe' interval and a six-

second 'record' interval. During the 'observe' interval, an observer focuses on one target child, after which the PA level is coded at the 'record' prompt. During one observation session, an observer coded two children alternately. One child was coded for ten intervals after which the observer focused on the second child for the next ten intervals. PA levels were based on body posture and categorized as level 1 (lying), level 2 (sitting), level 3 (standing), level 4 (walking) and level 5 (very active). Level 4 and 5 were combined to represent MVPA.

Observer training

Eighteen observers were trained through six steps. First, observers had to learn definitions of PA levels, while in a second stage a written test was taken on those definitions and coding conventions. An additional multiple-choice test assessed the observers' understanding through video recordings. Observers could only proceed to the next step by achieving a 100% score. Observers had to code two training videos and achieve an interobserver agreement (IOA) of ≥85%. The IOA was calculated by dividing the total number of agreements by the total number of agreements and disagreements. Finally, observers coded an extra training video with a reliable coder, with an IOA of at least 85% in order to proceed as an independent coder.

Two independent observers simultaneously coded 17% of all physical education lessons for MVPA with an IOA of 85%. Of all parkour recesses, 12% served as IOA checks which resulted in 85% IOA level. Both IOA from MVPA during physical education and parkour recess met the recommendation of 85% as suggested in behavioural research (Cooper et al., 2020; McKenzie et al., 1992).

Data analysis

SOFIT data were retrieved in an Excel file and analysed using descriptive statistics. The descriptive statistics specified the percentage of time spent in the different PA levels as defined in the SOFIT tool (McKenzie et al., 1992), namely lying down (1), sitting, (2), standing (3), walking (4), and very active (5). The frequencies of the recorded intervals where children engaged in MVPA were calculated and converted to percentages.

Medians were calculated for children without ASD and their voluntary participation, since the data were skewed. Absolute values were used for children with ASD. Since there were five recess sessions in both generalization and maintenance phase and medians were reported as a percentage, a percentage of 80% implies being present in four out of five parkour recess sessions.

Results

Voluntary participation during parkour recess

Hazel and Kevin participated in all parkour recess sessions in generalization phase, while Oliver and Steven participated in four out of five sessions and Sharon participated only once (Figure 1). During maintenance phase, Hazel, Kevin, Oliver and Steven attended four of the five parkour recess sessions, while Sharon did not attend any session. Overall children with ASD attended 76% of parkour recess sessions during generalization phase, compared to 75% for children without ASD. During maintenance phase, children with ASD attended parkour recess for 64%, while children without ASD attended 47% of sessions.

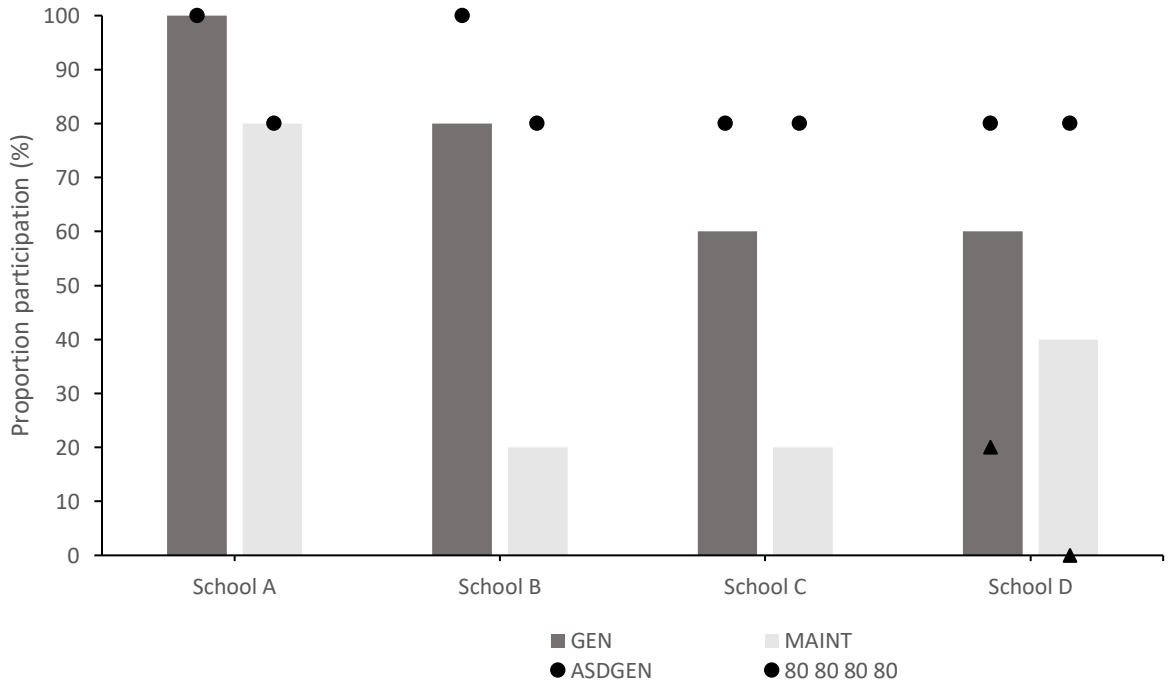

Figure 1. Median participation of children without ASD (bars) versus absolute participation of children with ASD (dots and triangles) ● Children with ASD: Hazel (school A), Kevin (school B), Oliver (school C) & Steven (school D ▲ Sharon (school D). GEN: Generalization, MAINT: Maintenance, ASD: Autism Spectrum Disorder

Moderate to vigorous physical activity during physical education

In school A, MVPA levels of all children during physical education were below 40%. On average typically developing children spent 21% (range: 18-27%) of time in MVPA, compared to 19% (range: 14-25%) for Hazel. In school B, children spent 59% (range: 26-84%) of lesson time in MVPA, while Kevin spent 53% (range: 38-75%) of time in MVPA. In school C, 43% (range 21-60%) of time was spent in MVPA, whereas Oliver spent 39% (range: 34-46%) in MVPA. In school D, children spent 40% (range: 22-64%) of lesson time in MVPA, compared to 43% (range: 31-56%) for Sharon and 34% (range: 28-38%) for Steven. Detailed MVPA levels per child in each school can be found in Figure 2.

Moderate to vigorous physical activity during parkour recess

There are no data for lesson five in school A, since there were technical issues with the recording. Hazel was present during all sessions, except for session seven. Overall, children spent 56% (range: 24-83%) MVPA in school A during parkour recess, while Hazel spent 38% (range: 24-47%) of the session in MVPA. Kevin was only absent in parkour recess nine and spent 65% (range: 47-86%) of the sessions in MVPA, compared to 67% (range: 35-89%) for his typically developing peers. In school C, there was also no recording for parkour recess session one, due to technical issues. Oliver did not participate in session four and six and spent on average 57% (range: 48-70%) of time in MVPA, while other children spent 67% (range: 38-98%) of the session in MVPA. There was no recording for session seven in school D. While Sharon only attended the first session, in which she engaged in 67% of MVPA, Steven was absent in session three. Steven spent 72% (range: 49-90%) of time in MVPA, while others spent 68% (range: 46-94%) of time in MVPA. Children's MVPA levels per session can be found in Figure 3.

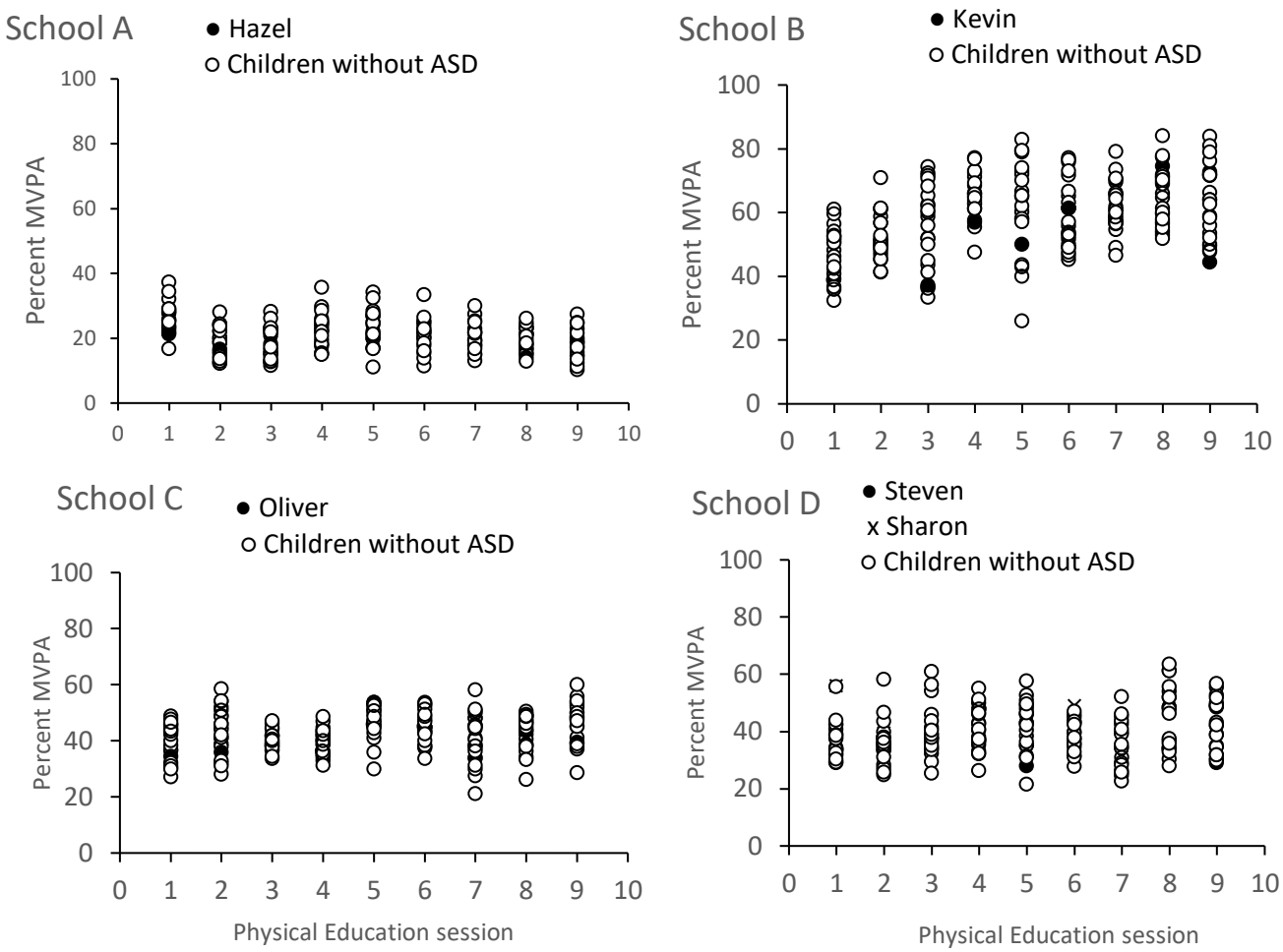

Figure 2. Proportion of MVPA during physical education of children with ASD (filled dots and cross) and children without ASD (empty dots). MVPA: Moderate-to-Vigorous Physical Activity, ASD: Autism Spectrum Disorder

Discussion

The purpose of this study was to investigate differences in voluntary participation during parkour recess and PA during physical education and parkour recess between children with and without ASD. During physical education, most children did not achieve the 50% of MVPA, which is a benchmark for physical education (Elliot et al., 2013). Only Kevin and Sharon have several physical education lessons in which they had MVPA levels above this benchmark. MVPA levels of children in school A were lower compared to other schools. This might be a result of a different context (smaller gymnasium, less equipment) or the way the teacher taught the lesson (more time spent on management). Since all teachers had no prior experience in parkour, they instructed this content for the first time. Possibly, their delivery of the parkour content will evolve over time which can lead to higher MVPA levels due to reduced management and/or instructional time. On average, children with ASD had lower MVPA levels during physical education than their peers without ASD, however due to the small sample size these findings could not be generalized. Children with ASD encounter more barriers to engage in PA compared to children without ASD, such as motor skills deficits, behavioural problems, a preference for sedentary behaviours and the lack of experts (i.e. physical education teacher) to include the child (Healy et al., 2018).

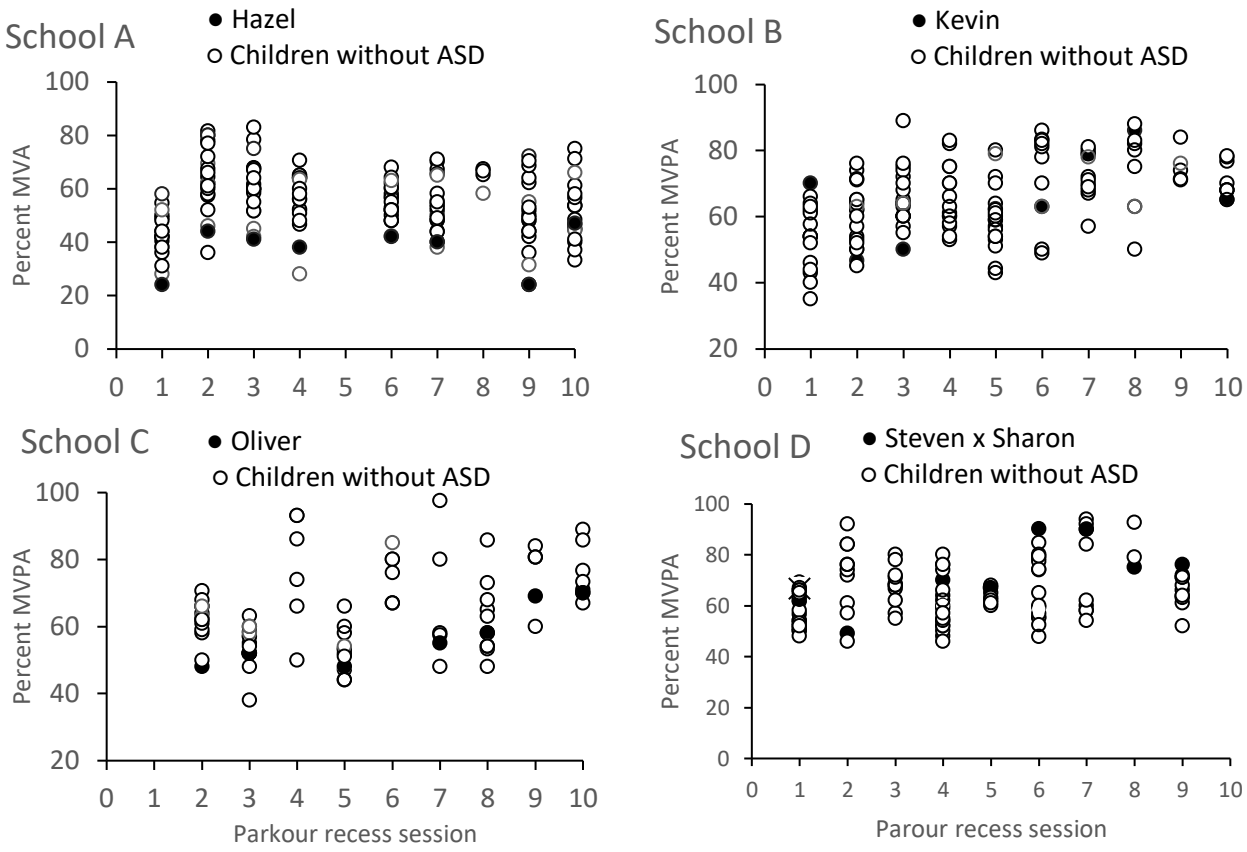

Figure 3. Proportion of MVPA during parkour recess of children with ASD (filled dots and cross) and children without ASD (empty dots). MVPA: Moderate-to-Vigorous Physical Activity, ASD: Autism Spectrum Disorder

An analysis of teacher student interactions and an investigation regarding the developmentally appropriateness of instructions and if they were clear for students with ASD is needed to address differences in MVPA between children with and without ASD. Except for Sharon who only participated during the first parkour recess session, children with ASD had equal participation rates during generalization phase, and higher participation during maintenance phase compared to children without ASD. Coolkens et al. (2018) suggested that the decrease in participation for children without ASD might be related to novelty effects, while these results do not follow for children with ASD. These results are promising since children with ASD are more at risk for low engagement in PA (Rech et al., 2022). Except for Sharon, children with ASD participated in most parkour recess sessions with high MVPA, which shows that organised recess connected to the content of physical education can be an important public health intervention for children with ASD. The need for PA interventions for children with ASD was emphasized in previous research, as they do not meet the PA guidelines (Case et al., 2020; Healy et al., 2018; 2019). This study makes a valuable contribution in offering children opportunities to engage in activities learned during physical education and be physically active. Pan (2008) reported that children with ASD (28%) had lower MVPA levels during traditional recess compared to children without ASD. These children were elementary school children between 7 and 12 years, with MVPA levels far below those reported in this study during parkour recess.

While participation during generalization phase was similar for children with and without ASD (76% versus 75%), a difference between both could be observed during maintenance phase (64% versus 47%). Possibly, children with ASD preferred the more organised, structured recess sessions (i.e., parkour recess) over regular recess where there was less structure and more options regarding possible activities to engage in. There is some

evidence that elementary school children preferred organised recess over a less structured alternative in which the physical education teacher only provided supervision (Coolkens et al., 2018b). Although speculative, children with ASD might have maintained their participation in parkour recess because they became more competent in parkour over time and experienced success, which is reinforcing. It is not unreasonable to claim that in order to participate voluntarily and enjoy the activity, some level of motor competence is needed. Future research, which investigates reasons why children with ASD participated during parkour recess, even when the physical education lessons had concluded, is warranted. Deficits in social interactions, which are characteristic for children with ASD have been reported as related to physical inactivity (Memari et al., 2017). Perhaps in the case of parkour, individual content domains are more attractive for children with ASD as opposed to team-based activities such as invasion games (e.g., basketball) or net games (e.g., badminton, etc.). Parkour recess offered children the opportunity to overcome obstacles at their own pace. Children were also not dependent on peers to participate in parkour. Future research should be done to assess if similar results are found for children with ASD in other content domains. In addition, a better insight into the network and social interactions children with ASD have during parkour recess and traditional recess would be a valuable addition to literature. For example, if children with ASD spent more time alone during traditional recess or less engaged in activities, organised recess might be more attractive to them.

During parkour recess most children achieved MVPA levels above 50%, which is a feasible threshold for recess as suggested by Stratton & Mullan (2005). Except for Hazel, most children with ASD were able to meet this threshold during parkour recess sessions Children with ASD managed to have 12-14 minutes of MVPA during a 20-minute recess session, which contributes to more than 20% of the daily recommended MVPA. This shows the potential of this intervention in contributing to children's daily MVPA, by connecting physical education content with organised recess sessions as recommended by Webster et al. (2021) in the CSPAP model. Indeed, the high level of MVPA suggests that children with ASD were able to generalize what they had learned in physical education lessons to a less structured parkour recess session. All equipment and materials were arranged in a similar way to during physical education. In previous research with typically developing elementary school children focused on parkour recess, about 22 percent of the total MVPA was accrued by doing previously learned parkour skills (Cheng et al., 2021). Cheng et al. (2023) found that during parkour recess children practice parkour skills at a frequency of about 3.8 per minute. Future research should investigate whether the data for children with ASD are similar.

Strengths and limitations

This study is one of the first in which generalization of participation in parkour recess for children with ASD in an inclusive setting was assessed. It used systematic observation, which is an objective measure that allowed for the collection of contextual data (McKenzie & van der Mars, 2015). For instance, when children were hanging on a climbing wall (i.e., performing the catleap), this could be coded as vigorous PA.

This study enabled all children to engage in activities learned during physical education in a non-physical education setting. This is an important first step towards a physically active lifestyle outside physical education. Parkour recess participation was voluntary and departs from the mandatory physical education setting. In addition, children with ASD can improve their social skills through inclusive PA (Nalbant, 2018). Therefore, the parkour recess setting could be a fruitful setting to foster social skills and peer interactions.

However, there were also some limitations concerning this study. The limited sample did not allow for inferential statistics, which could quantify differences between children with and without ASD. Recruiting large sample sizes of children with ASD in physical education classes is challenging given the low number of these children in those classes, especially in Flanders, where those children with ASD can attend special schools instead of being included in regular schools like in this study. The small sample size does not allow to generalize the findings of this study to other settings. During physical education, other variables could have been investigated, since MVPA is not the only important outcome measure. For example, teacher behaviour, as previous research has shown that the organisation of parkour requires good management (Vanluyten et al., 2024). Parkour recess was organised every two weeks, higher or lower frequencies of parkour recess might impact voluntary participation and MVPA levels of children and could be investigated in future studies.

Unfortunately, MVPA during traditional recess was not measured in this study. Future studies should focus on incorporating this variable as it can serve as a comparison for parkour recess. Although participation and MVPA levels were investigated, inclusion is more than those variables alone, as general physical education teachers aspire to support the educational needs of children with disabilities in general physical education settings. Important to highlight however, is the difference between inclusion, which is an educational philosophy, and integration, which is a placement (Haegele, 2019). Furthermore, some researchers define inclusion as a subjective experience associated with individual interpretations, feelings, beliefs and perceptions (Stainback and Stainback, 1996). This implies the need for qualitative data which incorporates student experience, student and teacher voice in these settings.

In this study, there was no investigation to take into account the perceptions and voice of children with ASD. Therefore, we cannot address their experiences. However, one could argue that most children with ASD in this study likely enjoyed it, since they participated and maintained their voluntarily during parkour recess.

Perspectives

This study is a first step in targeting public health interventions in school for children with ASD by connecting physical education to organised recess sessions. Based on this, the following conclusions seem appropriate: First, children with ASD participated voluntarily and regularly in parkour recess. Second, it offers them the opportunity to engage in skills learned during physical education and be physically active during lunch recess. And third, most children with ASD engaged in more than 50% of MVPA during parkour recess leading to a substantial contribution to the WHO guidelines regarding physical activity..

Supplementary Materials: Large tables and figures can be added at the end of the manuscript. Using the same format of tables as those in the text. See Appendix section.

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Author Contributions: Conceptualization, K.V. and P.I.; Methodology, K.V. and P.I.; Formal Analysis, K.V. and P.I.; Writing-Original Draft Preparation, K.V.; Writing-Review & Editing, K.V. and P.I.

Funding: This research was funded by Fonds Wetenschappelijk Onderzoek Vlaanderen (FWO), the reference number of this research grant is 1S71122N.

Availability of data and materials: The data are not publicly available due to privacy and ethical reasons.

Acknowledgments: The authors would like to thank the schools, principals, teachers, children and parents for their willingness to participate in this study.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

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