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Participation and physical activity in organized recess tied to physical education in elementary schools: An interventional study

Kian Vanluyten [a,1,*], Shu Cheng [a,2], Cédric Roure [b,3], Jan Seghers [a,4], Phillip Ward [c,5], Peter Iserbyt [a,6]

[a] Department of Movement Sciences, KU Leuven, Leuven Belgium
[b] University of Teacher Education, Vaud, Lausanne, Switzerland
[c] Department of Human Sciences, The Ohio State University, OH, USA

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ABSTRACT

Maintaining physical activity habits is important for long-term health benefits. Many children do not achieve the World Health Organization (WHO) benchmark of 60 min Moderate-to-Vigorous Physical Activity (MVPA) daily. Comprehensive school physical activity programs (CSPAP) target all opportunities at school for children to be physically active. The purpose of this intervention study was to investigate boys' and girls' voluntary participation and MVPA in physical activity recess sessions during and after these were connected with the content of physical education.

147 (55 girls, 92 boys; mean age = 8 years) second grade children from seven different schools received a 10-lesson parkour unit in physical education and were concurrently offered five parkour recess sessions. After the parkour unit in physical education (i.e., maintenance) another five parkour sessions in which children could voluntarily participate were organized. Systematic observation tools were used to assess children's MVPA.

Overall participation in parkour recess was 64% for both boys and girls. Participation decreased from intervention to maintenance phase for both boys (75% vs 54%; $p < .001$) and girls (80% vs 49%; $p < .001$). MVPA was higher for boys compared to girls in parkour recess (64% vs 58%; $p = .002$) and traditional recess (49% vs 39%; $p = .006$), but not in physical education (40% vs 37%).

One aspect of physical activity promotion is to connect recess activities with the content taught in physical education, which could contribute up to 20% of the daily recommended MVPA. Positive effects maintained when the connection between physical education and recess stopped.

1. Introduction

Moderate to vigorous physical activity (MVPA) is associated with physiological (Ortega et al., 2008; Cesa et al., 2014), cognitive (Hillman et al., 2009), and psychological benefits (Lees and Hopkins, 2013). Children aged five to 17 years should engage in at least 60 min of MVPA per day (How much of physical activity is recommended World Health Organization Website, 2023) and maintaining physical activity habits is important for long-term health benefits (Kahlert, 2015). However, results from several international Physical Activity Report Cards show that a majority of children does not meet this guideline (Katzmarzyk et al., 2016; Huang et al., 2019; Wijtzes et al., 2016).

In schools, multicomponent approaches such as the comprehensive school physical activity program (CSPAP), are recommended because

* Corresponding author.
E-mail address: kian.vanluyten@kuleuven.be (K. Vanluyten).
[1] Kian Vanluyten is a PhD researcher in the Department of Movement Sciences at KU Leuven in Leuven and FWO (Fonds Wetenschappelijk Onderzoek) fellow, Belgium. https://orcid.org/0000-0002-1311-036X.
[2] Shu Cheng is a PhD researcher in the Department of Movement Sciences at KU Leuven in Leuven, Belgium. https://orcid.org/0000-0001-9687-6709.
[3] Cédric Roure is an associate professor at the University of Teacher Education, State of Vaud (HEP-VD), Lausanne, Switzerland. https://orcid.org/0000-0001-9320-8174.
[4] Jan Seghers is a professor in the Department of Movement Sciences at KU Leuven in Leuven, Belgium. http://orcid.org/0000-0002-2930-1259.
[5] Phillip Ward is a professor in the Department of Human Sciences at The Ohio State University in Columbus, OH, USA. https://orcid.org/0000-0002-7447-3594.
[6] Peter Iserbyt is an associate professor in the Department of Movement Sciences at KU Leuven in Leuven, Belgium. https://orcid.org/0000-0003-3090-9007.

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they target different settings for children to be physically active throughout the school day (Pate et al., 2006; Carson and Webster, 2019). Recess is one setting in which all children can engage in MVPA every single day and both the Centers for Disease Control (CDC) and the Society of Health and Physical Educators (SHAPE America) emphasize the importance of recess (Strategies for recess in schools, 2017). Therefore, further research efforts should examine how children's physical activity during recess can contribute toward the MVPA guidelines (Stratton and Mullan, 2005). Although a criterion of 50% MVPA (similar to physical education (Kohl and Cook, 2013)) during recess is not yet adopted, interventions have shown this is feasible (Stratton and Mullan, 2005). During recess most studies report lower values for both boys (33%) and girls (27%) (Ridgers et al., 2007; Ridgers et al., 2011; Tercedor et al., 2019). One strategy that has been recommended to increase MVPA during recess is to connect the content of recess with physical education (Cheng et al., 2021; Coolkens et al., 2018; Iserbyt et al., 2023). Studies have shown that children achieved between 48% and 76% of MVPA in physical activity programs during recess that had the same content as physical education lessons, with only one study reporting a significant difference between boys and girls (Cheng et al., 2021). This is important, since research usually showed that girls participate less in physical activity programs and achieve less MVPA compared to boys (Drijvers et al., 2022; Knowles et al., 2018).

To date few studies investigated what happens when physical education and recess sessions are no longer connected (i.e., maintenance). For physical education to contribute to the development of a physically active lifestyle, it should affect children's behavior in other settings (i.e., recess) and after the curriculum has ended (McKenzie and Lounsbery, 2009). Therefore, the purpose of this study was to investigate boys' and girls' voluntary participation and MVPA in physical activity recess sessions during and after these were connected with the content of physical education.

2. Methods

The parkour focused recess intervention was conducted from September 2020 to June 2021 in seven elementary schools in Flanders, Belgium. These schools were a convenience sample based on their geographic location. The Social and Societal Ethics Committee of the first author's university approved all research protocols. A total of 147 (55 girls, 92 boys; mean age = 8 years) second grade children participated in this study. In each school one class was included in the study and the number of children per class ranged from 14 to 27. Seven teachers (2 women, 5 men; mean age = 38 years) followed a four-hour professional development workshop on parkour, taught a 10-lesson parkour unit in physical education (see Table 1 and supplementary file), and organized 10 voluntary parkour recess sessions.

Table 1
Overview Parkour lesson content for Second Grade Elementary.

Lesson	Lesson content
1	Precision: jumping from object to object, or landing after a vault. Stride: running strides from object to object. Balance: movement or landing in balance.
2–4-7	Vault: taking obstacles by jumping over them with hands supported on the obstacles. Wall-run: running up an inclined or vertical object. Tiktak: a running and turning movement against the wall.
3–6-8	Roll: roll after or over an obstacle. Catleap: jump and land on an obstacle where you hang (feet against obstacle). Underbar: movement between two bars.
5–7	Swing: swing movement on a bar in order to bridge some distance. Spin: rotate around own body-axis.
8–9	During lesson 8–9 the culminating event is prepared. The focus of those lessons is on the combination of different parkour moves in a fluent and efficient routine performed all over the gymnasium.
10	Culminating event. Children will perform a parkour routine.

Parkour is a motor activity in which one has to overcome various obstacles in an efficient and creative way. (Vanluyten et al., in press) During the intervention phase, five parkour recess sessions were organized concurrently with a parkour unit being taught in physical education. Then during the maintenance phase, five additional parkour recess sessions were offered without concurrent physical education lessons in parkour. All parkour recess sessions had a duration of 20 min and were organized once every two weeks according to the schedule of the schools. Parkour recess was organized in the school's gym and the arrangement of equipment was similar to that of the physical education setting. No new parkour skills were taught during parkour recess.

Traditional recess served as the comparison setting and was supervised by the school staff and teachers after children had lunch. Within traditional recess, play equipment (e.g., balls, hoops, building blocks) were available for children and they were free to engage in sports, games or any other behavior (even sedentary) on the playground. There was no recess policy plan in any of the schools. Supervisors nor teachers encouraged students to be physically active during traditional recess. Their supervision served to guarantee children's safety.

The number of children who chose to participate in parkour recess was recorded in each session. The percentage of MVPA that children achieved in physical education and parkour was collected using the System for Observing Fitness Instruction Time (SOFIT) tool, while during traditional recess the System for Observing Children's Activity and Relationship during Play (SOCARP) tool was used (McKenzie et al., 1991; Ridgers et al., 2010; Rowe et al., 1997). Systematic observation is a validated and reliable method to record children's physical activity levels (Rowe et al., 1997; Cooper et al., 2020). This instrument used momentary time sampling with a 6-second recording interval. During the 'observe' interval, observers continuously focused on the target children. Physical activity levels were coded when the 'record' prompt was signaled. Children's activity level was coded using five levels, namely level 1 (lying), level 2 (sitting), level 3 (standing), level 4 (walking), and level 5 (very active). Level 4 and 5 were added to represent the MVPA variable.

During traditional recess, four to six children with an equal number of boys and girls were observed. All observers were trained to collect reliable data on children's MVPA using systematic observation. Inter-observer reliability for physical activity level was calculated based on 47% overlap for traditional recess, 12% for parkour recess and 19% for physical education. The coding reliability of physical activity levels was 93% for traditional recess and 85% for parkour recess and 84% for physical education, which were all above the minimum of 80% as recommended in behavioral research (Cooper et al., 2020). MVPA data was collected based on live observations during traditional recess and video recording in physical education and parkour recess.

All data were analyzed using the Statistical Package for Social Science software (SPSS, version 27) and R 4.1.1 (R Core Team 2021). A chi-square test was used to analyze children's participation in each parkour recess session as a function of sex. For overall participation rates (mean participation), a one-way analysis of variance (ANOVA) was used to assess differences based on sex, a Welch ANOVA was used for differences within each phase, and Wilcoxon signed ranks test was used for differences between intervention and maintenance. A Pearson's chi squared test was used to assess time effects. For MVPA levels within each setting, differences between boys and girls were tested by Mann-Whitney U. To assess MVPA differences between settings and phases, Wilcoxon signed ranks and a paired T-test was used. The Holm-Bonferroni correction was used to control for a Type I error and did not change the significance of the results. To control for the clustered nature of our data since children are nested within schools, a Chi Square for clustered data test (Gregg et al., 2020) and multilevel regression was used. The required sample size was calculated with G*Power (3.1.9.7) and for a Cohen's d of 0.5, $\alpha = 0.05$ and power = 0.80, 51 girls and 51 boys are required.

3. Results

3.1. Participation in parkour recess

Table 2 shows the average proportions of voluntary participation in parkour recess for boys and girls. There were no significant differences between girls and boys except in the fifth parkour recess, χ^2 (1, N = 147) = 4.127, p = .04. No differences were found for mean participation between boys (64%) and girls (64%).

During both the intervention (75% vs 80%) and maintenance (54% vs 49%) phase, voluntary participation was not significantly different between boys and girls. However, there was a significant decrease in participation from intervention to maintenance phase for both boys (Z = −5.297, p < .001; ES = 0.56) and girls (Z = −5.176, p < .001; ES = 0.70) as shown in Fig. 1. In addition, time effects were only found for boys from session one to five, χ^2 (1, N = 147) = 14.919, p < .001, and from session one to ten χ^2 (1, N = 147) = 30.291, p < .001.

3.2. Moderate to vigorous physical activity in each setting

During physical education there were no significant differences for MVPA between boys (40%) and girls (37%), while in parkour recess boys (64%) achieved significantly more MVPA than girls (58%), Z = −3.13, p = .002; ES = 0.26. Significant differences between boys (49%) and girls (39%) were found during traditional recess, Z = −2.72, p = .006; ES = 0.35. The MVPA of boys was significantly higher during parkour recess (64%) compared to traditional recess (49%; t (32) = 8.34, p < .001; ES = 1.45), and also higher compared to physical education (40%; t (32) = −4.37, p < .001; ES = 0.76). For girls' MVPA, significant higher scores were found for parkour recess (58%) in comparison to physical education (37%; t(54) = 14.08, p < .001; ES = 1.90), and traditional recess (39%; t(26) = 5.88, p < .001; ES = 1.13). For parkour recess MVPA levels of children were higher during maintenance phase (66%) versus intervention phase (60%), Z = −4.299, p < .001; ES = 0.41, while for traditional recess no differences were found (See Fig. 2).

4. Discussion

The purpose of this study was to investigate boys' and girls' voluntary participation and their MVPA in organized parkour recess sessions during (i.e., intervention phase) and after (i.e., maintenance phase) the content was taught in physical education. In addition, boys' and girls' MVPA in these organized recess sessions were compared to the MVPA in physical education and traditional recess. For participation, there was only one out of 10 parkour recess sessions in which girls participated significantly more than boys. This is consistent with previous studies

Table 2
Boys' and girls' absolute and percentage participation during parkour recess sessions in both intervention and maintenance phase: Flanders, Belgium, 2020–2021.

		Participation	
		Boys (n = 92) %(N)	Girls (n = 55) %(N)
Intervention phase	1	91 (84)	85 (47)
	2	75 (69)	73 (40)
	3	73 (67)	80 (44)
	4	68 (63)	73 (40)
	5	68 (63)[a]	84 (46)[a]
Maintenance phase	6	60 (55)	53 (29)
	7	52 (48)	40 (22)
	8	53 (49)	38 (21)
	9	45 (41)	55 (30)
	10	55 (51)	62 (34)

[a] Significant difference, chi-square: p = .04.

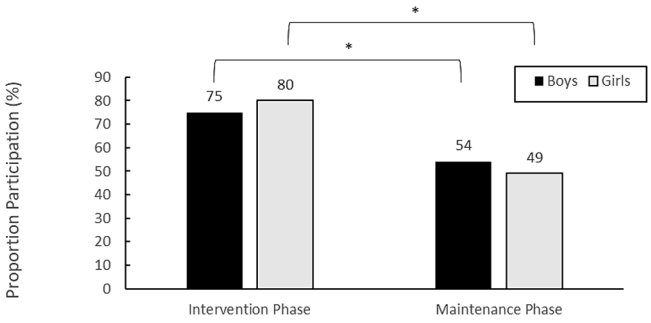

Fig. 1. Participation rate of boys (n = 92) and girls (n = 55) in parkour recess during intervention and maintenance phase: Flanders, Belgium, 2020–2021. *Wilcoxon signed ranks: p < .001.

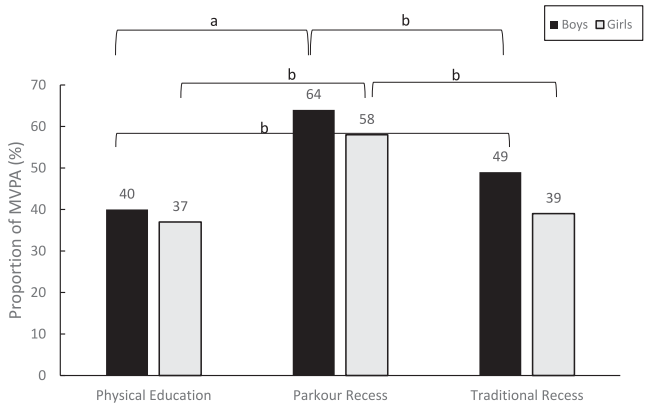

Fig. 2. Proportion of MVPA for boys (n = 92) and girls (n = 55) in physical education, parkour recess and traditional recess: Flanders, Belgium, 2020–2021. [a] Wilcoxon signed ranks: p < .001[b] Paired *t*-test: p < .001.

that reported marginally higher participation for girls in organized recess (Cheng et al., 2021; Iserbyt et al., 2023). The mean proportion of participation in this study showed no differences between boys and girls, which contrasts previous studies (Cheng et al., 2021). Previous studies have reported in general that more boys participated in physical activity programs during recess. These programs were not connected to physical education and often had a more competitive arrangement (i.e., tournaments) (Cheng et al., 2021; Drijvers et al., 2022; De Meester et al., 2014), in which boys tend to dominate girls (Knowles et al., 2018). In the current study, parkour recess was a non-competitive setting in which children were individually challenged. This may have resulted in a more balanced participation in terms of sex. Possibly physical education lessons gave both boys and girls the confidence and skills that led them to participate voluntarily and equally in this content during recess (Iserbyt et al., 2023). Herein lies an important role for the physical education teacher, who should provide children with developmentally appropriate tasks in which children can be successful.

Although participation for both boys and girls decreased, still more than half of the children kept on participating voluntarily in parkour recess after the parkour unit was completed in physical education. It is important to note that upon completion of the unit in physical education, no incentives were put in place to promote children's participation such as posters, announcements in the school's social media, or promotion by classroom teachers. Prior to a parkour recess, the physical education teacher announced the time and date in his or her class. In the future, several strategies to promote participation by the physical education teacher could be investigated such as prompting children to participate during physical education, a subscription list, the reinforcement of children after attending parkour recess, and challenging children with other, parkour-related tasks and games during these recess

sessions.

In terms of MVPA during physical education, there were no significant differences found for boys compared to girls, which aligns with previous work (Fairclough and Stratton, 2006). However, the MVPA levels are still below the benchmark of 50% (Elliot et al., 2013). During parkour – and traditional recess, boys generated more MVPA compared to girls, which is in line with previous research (Cheng et al., 2021). Overall, children surpassed the benchmark of 50% MVPA during parkour recess, but not during traditional recess. In addition, both boys and girls generated almost 20% more MVPA during parkour recess compared to traditional recess, which shows the importance of such an organized setting. Parkour recess might create an opportunity in which children perform skills learned during physical education in the presence of their teacher. These results show that it is possible to achieve levels above the benchmark of 50% MVPA during recess and highlight the potential to generate 12 of the 60 min of daily recommended MVPA during a 20-minute recess session.

The strategy to connect physical education with recess aligns with the Comprehensive School Physical Activity Program (CSPAP), a multicomponent model that aims to utilize all opportunities for students to meet the MVPA guidelines and to be physically active for a lifetime (Carson and Webster, 2019). While one component, physical education, is typically scheduled a limited number of times a week, a second component, recess, is scheduled every day across the school year and thus has the potential to improve children's MVPA as a constant site for the promotion of physical activity (Keep recess in schools, 2023). Schools should therefore consider recess as part of their physical activity promotion. To conclude, this study highlights the positive impact of connecting physical education and organized recess, two core elements of the CSPAP, on children's MVPA. Importantly, those positive effects remained with as little as five sessions after the connection with physical education was ended.

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CRediT authorship contribution statement

Kian Vanluyten: Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Funding acquisition. **Shu Cheng:** Formal analysis, Investigation. **Cédric Roure:** Writing – review & editing. **Jan Seghers:** Writing – review & editing. **Phillip Ward:** Conceptualization, Writing – review & editing. **Peter Iserbyt:** Conceptualization, Supervision, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pmedr.2023.102355.

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