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PEDAGOGY

Investigating the Impact of Learning Modality Shifts on K-12 Students' Physical Activity Participation During the COVID-19 Pandemic

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Abstract

The COVID-19 pandemic created many challenges for K-12 schools during the 2020-2021 school year (e.g., establishing social distancing measures, decisions regarding testing protocols, and transition from in-person to distance learning). Changes in teaching and learning modalities, from in-person to remote learning options, quickly became a reality for many students [an estimated 95%, according to Engzell et al. (2021)]. With an increase in distance learning came changes in students' structured and unstructured physical activity participation. The impact of these changes is unknown and justifies research investigating the effect modality shifts held on students' participation in physical activity and any associated outcomes. A mixed-methods survey was administered to examine changes in K-12 students' learning modality,

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participation in physical activity, and associated outcomes. Changes in learning modality from in-person to online were most frequently indicated (90%). Respondents stated both challenges and success stories associated with students' participation in physical activities resulting from modality shifts (e.g., decreased social engagements, decreased exposure to structured and facilitated physical education, and increased outdoor play). Positive outcomes were most prevalent in children engaging in moderate PA. However, 85% of respondents indicated a decrease in their child's physical activity participation. Our findings justify further investigation of the immediate and long-term impact of school modality shifts on students' engagement in physical activities.

Introduction

Throughout the 2020-2021 school year, the United States K-12 education system faced a breadth of challenges in providing students with an effective learning experience as a result of the COVID-19 pandemic. Select challenges included a swift transition in teaching and learning modalities, maintaining stakeholders' (i.e., students, guardians, educators) engagement and positive moral, and facilitating physically and cognitively challenging learning initiatives online (Roe et al., 2021). This research project explores the impact of learning modality shifts on K-12 students' participation in physical activity and the breadth of outcomes students associate with these shifts during the 2020-2021 school year.

K-12 Schools' Response to COVID-19

The COVID-19 pandemic affected approximately 95% of the world's student population in suspending face-to-face teaching in schools, making it the largest disruption to education in history (Engzell et al., 2021). In 2020, the Centers for Disease Control and Prevention (CDC, 2020b) established an outline of COVID-19 prevention strategies that included personal hygiene, the use of personal protective equipment (PPE), and physical distancing to provide the public with strategies to mitigate the spread of COVID-19. Prior to the start of the 2020-2021 school year, U.S. state school boards began formulating a plan of action to continue learning and instruction while meeting the recommendations of the CDC (NC Department of Health and Human Services, 2020a). The resulting impact of these

measures led to remote learning options (e.g., synchronous or asynchronous virtual courses) emerging as the main method of teaching delivery (Engzell et al., 2021).

The Importance of Physical Activity in Youth Development

Healthy growth and development for children are grounded in the importance of physical activity and movement. Routine engagement in physical activity is well documented as an influential element of students' personal (e.g., increased self-confidence, physical health, self-awareness, mental restoration) and academic development (e.g., increased investment in learning, reflection on content, reliance on social learning) (Bento & Dias, 2017; Committee on Physical Activity, 2013; Holland et al., 2018). The benefits of a physically active body on an intellectual mind have been shown for age groups ranging from early childhood to old age (Rasmussen & Laumann, 2013). In the school setting, physical activity participation in K-12 students has been found to be necessary for its physical health benefits and, later, its direct relationship with increased social, mental, and emotional development (Rasmussen & Laumann, 2013). Students routinely engage in structured and unstructured activities such as Physical Education class (P.E.) and daily recess. These activities provide opportunities for young students to practice movement and motor skills and promote social and emotional learning and development for students of all ages (American Academy of Pediatrics [AAP], 2013).

Benefits associated with physical activity also contribute to positive mental health outcomes, including reduced levels of anxiety and depression and improved self-esteem (Committee on Physical Activity and Physical Education in the School Environment; Food & Nutrition Board, 2013). Demand for mental health care for adolescents has increased over the past decade (Moitabai & Olfson, 2020), and mental health issues among K-12 students are a growing concern as an estimated 20-25% of children in the U.S. experience a mental health disorder each year (Bains & Diallo, 2016). Research suggests that promoting physical activity may protect the mental health of this group (Rodriguez-Ayllon et al., 2019). However, the relationship between physical activity and children/adolescents is complex, and positive outcomes and mental health benefits can depend on the

context and personal experience related to physical activity (Biddle et al., 2019), yet benefits associated with physical activity make it an important component of positive health and development for this age group.

Difficulty of Tracking Physical Education

Virtual or remote learning from home has been identified as a potential indicator for decreased promotion and participation in physical activity for students (Roe et al., 2021). Physical education in schools is foundationally supported by the CDC and is outlined as a planned, sequential curriculum for K-12 based on national standards (CDC, 2021). Before the COVID-19 pandemic, the national standard disseminated to state boards of education recommended implementing 60 minutes or more of daily physical education activities (Physical Education During COVID-19, 2021). Potential adaptations to physical education in remote learning formats included asynchronous pre-filmed videos where students were provided the means to complete the physical activity lessons on a weekly basis (Physical Education During COVID-19, 2021). However, the pivot from in-class physical activity participation to at-home participation shifted the accountability of students' participation from their teacher to the parent or guardian. While teachers could encourage students to remain active and participate in their virtual physical education and daily physical activity on their own, it became difficult to track a student's participation (Physical Education During COVID-19, 2021).

From a review of the literature, there appears to be limited research exploring the impact of modality shifts on K-12 students' physical activity engagement. Therefore, this study focused on the following research questions:

Research Questions

Q1: How, if at all, was physical activity participation influenced as a result of shifts in K-12 students' learning modality?

Q2: What outcomes, if any, are associated with changes in K-12 students' physical activity participation resulting from learning modality shifts?

Methods

A mixed-methods survey was constructed using Qualtrics survey software and administered via social media over a duration of 3-weeks in Fall 2021. The population for this study included legal guardians of K-12 students during the 2020-2021 school year. The study was approved by the University of North Carolina Wilmington Institutional Review Board (#21-0300).

To investigate changes in learning modality associated with the pandemic, respondents were asked, "*During the 2020-2021 school year, was your child's learning format different from previous school years as a direct result of COVID-19?*". Further, respondents were asked, "*What type of learning format did your child change from?*" and "*What type of learning format did your child change to?*" To investigate changes in physical activity participation, respondents were asked, "*Did your child's participation in physical activity change as a result of their school's response to the COVID-19 pandemic?*" Respondents who indicated a change in their child's participation in physical activity were asked, "*Please explain in detail below how your child's participation in physical activity changed as a result of their school's response to the COVID-19 pandemic?*" Lastly, to investigate outcomes associated with changes in learning modality, respondents were asked if they associated positive or negative outcomes with their child's participation in the previously mentioned physical activity over the 2020-2021 school year. Respondents who indicated either outcome were asked to explain those outcomes in detail.

Frequencies and percentages were computed for all questions to analyze responses to closed-ended questions. An open coding technique was used for open-ended responses. Responses were first coded into corresponding groups individually by two researchers. Next, coding notes were shared to identify congruencies in coding, and upon agreement, categories were created from the list of codes. Lastly, each researcher recorded responses using the agreed-upon codes and categories. Two researchers each used the predefined value categories to code responses. Codes were compared and discrepancies were addressed to determine final code categories.

Results

Following data collection, cleaning and the removal of incomplete surveys, our final working sample included 211 surveys. Students ranged in grade level from kindergarten to twelfth grade, with first grade most frequently indicated (28%). Our sample consisted of 56% male (43% female) and 84% self-identifying as *white or Caucasian*. Fifty-seven percent of students attended public schools, and 23% attended charter schools.

Shifts in Learning Modality Associated with the COVID-19 Pandemic

The vast majority (92%; N=194) of our sample indicated their child had experienced a change in learning modality during the 2020-2021 school year as a direct result of COVID-19. Most of these individuals (90%; N=174) changed from an in-person to a fully virtual/remote learning modality.

Q1: Participation in Physical Activity Associated with Shifts in Learning Modality

Of respondents who indicated their child had experienced a change in learning modality (92%; N=194), 92% indicated their child's participation in physical activity changed because of their learning modality shifting. When asked how their child's participation changed, respondents indicated increased and decreased participation forms. Seven change categories were constructed from respondents' data (Table 1). However, decreases or the absence of physical activity participation were most frequently indicated (85% of respondents). The absence of extracurricular activities (41%), decreased general physical activity participation (34%), and an increase in unstructured physical activity participation (26%) were the three most frequently indicated change categories. One respondent indicated, "*Decreased. During in-person school, he would have recess every day and PE a couple of times a week. Remote school reduced PE to once a week and having two working parents made daily recess difficult.*" Table 1 shows each change category indicated by >10% of respondents, the percentage in which each category was coded from respondent data and select quotes from respondents for each category. Interestingly, seven percent of respondents indicated an in-

Table 1
Changes in Physical Activity Participation Resulting from Modality Shifts

Category	Percentage	Select Respondent Quote
No extracurricular activities	41	• "*We stopped playing sports due to health concerns for my child.*"
Decreased physical activity	34	• "*He was more sedentary. I had to make him do physical activity daily.*"
Increased unstructured physical activity	26	• "*Extracurricular after school activities were limited so my son began running*"
Logistical physical activity changes	25	• "*Gym class was outside. They set up a gaga ball pit for them. Inside, the gym was half closed off as an eating area to help distance kids while they ate lunch.*"
Decreased social physical activity	22	• "*Activities with friends were often discouraged by other parents.*"
No physical activity	19	• "*My student ceased to participate in anything. My student slept a lot and was eventually diagnosed with depression.*"
Increased screen time	13	• "*Less active overall - sitting in front of computer screen most of each day.*"

**Percentages do not equal 100% because respondents could indicate more than one change*

crease in their child's physical activity associated with shifts in their learning modality.

Q2: Outcomes Associated with Physical Activity Participation During Modality Shifts

Positive Outcomes

Of children who had experienced a shift in learning modality, 14% of the parents associated a positive outcome(s) with changes in their child's participation in physical activity resulting from learning modality shifts. Nine positive outcome categories were constructed from respondents' data. Most respondents stated that their child's adapted participation in physical activity was associated with maintaining physical or mental health (indicated by 95%). Maintained mental health (54%), physical health (41%), and exposure to social contexts (40%) were the three most frequently indicated positive outcomes categories identified. Table 2 shows each positive outcome category indicated by >10% of respondents (who associated a positive outcome), the percentage in which each category was coded

Table 2
Positive Outcomes Associated with Changes in Physical Activity Participation Resulting from Modality Shifts

Category	Percentage	Select Respondent Quote
Maintained mental health	54	• "*My child was able to rejuvenate mental fatigue.*"
Maintained physical health	41	• "*My son continued to practice soccer which gave him much needed physical activity and maintained his physical health.*"
Exposure to social groups	40	• "*She wasn't isolated. She was around other kids and always had interactions with them.*"
Increased unstructured physical activity	35	• "*Spent more time participating in unstructured activities that built confidence and improved overall physical health.*"
Increased time spent outdoors	32	• "*Because activities were cancelled, all the kids in our neighborhood were home to play outside every day at lunch and after school.*"
Technical skill development	28	• "*He has become a very good tennis player.*"
Increased self-confidence	17	• "*Outside of school activities-built confidence.*"
Maintained normalcy	16	• "*Gymnastics team helped maintain some sense of normalcy.*"
Developed new hobbies	16	• "*She learned archery & rope climbing.*"

**Percentages do not equal 100% because respondents could indicate more than one outcome*

from respondent data and select quotes from respondents for each category.

Negative Outcomes

Of K-12 students who had experienced a shift in learning modality, 86% of their parents associated negative outcomes with their child's participation in physical. We coded nine negative outcome categories from respondents' data. The three most frequently coded negative outcome categories included decreased physical (80%), decreased social interactions (79%), and a decrease in motivation to engage in physical activities (71%). Table 3 shows each negative outcome category indicated by >10% of respondents (who associated a negative outcome), the percentage in which each category was coded from respondent data and select quotes from respondents for each category.

Table 3
Negative Outcomes Associated with Changes in Physical Activity Participation Resulting from Modality Shifts

Category	Percentage	Select Respondent Quote
Decreased physical health	80	• "*He gained weight, lost muscle and worst part his drive to participate diminished.*"
Decreased social interactions	79	• "*He did these activities alone. Missed team sports.*"
Decreased motivation to be physically activity	71	• "*My child lost interest and motivation to participate in physical activities.*"
Decreased mental health	66	• "*Lack of contact with other peers as well as activities seemed to negatively impact emotional well-being.*"
Increased screen time / dependency	59	• "*She grew an increased dependency on her computer and phone.*"
Decreased body image	57	• "*My child gained excessive weight and didn't gain skills/physical confidence that he should have at that age.*"
Decreased social skills	56	• "*The lack of team sports meant a lack of learning to play as a team.*"
Decreased diversity of physical activity	43	• "*There was a lot less focus on the variety of activities they usually participate in during a school setting.*"
Deceased desire to go outdoors	33	• "*My kid doesn't want to go outdoors as much anymore.*"

**Percentages do not equal 100% because respondents could indicate more than one outcome*

DISCUSSION

This study aimed to identify the impacts of learning modality shifts associated with changes in K-12 students' physical activity engagements during the 2020/2021 academic school year. Further, we aimed to explore the breadth of outcomes, if any, associated with changes in K-12 students' physical activity engagement resulting from modality shifts. Our findings demonstrate that many students experienced modality shifts and adapted their physical activity participation as a result. Further, our findings show that the changes made in K-12 students' physical activity engagements are associated with a range of positive and negative student outcomes. The following sections will discuss these findings and their implications further.

K-12 Students' Adaptations to Physical Activity Due to COVID-19

Guardians in our study frequently expressed the hardship of structured extracurricular activities (e.g., school sports, specialty

camps, social gatherings) no longer being provided for their child. Many of these activities were associated with structured physical activity engagements, opportunities to socialize, soft and hard skill development, and provided guardians with forms of routine childcare. As a result of these activities no longer being provided, K-12 students were pushed to demonstrate adaptability and self-reliance in their physical activity and social engagements. Unfortunately, our data demonstrates this was not a productive responsibility to place on most students (85% of respondents indicated a decrease in their child's physical activity participation).

Outcomes Associated with Changes in Student's Physical Activity Participation

Many of the respondents reported that shifts in their child's learning format created challenges in maintaining their physical activity participation. Parents identified both positive and negative outcomes in their children related to their participation in physical activity due to learning modality change. Of those respondents, 84% indicated their child experienced negative outcomes, whereas only 14% indicated positive outcomes. Due to the learning modality change, many parents who indicated negative outcomes noted their child was participating in fewer extracurricular activities and reduced structured activities such as P.E. when they were not attending in-person school. Some respondents who indicated their child's ability to spend more time participating in outdoor play with the increased amount of time spent at home saw positive outcomes. This may provide some evidence to support the idea that physical activity participation in children promotes healthy growth and development.

Implications of Changes in K-12 Students' Physical Activity Engagements

The amount of structured physical activity students had been receiving during the school day greatly decreased during the 2020/2021 school year because of learning modality changes. While some children still could participate in extracurricular and physical activities outside of the school day, which indicated positive outcomes such as maintaining both physical and mental well-being, many were not participating in much physical activity at all. Participants in our study noted that their child had decreased physical, emotional, and

mental health as a result of this loss of physical activity and interaction. 80% of the respondents indicated negative outcomes correlated these changes in their child with decreased physical health and 79% with decreased mental health. The data in this study indicates changes in physical activity affecting outcomes associated with a child, with increased physical activity levels correlating with positive outcomes and decreased physical activity levels correlating with negative outcomes.

References

American Academy of Pediatrics. (2013). The crucial role of recess in school. *Pediatrics, 131*(1),183−188.

Bains, R. N., & Diallo, A. F. (2016). Mental health services in school-based health centers: systematic review. *The Journal of School Nursing*, *32*(1). https://doi.org/10.1177/1059840515590607

Barnett, A. L. (2011). Benefits of exercise on cognitive performance in schoolchildren. *Developmental Medicine & Child Neurology*, 53, 580-580. doi:10.1111/j.1469-8749.2011.03973.x

Bento, G., & Dias, G. (2017). The importance of outdoor play for young children's healthy development, *Porto Biomedical Journal, 2*(5), 157–160. https://doi.org/10.1016/j.pbj.2017.03.003

Biddle, S. J. H., Ciaccioni, S., Thomas, G., & Vergeer, I. (2019). Physical activity and mental health in children and adolescents: An updated review of reviews and an analysis of causality. *Psychology of Sport and Exercise,* 42, 146–155. http://doi.org/10.1016/j.psychsport.2018.08.011

Centers for Disease and Control Prevention. (2020a). *Inclusive School Physical Education and Physical Activity*. U.S. Department of Health and Human Services. https://www.cdc.gov/healthyschools/physicalactivity/inclusion_pepa.htm.

Centers for Disease and Control Prevention. (2020b). *Physical Education and Physical Activity*. U.S. Department of Health and Human Services. https://www.cdc.gov/healthyschools/physicalactivity/physical-education.htm.

Committee on Physical Activity and Physical Education in the School Environment; Food and Nutrition Board. (2013). *Physical Activity and Physical Education: Relationship to Growth, Development, and Health*. https://www.ncbi.nlm.nih.gov/books/NBK201497/

Engzell, P., Frey, A., & Verhagen, M. D. (2021, April 27). Learning loss due to school closures during the COVID-19 pandemic. https://www.pnas.org/content/118/17/e2022376118/tab-article-info

Holland, W. H., Powell, R. B., Thomsen, J. M., & Monz, C. A. (2018). A systematic review of the psychological, social, and educational outcomes associated with participation in wildland recreational activities. *Journal of Outdoor Recreation, Education, and Leadership*, *10*(3).

Mojtabai, R., & Olfson, M. (2020). National trends in mental health care for US adolescents. *JAMA Psychiatry, 77*(7), 703–714. https://doi.org/10.1001/jamapsychiatry.2020.0279

NC Department of Health and Human Services. (2020a). *Infection Control and PPE Guidance (K-12*). https://covid19.ncdhhs.gov/media/406/open

NC Department of Health and Human Services. (2020b). *Public Health Toolkit (K-12*). https://covid19.ncdhhs.gov/media/164/open

Rasmussen, M., & Laumann, K. (2013). The academic and psychological benefits of exercise in healthy children and adolescents. *European Journal of Psychology of Education, 28*(3), 945–962. http://www.jstor.org/stable/23581530

Rodriguez-Ayllon, M., Cadenas-Sánchez, C., Estévez-López, F., Munoz, N.E., Mora Gonzalez, J., Migueles, J. H., Molina-Garcia, P., Henriksson, H., Mena-Molina, A. Martinez-Vizcaino, V., Catena, A., Lof, M., Erickson, K. I., Lubans, D. R., Ortega, F. B., & Esteban-Cornejo, I. (2019). *Role of Physical Activity and Sedentary Behavior in the Mental Health of Preschoolers, Children and Adolescents: A Systematic Review and Meta-Analysis. Sports Med,* 49**,** 1383–1410. https://link.springer.com/article/10.1007/s40279-019-01099-5

Roe, A., Blikstad-Balas, M., & Dalland, C. P. (2021). The impact of COVID-19 and homeschooling on students' engagement with physical activity. https://www.frontiersin.org/articles/10.3389/fspor.2020.589227/full

The Hunt Institute. (2021). *Physical Education During COVID-19*. https://hunt-institute.org/resources/2021/05/physical-education during-covid-19/