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Commentary: The impact of COVID-19 Delta variant home confinement on student physical health literacy—a call for awareness in physical education

Introduction

In 2021, the COVID-19 (coronavirus disease 2019) Delta variant spread worldwide, resulting in another wave of the COVID-19 global pandemic. Governments worldwide have been implementing health policies and orders as preventive measures to slow down and reduce infection risk. These preventative measures included social distancing, cancellation of weekend sport, limiting outdoor exercise to one hour per day and closing workplace activities to avoid social gatherings. The normal functioning of schools was also impacted: face-to-face education was suspended and replaced with online learning from home. Students learning from home had limited access to specialised school equipment required for practical elements of subjects, such as PE equipment. Furthermore, PE teacher instruction and space to effectively engage in PE curriculum within the home environment were limited in some circumstances. Some schools provided students with unsupervised home-based PE movement activities, which were self-determined or led by an instructor in a pre-recorded online video. However, logistical constraints, and the difficulty in implementing practical PE movement activities, made it difficult for PE teachers to provide teaching and learning activities comparable to those implemented

within the typical school environment pre-COVID-19 Delta variant.

This commentary begins with a description of the impact of confinement on students' physical health literacy during the current COVID-19 Delta variant pandemic. Next, it will discuss the impact of reduced exposure to physical activity and supervised structured PE lessons. The discussion is then followed by an outline of recommendations for teachers to consider when students return to face-to-face PE lessons to reduce the risk of injury and commence reconditioning. The paper ends with a short conclusion on the resumption of PE after confinement. In such a dynamic environment, caution and considerations are needed for the re-

sumption of PE to ensure student safety and return of fitness and motor performance skills proficiency.

Impact of confinement on physiological adaptations

For those governments that have implemented home confinement to minimise the spread of COVID-19 Delta variant, student's physical health literacy is likely to have decreased. According to Trimble and Sortwell (2021), 'physical health literacy' is the multifaceted foundation for lifelong engagement in physical activity, of which adequate motor performance skill proficiency is a key aspect. Critical to adequate motor performance skill

Table 1 PE programming considerations following students return to school after home confinement due to COVID-19 Delta variant

<i>Consider the following suggested recommendations and adapt these to the context of your school. Remember for student safety and wellbeing, progress through small increments in intensity (e.g. reduced space, speed of the activity, distance kicked/thrown, number of students) and volume (e.g. number of repeats, duration on task, recovery time, student numbers)</i>
Prior to each PE lesson, select a specific warm-up to help prepare students for the class
Initially focus on improving cardiorespiratory and neuromuscular fitness upon return
Over the first 3 months of PE classes, include muscular fitness building activities
All ball skill drills should start with a small number of students and limited space to control the intensity and maximise engagement
Participation in games and sports should start with small groups with limited space and gradually increase the playing area
Movement activities involving a repeated change in direction should be performed at the sub-maximal effort and then over time, include subtle changes and higher intensity
PE activities, including jumping, should commence with drills and controlled movements
Kicking and throwing should initially focus on technique and 're-introduce' the movement

proficiency is morphological and physiological adaptations.

Development and maintenance of motor performance skills require opportunities to regularly practise these with feedback from a PE teacher (Hardy, Reintgen-Reynolds, Espinel, Zask, & Okely, 2012) and adequate motor abilities such as explosive strength (muscular strength and power). Explosive strength is an essential component of motor performance skill development (Malina, 2004) due to the functional (e.g. changes in motor unit coordination) and structural (e.g. muscle and connective tissue) adaptations (Behringer, v. Heede, Matthews, & Mester, 2011). Therefore, home confinement and without engagement in traditional PE classes, some level of detraining (i.e. the partial or complete loss of movement activity morphological and physiological adaptations) is likely (Faigenbaum et al., 2013; Fontoura, Schneider, & Meyer, 2004) and may inevitably lead to an increase in physical health illiteracy (Faigenbaum, Rebullido, Peña, & Chulvi-Medrano, 2019). The suggested changes may result in impaired motor performance, poor biomechanics and a greater likelihood of injury if, upon return to school and traditional PE classes, age and maturational stage-appropriate movement activities that allow reconditioning are not implemented.

Cardiorespiratory and neuromuscular performance support engagement in a wide range of PE movement experiences for children and adolescents. However, substantial cardiorespiratory and neuromuscular declines may occur after medium-term (<8 weeks) training cessation (Faigenbaum et al., 2013). Furthermore, injury occurrence may increase in untrained individuals due to the mechanical properties of the connective tissue, for example, a decrease in type I collagen leads to weaker tendons (Faigenbaum & Schram, 2004; Frizziero et al., 2016). The impact of 3 to 4-months confinement on school students can be similar to detraining for an athlete, leading to changes in muscle architecture (i.e. reduced sarcomere volume), muscular atrophy and alteration of tendon mechanical properties in lower-limbs, even

after a short period (<23 days) (Kubo et al., 2004). During sustained periods of confinement leading to physical inactive students, muscular weakness and neuromuscular dysfunctions are most probable (Faigenbaum & Geisler, 2021). It appears that low levels of muscular power, strength and motor performance skills in the early years of primary school can interact synergistically over time to predispose children to negative health outcomes, including decreased level of physical activity, unhealthy body composition and related comorbidities (Faigenbaum & Geisler, 2021; Stodden, Gao, Goodway, & Langendorfer, 2014).

With both a sudden and long-term (3 months) reduction in directed moderate to vigorous physical activity and elimination of supervised traditional PE classes within the school environment, it is conceivable that students have inadequate stimuli. This implies that home confinement could reduce neuromuscular fitness and be detrimental to students physical health literacy as it underpins many motor abilities needed to perform movement skills (Suchomel, Nimphius, Bellon, & Stone, 2018). In addition, these alterations could increase injury risk when returning to regular PE lessons of similar load and intensity pre-lockdowns since overexertion is the most common cause of all injuries requiring medical attention by children and youth (Myer et al., 2011).

Resuming PE after confinement

When the COVID-19 Delta emergency ends in individual countries, and governments permit the recommencement of face-to-face classes on school premises, physical activity, fitness and movement skill-specific reconditioning period may be necessary for PE students to recover back to their pre-COVID-19 Delta physical health literacy levels. Not only will cardiorespiratory and neuromuscular qualities improve but reduce the potential risk of injury. The importance of implementing a reconditioning period may also be increased considering that prior to the second wave of the COVID-19 pandemic, the trend for physical fitness and movement skill performance

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A. Sortwell · R. Ramirez-Campillo

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Abstract

During the coronavirus disease 2019 (COVID-19) Delta variant wave of the pandemic, governments implemented health orders and policies that included citizens in lockdowns and confined to the home. These health orders and home confinement reduced children's time for engagement in physical activity and access to supervised, structured physical education (PE) lessons. To understand the potential impact on the physiological aspects of children's physical health literacy, one must understand the adverse consequences of detraining in relation to the reduction in physical activity and supervised structured PE lessons. The aim of this paper is to give a brief overview of how PE students were affected during the current COVID-19 pandemic. It will also discuss the impact of confinement on physiological adaptations. The article ends with a short discussion on the resumption of face-to-face PE lessons after enforced confinement and PE programming considerations. In such an uncertain environment, PE teachers need to show caution and consider the effects of detraining when programming PE lessons to ensure their safety and strategies for reconditioning.

Keywords

Human physiology · Training · Conditioning · Pandemics · Physical fitness · School sport

of children has declined (Bolger et al., 2020; Masanovic et al., 2020).

Conclusion

This commentary advocates caution in the delivery set PE programs and classes and dispels the notion of 'business as usual' after the COVID-19 Delta variant

lockdowns. We also advise the involvement of all stakeholders (e.g. PE teachers, leaders of wellbeing, education officers) in the planning and implementation of the PE curriculum when students return to schools (Table 1). This is important because of the potential impact of choices on injury risk and wellbeing of students in PE upon return to school. In addition, an adequate plan to return to face-to-face PE classes may facilitate student's enjoyment, potentially favouring long-term physical activity habits and students' physical health literacy (Trimble & Sortwell, 2021).

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Declarations

Conflict of interest. A. Sortwell and R. Ramirez-Campillo declare that they have no competing interests.

For this article no studies with human participants or animals were performed by any of the authors. All studies mentioned were in accordance with the ethical standards indicated in each case. No human subjects were involved so no ethical approval or data protection was applied for.

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