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Resurgence of Physical Education and physical activity in the COVID-19 era: Policy inconsistencies, implications and future considerations

M. Adamakis (Cork, Ireland)

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Abstract
COVID-19 has already changed the world, not only because of the disease itself, but because of the long-term effects of the world's reaction to the pandemic. Many countries worldwide have imposed large-scale or national closures of schools and sports facilities, and the practice of outdoor physical activity in public parks and playgrounds was not allowed, and these policy responses to reduce SARS-CoV-2 transmission have a direct impact on children and adolescents. Due to these measures, overall children's physical activity has been reduced and sedentary behaviour has increased during the COVID-19 pandemic. This policy brief aims to discuss policy inconsistencies during lockdown and physical distancing measures imposed on children and adolescents [i.e., school closures, screen-based (in)activity, curricular Physical Education, hygiene measures, active school travel, sport facilities and physical activity], in relation to current recommendations for exercise during the pandemic, and Physical Education school re-entry considerations.

Key words: SARS-CoV-2, coronavirus, school closures, sport facilities, children, sedentary behaviour, social distancing, lockdown, exercise

1 Introduction

COVID-19 has already changed the world, not only because of the disease itself, but because of the long-term effects of the world's reaction to the pandemic (Harper et al., 2020). Multiple policy responses have been implemented to reduce SARS-CoV-2 transmission and prevent health system strain, including the detection and isolation of infected individuals, contact-tracing, physical distancing, and closure of non-essential businesses (Hartley & Perencevich, 2020). Quarantine measures are widely used as part of national strategies to contain the spread of the COVID-19 pandemic, which are usually mentioned as confinement, nationwide quarantine, curfew, movement outside of the house for specific reasons, isolation, general lockdown, protective restrictions, and stay-at-home orders (Stockwell et al., 2021). These measures have a direct impact on children and adolescents, since many countries have imposed large-scale or national

school and sport facilities closures, affecting millions of children and young people worldwide. As a result, curricular and extracurricular Physical Education (PE) has been restricted or even cancelled, leading to increased physical inactivity levels.

2 School closures

Currently, over 800 million students still face significant disruptions to their education, ranging from full school closures for all levels in 31 countries, to reduced academic schedules or school closures at some levels in another 48 countries (OurWorldInData, 2021; UNESCO, 2021). Although school closures reduce the number of contacts children have, and may decrease virus transmission, this assumption is not confirmed for COVID-19. Even though SARS-CoV-2 transmission can occur within school settings and clusters have been reported by countries in all school levels, in-school transmission accounts for the minority of all COVID-19 cases, while the prevalence of SARS-CoV-2 transmission is mainly associated with community transmission (CDC, 2021; ECDC, 2020). Recent findings suggest that children transmit COVID-19 far less than adults, since their ability to pass the virus is estimated to be 63% relative to that of adults (Dattner et al., 2021), and they cannot be considered the main drivers of SARS-CoV-2 transmission (Bullard et al., 2021). Based on the data available, in-person learning in schools has not been associated with substantial community transmission, especially in primary education, because studies have found very low rates of symptomatic or asymptomatic SARS-CoV-2 infection in students and staff following partial and full schools' reopening (Ladhani et al., 2021). Though outbreaks do occur in school settings, multiple studies have shown that transmission within schools is typically lower than, or at least similar to, levels of community transmission, when mitigation strategies are in place in schools (CDC, 2021).

In addition to children's low transmission rates, the overall risk to children and young people from COVID-19 is limited (Spiegelhalter, 2020), and hyperinflammatory syndrome is extremely rare in these age groups (Riphagen et al., 2021). For example, in Sweden, a country that kept schools and preschools open, there was a low incidence of severe COVID-19 among schoolchildren and children of preschool age. Among the 1.95 million children aged one to 16 years, 15 children were tested positive to COVID-19 and were admitted to an intensive care unit, which is equal to one child in 130,000 (Ludvigsson et al., 2021). Recent modelling studies of COVID-19 predicted that school closures alone would prevent only 2-4% of deaths, much less than other social distancing interventions (Viner et al., 2020). Overall, children have a low risk of being infected by COVID-19, and, on the other hand, are disproportionately harmed by these precautionary measures (Snape & Viner, 2020).

The negative physical, mental health and educational impact of proactive school closures on children, as well as the economic impact on society more broadly, would likely outweigh the educational benefits (ECDC, 2020). COVID-19, via these school closures, will exacerbate the epidemic of childhood obesity and increase disparities in obesity risk. Furthermore, social distancing and stay-at-home orders have reduced the opportunities for physical activity (PA) among children and youths, particularly for those in urban areas living in small apartments, and sedentary behaviours (SB) and screen time have expanded (Rundle et al., 2020; Zhou et al., 2021). In healthy children, PA during lockdown decreased and SB increased compared with pre-lockdown, despite the fact that various organisations, health and exercise professionals provided useful recommendations and guidelines on how to stay physically active during home confinement (Stockwell et al., 2021).

3 Screen-based activity

In these recommendations on how to stay physically active during home confinement, exercise videos that focus on PA delivery through the Internet, mobile technologies (e.g., smartphone apps), and television, are considered viable pathways for maintaining PA and mental health during quarantine (Chen et al., 2020). This approach is backed up by recent studies, which showed that PA through exergaming can be classified as moderate-to-vigorous PA (MVPA) (Cortis et al., 2020), and fitness apps may help buffer the PA decline (but do not increase PA) during lockdown (Yang & Koenigstorfer, 2020). Currently, a growing body of literature informs the rising trends of screen time and associated health outcomes during the COVID-19 pandemic (Carroll et al., 2020; Hu, Lin, Chiwanda Kaminga, & Xu, 2020).

In addition to this, the U.S. Ambassador of the World Health Organization (WHO) tweeted his support of playing video games and asking people to continue social distancing by picking up a videogame. He used the hashtag "play apart together" as part of WHO's growing movement to unite people around the world while also keeping their distance (CNN Newsource, 2020). While the above-mentioned recommendation might be useful in certain cases, it should not be disregarded that WHO (2020) officially claimed videogame addiction a mental health disorder and added "Gaming disorder" to its global medical guide, the International Statistical Classification of Diseases and Related Health Problems or "ICD-11", which will go into effect in January 2022. The line between "gaming" and "gaming disorder"[3] is very thin and in times of unforeseen pressure and decreased mental health status (as in times of pandemics), such recommendations should be interpreted and practiced with extreme caution, while parents and children should be aware of the negative consequences that "crossing the line" might have on wellbeing. The adverse effects of increased video gaming and smartphone usage will potentially lead to a "screen-based pandemic", following the end of the COVID-19 pandemic.

4 Curricular physical education

Due to school closures, PE classes have been impacted negatively, because in many cases PE classes have been cancelled (even if schools remained open), and the need for social distancing and enhanced personal hygiene practices posed further practical restrictions (Harrington & O'Reilly, 2020), while other classes are delivered through online platforms. Particularly related to the COVID-19 situation, PE is being internationally advocated as a critical face-to-face experience for students and face-to-face PE lessons are the only methodology for learning PA (EUPEA, 2020). In the absence of face-to-face learning, PE educational institutions raise well-founded concerns for their education principles, specifically the diversity of content lost through the medium of online learning environments (O'Brien et al., 2020). The minimisation of the practical PE components poses a serious threat over the core PE principles, as well as the delivery of quality PE, which is grounded in the equality of opportunity for all students to access a well-balanced and inclusive curriculum.

Furthermore, PE classes might now see a change in terms of the activities proposed (more individual activities instead of group ones), the personal space around each student and the increased avoidance of physical contact (Varea & González-Calvo, 2020). Indeed, as suggested in various PE re-entry recommendation documents, individual activities should be prioritised as these present less risks, rather than traditional team sports (SHAPE America, 2020). It is further advised to avoid as much

[3] The ICD-11 describes "Gaming disorder" as recurrent videogame playing that leads to "impaired control over gaming" and an "increasing priority given to gaming to the extent that gaming takes precedence over other life interests and daily activities", despite "the occurrence of negative consequences".

as possible the contact aspect of contact sports and instead focus on fitness and skills (Department of Education and Skills, 2020). These recommendations are based on the notion that the close proximity of participants and the increased respiration rate due to PA demands pose potential risks for SARS-CoV-2 transmission during team and contact sports, however the actual transmission rate is unknown. To answer this question, current research in outdoor rugby and soccer shows that despite the frequent interactions between SARS-CoV-2 positive players and other players, transmission and severe illness are limited during matches, when preventive measures are in place (Jones et al., 2021; Schumacher et al., 2021).

It should not be disregarded that curricular PE has broader developmental goals (and not only physical health), such as psychological, affective, social, and cognitive outcomes and mental health (OECD, 2019). Games and sports, including individual and/or team sports, are part of most countries' PE curriculums, including sports to promote healthy competition, or to promote collaboration and teamwork (OECD, 2019). "Social distancing" games might be an adequate substitute during times when virus community transmission is high, however these games and/or sports have limited efficacy in promoting social and teamwork-related curricular outcomes. More research is definitely needed to determine the virus transmission risk during indoor and outdoor sport activities, and to assist traditional team and contact sports to survive following the COVID-19 pandemic and be fully incorporated in PE classes.

5 Hygiene measures in physical education

Regarding hygiene practices, it has been suggested that students and staff should take good care of their personal hygiene (e.g., sanitize hands, avoid sharing of water bottles, wear face masks when possible), as well as sanitise shared PE equipment and surfaces on a regular basis (e.g., Department of Education, 2021; Department of Education and Skills, 2020; SHAPE America, 2020). The latter strategy (equipment sanitation) was imposed by guidelines which mentioned that the virus that causes COVID-19 can spread through contaminated surfaces, known as fomites. However, Goldman (2020) took a closer look at the evidence around fomites and found that there was little evidence to support the idea that SARS-CoV-2 passes from one person to another through fomites. He further argued that surfaces presented a relatively low risk of transmitting SARS-CoV-2.

The overall risk of SARS-CoV-2 infection via the fomite transmission route is low, and generally less than one in 10,000, which means that each contact with a contaminated surface has less than a one in 10,000 chance of causing an infection (Harvey et al., 2021; Pitol & Julian, 2021). Now it is agreed that SARS-CoV-2 transmits through the air, in both large droplets and small particles called aerosols, and surface transmission, although possible, is not thought to be a significant risk (Lewis, 2021). This lack of clarity about the risks of fomites, compared with the much bigger risk posed by transmission through the air, has serious implications. People and organizations continue to prioritize costly and time-consuming disinfection efforts, when they could be putting more resources into emphasizing the importance of masks, hand washing and investigating measures to improve ventilation systems (Nature Editorial, 2021; Lewis, 2021) in PE and sport facilities.

6 Active school travel

A side effect of school closures, which results in further reduction of students' daily PA, is the minimization of active school transport. School-based active travel is important because children and adolescents go to school every day, and this environment is a natural and ongoing opportunity to develop active travel behaviours (Carlin et al., 2016).

Schoeppe et al. (2013) found that children who have the freedom to play outdoors and travel actively without adult supervision accumulate more PA than those who do not, while Larouche et al. (2014) identified positive associations between active travel and health outcomes. In general, active transport can be a major contributor to total MVPA, with the mode of commute having a significant role in the level of this contribution to total MVPA (Gbadamosi et al., 2020). Between 2015-2017, one in two school-aged children used active transport (i.e., they walked or cycled) to get to and from school (Whiting et al., 2020).

Unfortunately, due to current lockdowns and home confinement measures, millions of children worldwide do not actively commute to school, leading to further decrease in opportunities to be physically active. Active travel to school cannot resume when schools are closed, and this is another major reason for the resumption of schooling activities. Without access to structured PE and active travel, children and adolescents are at risk of weight gain, lowered physical functioning and increased screen time use (Rundle et al., 2020).

7 Sport facilities and physical activity

In addition to school closures, PE classes amendments and/or cancellations, active travel minimization, and screen time increase that negatively affect children's PA, citizens were allowed and even encouraged by governments to exercise, but with considerable restrictions (Constandt et al., 2020). It is well-known that since the beginning of the pandemic, due to the restrictive measures adopted worldwide, sports facilities were closed and the practice of outdoor PA in public parks and playgrounds was not allowed (Di Stefano et al., 2020). Also, organized sports activities were to be discontinued and several businesses ceased their function, including stadiums, gyms, professional and amateur sports, leisure centres and swimming pools (Ernstsen et al., 2020).

These restrictions and sport closures were adopted due to the close proximity of individuals in crowded places, where personal contact between participants is inevitable and a "safe distance" cannot be maintained. Furthermore, the increased respiration rate due to the demands of exercise poses a potential risk for SARS-CoV-2 transmission during sports. Indeed, initial data from indoor fitness dance classes suggested that large class sizes, small spaces, and intensity of the workouts (five to 22 participants in a room $\approx$60 m^2 during 50 minutes of vigorous exercise) facilitated the transmission of the virus (Jang, Han, & Rhee, 2020). On the other hand, more recent data confirms that gyms and leisure centres provide safe public spaces in which to exercise (following good hygiene and distancing measures), with a self-reported incidence rate of 1.12 positive COVID-19 cases per 100,000 visits (Jimenez et al., 2020). Additionally, current studies from soccer (Schumacher et al., 2021) and rugby (Jones et al., 2021), which are both considered outdoor close-contact team sports, show that there is a limited risk for SARS-CoV-2 infection and severe illness when preventive measures are in place, suggesting a lower risk of viral transmission than previously predicted. It is possible that the number of new weekly COVID-19 cases in professional sports (e.g., rugby) is related to community COVID-19 cases, and when community prevalence is increased, more professional players athletes are likely to have COVID-19 (British Journal of Sports Medicine, 2021). This potentially means that gyms, leisure centres, and outdoor sports do not contribute significantly to the increase of COVID-19 cases in the wider community and when implementing hygiene and distancing measures protocols, structured physical and exercise activities can resume. The association between COVID-19 cases in the community and sport requires further evaluation, which may help the implementation of evidence-informed risk mitigation strategies. The safe resumption of these activities is extremely important because, depending on the national

context, sports organisations may function as an essential facilitator for PA and sport participation among children (Whiting et al., 2020).

8 Discussion

Currently, there is plenty of evidence that children's PA has been reduced and SB has increased during the COVID-19 pandemic (e.g., Dunton et al., 2020; Stockwell et al., 2021), due to the previously discussed reasons, and we are facing a "physical inactivity crisis in waiting". Unfortunately, even though exercise and many drug interventions have often similar mortality benefits in the prevention of various diseases (Naci & Ioannidis, 2015), PA and fitness have preventive potential on many chronic diseases that are risk factors for COVID-19 outcomes (Burtscher et al., 2020), and the consistent meeting of PA guidelines is strongly associated with a reduced risk for severe COVID-19 outcomes among infected individuals (Sallis et al., 2021), the role of children's curricular and extracurricular PA and exercise during the pandemic is clearly underestimated. Extreme lockdown measures (usually non-evidence-based) for postponing the pandemic wave for many months, which may have even worse consequences than a pandemic wave that runs an acute course (Ioannidis, 2020), may further have irreversible effects on children's PA levels and intention to remain physically active.

For children to achieve the updated WHO recommendations to do at least an "average of 60 min/day" of MVPA, rather than the previously stated "accumulate 60 min of PA daily" (Bull et al., 2020), it is not feasible to rely only on their "individual responsibility" to be active, home-based PA and exergaming, when at the same time many of the "Eight investments that work for PA" (i.e., whole-of-school programmes, active travel, sport and recreation for all, and community wide programmes; International Society for Physical Activity and Health, 2021) are neglected. Children are currently confronted with two pandemics occurring at the same time, COVID-19 and physical inactivity. They are at risk of a continuous cycle where current and potentially accelerated physical inactivity patterns and SB may worsen the impact of future pandemics (Hall et al., 2020). Active play (during PE and unstructured, outdoor PA in children's free time), active transport (cycling or walking) and participation in sports, are the major contributors to total PA among children. Schools are crucial because children spend a lot of time there and school PE contributes significantly to reducing students' daily physical inactivity and SB (Mayorga-Vega et al., 2018). The closing of schools and sport facilities prevents children from being physically active and pose an increased threat on future PA participation levels. Additionally, curricular PE is not only related to health outcomes, and continuous cancellation of regular PE classes might have an adverse effect on children's psychological, affective, and social development.

It is important that governments, policymakers, and other stakeholders (e.g., health and care services, schools, and civil society organizations) work collaboratively to support increased opportunities for children to be physically active. Yet, one year into the COVID-19 pandemic, it is crucial that WHO, CDC and other public-health agencies update their guidance and recommendations on the basis of evidence-based data and current knowledge. These agencies have the responsibility to present clear, up-to-date information that provides what people need to keep themselves and others safe in various environments. Developing guidelines is an important stepping stone in the pathway of translating science into policy, however change will only come about when evidence-based governmental policies are translated into actual practice. Extreme, not-scientifically justified measures (e.g., nationwide lockdowns and school closures; thorough equipment disinfection before and after use; compulsory, horizontal use of

face masks from a young age, even during school breaks and outdoor unstructured play) may impose to children further limitations and discouragement to be physically active. This policy brief aimed at identifying policy inconsistencies, which relied on exaggerated information and non-evidence-based measures, and their negative impact on children's PA. A central point in this approach is the closure of schools and sport facilities, leading to cancellation of PE classes and extracurricular PA. Reliable evidence and better information are needed to guide decisions and actions of monumental significance and to monitor their impact.

Lewis et al. (2021) claim that in the absence of strong evidence for benefits of school closures, the precautionary principle would be to keep schools open to prevent catastrophic harm to children. Given the severe consequences of school closures on children and their communities, this measure should be employed as a last resort for disease control and, even then, should be time limited (ECDC, 2020). In addition, resumption of PE, and structured PA and sports, given the health, social and financial benefits, requires substantial planning, however it is a feasible goal. The benefits of exercise during the COVID-19 pandemic may outweigh the risks of infection (Dominski & Brandt, 2020); caution is needed mainly in small indoor spaces where participants exercise in high intensities, where contamination could be airborne. In this case, high intensity building ventilation is considered as the most straightforward measure (Blocken et al., 2020), as well as social distancing measures.

If the use of masks is necessary during indoor classes and PA, it is important to carry out the lesson with light exercises and to ensure that students rest intermittently, and if excessive facial sweating occurs, the masks should be changed (Filiz & Konukman, 2020). If activities require high effort to be performed over a prolonged period of time, masks should be avoided because cloth face masks are associated with 14% reduction in exercise time and 29% decrease in VO_2max, attributed to perceived discomfort due to mask-wearing (Driver et al., 2021).

On the other hand, policymakers should not promote exercise and PA as social isolation, and "social distancing" games should not be considered the "new normal" in PE and PA. Also, sports that involve high-risk elements (such as prolonged face proximity) may have to be played with modified rules to limit contact activity, mainly during training but also in matches. Children's recommended amounts of moderate-intensity PA can be consistent with enhanced immunosurveillance and lowered risk for respiratory illness, minimizing virus transmission through lower respiration rate.

The information presented can be used to ensure that schools, PE, and sports activities continue during and after the pandemic, protecting the health of everyone involved and supporting the national agenda of reducing COVID-19 in the population. It is of vital importance that opportunities for children and young people to participate in daily PA increase with the resumption of their normal, everyday activities, as well as to explore solutions to address excessive SB and screen time to improve children's overall physical and mental health.

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