Chapter 50
Sport Exergames for Physical Education

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ABSTRACT

Sports active video games (exergames) are accessible forms of physical activity which might also be used in physical education (PE) curriculum. The purpose of this chapter is to review some of the relevant applications of sports exergames for inclusion in PE and to characterize one of these games (swimming) from different aspects of biomechanics, physiology, and psychology. The authors compared movement patterns, muscle activation, energy expenditure, enjoyment, usability, and game experience in participants with different performing levels (real-swimmers vs. non-swimmers, experienced vs. novice) and gender. Understanding these parameters may help in the development of more realistic sports exergames and meaningful gameplay and may give PE teachers a better idea of the inclusion of such games in their practice.

INTRODUCTION

Insufficient physical activity is one the main parameters for mortality, and obesity is a growing concern in post-industrial countries. A combination of physical exercise and healthy nutrition is essential for decreasing obesity. Active video games (exergames) are becoming popular as ways of motivating people to exercise more. However, it is not clear whether these serious games could also be used in physical education (PE) and serve as more than mere entertainment. In this chapter, we will examine existing academic literature based on the characteristics of sport exergames that are important in the domain of PE. We also provide a practical example of psycho-biophysical evaluation of a sport exergame to see how close and encouraging these games are, compared to the real sports.

BACKGROUND

PE is considered to be a crucial part of primary school curriculum around the world which include both physical and educational contents (Lindberg, Seo, & Laine, 2016). Thanks to digital technologies, new learning environments provide opportunities for skill acquisition and socializing, and researchers are now examining the role, efficacy, and opportunities that these environments provide. On the other hand, several reasons including lack of time, lack of skills of PE instructors, and lack of support might reduce the quality and quantity of PE education (Lindberg, Seo, & Laine, 2016). Moreover, pedagogy has always tried to innovate teaching, and PE is also emerging regarding integrating technology into regular classes. One exciting area in which technology and education could merge is by using video games that include visual (and/or audio) stimulus. Video games can be applied to improve attention, executive functions, and reasoning (Neugnot-Cerioli, Gagner, & Beauchamp, 2015). They are also shown to increase several types of intelligence (e.g. visual-spatial and bodily-kinesthetic) while providing a playful-formative experience (del Moral-Pérez, Fernández-García, & Guzmán-Duque, 2015).

On the other hand, previous psychological research has linked aggression with video gaming (Anderson et al., 2010) and content analysis of video games was mainly concerned about violence and role of gender (Lee & Peng, 2006). As excessive use of technology, which also includes video gaming, is suggested to be a contributing factor in obesity, a new approach has been proposed to include active video games (exergames) that incorporate motion sensor technology and could be played using whole body movements. While gamification of regular exercise activities (e.g. GPS-based virtual reality zombie run) has been previously reported, active video games are not frequently used in the context of PE (Lindberg, Seo, & Laine, 2016), and insufficient evidence about efficacy of exergames exist within schools (Norris, Hamer, & Stamatakis, 2016). Previously, Ennis (2013) considered exergames in three categories of recreation (light to moderate intensity), public health (moderate to intensive physical activity - PA), and educational (to facilitate skills).

MAIN FOCUS OF THE ARTICLE

Motivation/Literacy to Play and Exercise

Several methods are used to increase players' motivation in sporting activities (Keegan, Harwood, Spray, & Lavallee, 2009) and game-based learning and storytelling are the primary ways to provide intrinsic motivation for learning (Laine, Nygren, Dirin, & Suk, 2016). Exergames provide a non-scary environment to develop components of mastering of fundamental movement skills (George, Rohr, & Byrne, 2016). For example, children might improve aiming and catching skills during virtual tennis without the fear of getting hit by the physical ball. In children with sensory dysfunction, exergames are used to increase their learning motivation and to make them more confident in facing various learning challenges (Chuang & Kuo, 2016). By embedding elements of nature, exergames can also provide a sense of connectedness and environmental concern, which might be important for exercising outdoor (Öhman, Öhman, & Sandell, 2016). Wittland, Brauner, and Ziefle (2015) also suggested that accepting serious games for physical fitness, is not dependent on gender, expertise, and gaming habits. However, when used with older adults, "guided hands-on" and "1-on-1" teaching methods might be used to increase their engagement when facing technology (Seides & Mitzner, 2015), because older adults need more

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