




Shifts in Self-Reported Physical Activity, Sedentary Behavior, and Play Among Lower-Socioeconomic Children During the COVID-19 Pandemic: A Repeated Cross-Sectional Study

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Abstract

Purpose: The lack of in-person schooling and participation in structured recreation activities during the COVID-19 pandemic may have altered children's movement behaviors. This study assessed changes in children's self-reported in school and out of school physical activity, sedentary behavior, and play before and during the pandemic.

Design: A repeated cross-sectional online survey was administered in February 2020 (pre-pandemic, in-person) and 2021 (during pandemic, remote).

Setting: Children attended an urban public school district in Phoenix (AZ) serving a low-income population.

Subjects: Students in grades 4–8 completed the survey in 2020 ($n = 253$, 62% response rate) and 2021 ($n = 261$, 77% response rate).

Measures: The survey included items from the Youth Activity Profile and three additional questions about play.

Analysis: Differences in mean scores and mean scores by gender were analyzed using one-way and two-way ANOVAs.

Results: Students reported less physical activity during remote recess in 2021 ($M = 3.42$, $SD = .80$ v. $M = 2.99$, $SD = .86$, $p < .05$). Physical activity outside of school decreased during the pandemic ($M = 2.76$, $SD = 1.26$ v. $M = 2.53$, $SD = 1.18$, $p < .05$). Most students (55%) reported playing less during the pandemic, but playing in new ways (67%).

Conclusion: Children may benefit from interventions to counter reduced movement experienced during the pandemic, particularly in under-resourced areas.

Keywords

COVID-19, physical activity, sedentary behaviors, school-aged youth, play

Schools are central in educating youth about healthy behaviors and are optimal settings for children to participate in physical activity (PA).¹ However, shifts to remote learning during the COVID-19 pandemic may have altered youth activity behaviors.² This study utilized a socioecological framework³ to explain the impact of the physical and sociocultural environments on children's PA, sedentary behavior (SB), and play pre- and during the pandemic. We administered repeated cross-sectional surveys to children at one urban school district serving lower-socioeconomic students to determine if children reported differences pre- and during the pandemic overall and by gender in school-based PA and play and out of school PA, SB, and play.

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Methods

Design

Surveys were administered to students online during February 2020 and 2021. In 2020, the pandemic had not impacted schools, while in 2021, instruction had been remote for the entire school year. This study was approved by Arizona State University's Institutional Review Board (STUDY00007525).

Sample

Students in grades 4–8 at one Title I (>40% of students from low-income families) public charter school district in Phoenix (AZ) were invited to participate. The school director granted approval to administer the survey with passive parent consent and sent letters home allowing parents to opt-out. In 2020, 253 students assented online prior to taking the survey (62% response rate). In 2021, 261 students assented to complete the survey online (77% response rate). Median time to complete the survey both years was 22 minutes. In 2020, of the 865 students enrolled in grades K-12, 59% identified as Hispanic with 69% qualifying for free or reduced-price lunch. In 2021, of the 773 students enrolled, 67.3% identified as Hispanic with 71.6% qualifying for free or reduced-price lunch.⁴

Measures

Students self-reported levels of PA and SB outside of school using a seven-day recall with five questions on a scale from 1 (“none”/“not really at all”) to 5 (“7+” times in last week for physical activity/“>3” hours per day for SB) adapted from the Youth Activity Profile (YAP).⁵ Students reported the times physically active and amount of SB per day in the past week including TV, computer, video game, and cellphone use. One question assessed number of sports played on scale from 1 (“none”) to 4 (“3+”). YAP outcomes have been validated and calibrated against device-based group-level PA estimates.⁶ Two questions about degree of movement and play with friends during recess were measured on a scale from 1 (“strongly disagree”) to 4 (“strongly agree”). In 2020, these questions referred to recess during the typical school day while in 2021 they referred to breaks from learning during the remote school day. Three exploratory items were added to the survey in 2021 to measure perceived changes in ability to play, levels of play, and ways to play during the pandemic as compared to the prior year on a 4-point scale from 1 (“strongly disagree”) to 4 (“strongly agree”).

Analysis

After the removal of completely missing data (3% of total respondents), differences in mean item scores by year and gender were determined using one-way and two-way ANOVAs with Bonferroni post hoc corrections.

Results

Demographics

The 2020 sample consisted of 51% girls and more sixth (35%) and fifth grade (33%) students. The 2021 sample consisted of 52% girls with more fifth (31%) and seventh graders (24%).

School-Based Activity

Students reported less moving and playing during recess, $F(1,478) = 32.81, p < .01$, in 2021 compared to 2020, and differences by gender existed in 2020, $F(1,478) = 10.01, p < .05$. Both boys and girls reported decreases in moving and playing during recess. Girls expressed less moving and playing during recess than boys in 2020, but not in 2021.

Students reported lower levels of playing with friends during recess, $F(1,478) = 35.27, p < .01$, in 2021 and differences persisted by gender, $F(1,478) = 13.44, p < .01$. Boys and girls reported less playing with friends during recess in 2021. The higher levels of playing with friends during recess for boys were also significant for both years. Comparisons of school-based activity are shown in [Table 1](#).

Out of School Activity

Compared to 2020, in 2021 students reported playing less sports, $F(1,483) = 50.98, p < .01$, and less frequent engagement in PA, $F(1,481) = 7.69, p < .01$. TV watching increased by approximately one hour per day, $F(1,483) = 9.37, p < .01$. No statistically significant differences were found by year in time playing video games, $F(1,482) = 2.85, p > .05$, using computers, $F(1,481) = 1.68, p > .05$, or using cellphones, $F(1,484) = .80, p > .05$. While boys reported significantly higher PA and video game usage and lower cellphone usage compared to girls in 2020, only the number of sports played was significantly higher for boys in 2021. Comparisons of out of school activities are shown in [Table 1](#).

General Play

The majority of students agreed they were able to play during the pandemic (67%) and reported playing in new ways (67%). However, 55% of students agreed they played less during the pandemic than before. No differences in play behavior by gender were found.

Discussion

Our results showed decreases in student-reported PA and play and increased time spent in SB during remote learning. The co-occurrence of PA declines and increased SB comes with important health implications, particularly for children in lower-socioeconomic areas who are more likely to be overweight or obese and reside in environments more conducive to SB and less favorable to PA.⁷ In-person schooling is essential

Table 1. One- and two-way ANOVA comparisons of children's in and out of school activity.

Item	2020 (n = 237)	2021 (n = 245)
	M(SD)	M(SD)
School-based recess activity		
Move and play a lot	3.42 (.80)	2.99 (.86)*
Boys	3.58 (.80)	3.08 (.86)*
Girls	3.27 (.78)**	2.91 (.86)*
Play with lots of friends	3.38 (.86)	2.89 (.96)*
Boys	3.56 (.75)	3.03 (1.01)*
Girls	3.21 (.94)**	2.77 (.91)***
Out of school activity		
Sports played ^a	2.65 (1.05)	1.97 (1.04)*
Boys	2.75 (1.03)	2.14 (1.03)*
Girls	2.56 (1.07)	1.82 (1.03)***
Being physically active	2.76 (1.26)	2.53 (1.18)*
Boys	3.10 (1.32)	2.65 (1.21)*
Girls	2.57 (1.17)**	2.41 (1.18)
Watching TV	2.98 (1.50)	3.40 (1.41)*
Boys	3.02 (1.48)	3.44 (1.31)*
Girls	2.97 (1.53)	3.35 (1.47)*
Playing video games	2.86 (1.60)	3.13 (1.55)
Boys	3.46 (1.49)	3.51 (1.43)
Girls	2.32 (1.50)**	2.73 (1.58)***
Using computers	2.43 (1.41)	2.24 (1.55)
Boys	2.45 (1.35)	2.38 (1.71)
Girls	2.43 (1.49)	2.09 (1.48)*
Cellphone talking/texting	3.21 (1.59)	3.00 (1.53)
Boys	2.63 (1.53)	2.82 (1.48)
Girls	3.58 (1.48)**	3.16 (1.53)*

Note. School-based items on scale from 1 (strongly disagree) to 4 (strongly agree). Out of school items on scale from 1 (none/not really at all) to 5 (7+ times in last week for physical activity/>3 hours per day for sedentary behaviors).

^aItem on scale from 1 (none) to 4 (3+). *Significantly different than 2020, $\alpha = .05$. **Significantly different from boys, $\alpha = .05$. ***Significantly different than 2020 and boys, $\alpha = .05$.

for children's health as schools provide opportunities for movement and access to nearly all children.⁸

The lower levels of PA during recess reported in 2021 were likely because students were learning remotely and may have not perceived breaks as typical recess. Reduced opportunities for recess are concerning as recess accounts for significant amounts of PA during the school day and counters sedentary time.⁹ Out of school, students played fewer sports during the pandemic, with girls reporting less participation than boys. Cessation of youth sports may result in long-term lowered participation among this generation of children¹⁰ and will require increased support to ensure success.¹¹ TV watching increased in 2021, while video game playing increased among girls. These increases align with other studies during the pandemic where children spent the majority of free time in SB, with girls spending more time sedentary than boys.¹² Although our sample

reported lower PA and increased SB, most reported playing in new ways during the pandemic, corresponding to a similar study.¹²

Limitations

Although the diverse racial/ethnic background of our sample and ability to administer repeated surveys at the same time pre- and during the pandemic are strengths, our data are limited as they were collected from one school district and measures were self-reported, potentially introducing recall bias. While we found decreases in self-reported PA frequencies, the instrument used in this study did not allow for the determination of PA duration.

So What?

What Is Already Known on This Topic?

Literature from early months of the COVID-19 pandemic, when schools were operating remotely, suggested children were engaging in increased SB and decreased PA via parent reports.

What Does This Article Add?

Through repeated cross-sectional surveys at the same school district, this self-reported data supports that children's SB increased and PA decreased during the pandemic, and adds that PA during recess was lower when learning was remote compared to pre-pandemic levels.

What Are the Implications for Health Promotion Practice or Research?

Moving forward, students attending schools in lower-socioeconomic areas may benefit from interventions to mitigate the increased SB and decreased PA experienced during the pandemic, particularly within the comprehensive school day. If in-person learning becomes interrupted in the future, school administrators should prioritize recess as a scheduled opportunity for movement to promote healthy social and physical behaviors.

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Author Contributions

Conception and design of the work: K.W., A.S., A.H., J.V., and A.R.; data acquisition: A.H., J.V., and A.R.; data analysis and interpretation: K.W.; drafting the work and revising for important intellectual content: K.W., A.S., A.H., J.V., and A.R.; final approval of version to be

published: K.W., A.S., A.H., J.V., and A.R.; agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: K.W., A.S., A.H., J.V., and A.R.

Declaration of conflicting interests

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Ethical Approval

Study approval was granted by Arizona State University's Institutional Review Board (STUDY00007525).

Informed Consent

The school director granted approval to administer the survey with passive parent consent and sent letters home allowing parents to opt-out. Students assented online prior to taking the surveys.

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