

# Chapter 103

## Can Exergaming Promote Physical Fitness and Physical Activity?

### A Systematic Review of Systematic Reviews

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#### ABSTRACT

*This systematic review of systematic reviews evaluates the effectiveness of exergaming on physical fitness and physical activity. A systematic literature search was conducted on 10 databases, and 1040 articles were identified. Sixty-eight articles were found potentially relevant and were selected for closer screening. Cross-referencing was conducted to find other potentially relevant articles. The quality of all relevant articles was evaluated using the AMSTAR tool. After all the duplicates were removed and inclusion, exclusion, and quality criteria were implemented, six articles remained for review. The results indicate that exergaming is generally enjoyed and can evoke some benefits for physical fitness and physical activity, but the current evidence does not support the ability of exergaming to increase physical fitness or physical activity levels sufficiently for significant health benefits. This systematic review also revealed several gaps in previous research. Additional high-quality research and systematic reviews concerning exergaming are needed.*

#### INTRODUCTION

The health consequences of physical inactivity as well as the health benefits of physical activity are well established (e.g. Lee et al., 2012; Warburton, Nicol, & Bredin, 2006; World Health Organisation [WHO], 2010, p. 10). Physical inactivity is a serious public health problem. It has been identified as the fourth most significant risk factor for

global mortality (WHO, 2010, p. 10), and several studies have presented evidence on the increasing healthcare costs caused by physical inactivity (e.g. Kohl et al., 2012; Lee et al., 2012). Thus, physical inactivity is not just an individual problem but also a societal one, and due to its importance from the perspective of both public health and finance, finding new ways to promote physical activity and prevent physical inactivity is essential.

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## ***Can Exergaming Promote Physical Fitness and Physical Activity?***

Changes in society have led to a significant decrease in the level of physical activity of individuals during the past decades. One of the major changes has been the growing popularity of leisure time sedentary activities brought about by new media solutions such as television viewing, computer use, and video gaming (Matthews et al., 2008; Matthews et al., 2012). Sedentary activities have been shown to be a distinct risk factor for several adverse health outcomes among both adults (e.g. Matthews et al., 2012; Thorp, Owen, Neuhaus, & Dunstan, 2011) and children (e.g. Saunders, Chaput, & Tremblay, 2014; Tremblay et al., 2011). At the same time, the popularity of video gaming is on the rise. It has already become one of the most popular entertainment mediums in the world (Maddison et al., 2013), and Gartner, Inc. (2013) estimates that the total market for video games will increase from US\$93bn (end of 2013) to US\$111bn by 2015. This raises an interesting question about whether video games could be utilised as a medium to promote physical activity.

In recent years, a new form of video gaming that combines exercise and games has emerged. This type of gaming has been called by different terms such as ‘exergaming’, ‘active gaming’, or ‘active video gaming’ (AVG). They all refer to digital gaming that requires physical effort from the player in order to play the game, with the outcome of the game being mainly determined by these physical efforts (Mueller et al., 2011). Exergames are played in all age groups, but it seems that playing is more common among the younger age groups than the older (Kari, Makkonen, Moilanen, & Frank, 2013). The widespread familiarity and allure of video games makes exergaming an interesting research area, for example in terms of promoting a more active and healthier lifestyle (Maddison et al., 2013). Over the past years, researchers have become increasingly interested in exergaming and especially in its effects on physical fitness and physical activity levels.

This article is a systematic review of systematic reviews and meta-analyses of exergaming published in the fields of information systems and

healthcare. The objective of this review article is to form a wide range view of the effects that exergaming activities have on physical fitness (PF) and physical activity (PA) levels and also to identify gaps in previous research. More precisely, it aims to answer the following research questions: (1) What levels of exertion are typical for exergaming? (2) Can exergaming contribute to increasing physical activity? (3) Can exergaming be used to increase physical fitness? This article also identifies gaps in previous research and gives recommendations for future studies.

## **METHODOLOGY**

The methodology followed the guidelines given by Smith, Devane, Begley, and Clarke (2011). The research design was determined *a priori*. The research questions, search strategy, and inclusion/exclusion criteria were established before the actual search and review. Flow of information through the different phases of this systematic review is presented in Figure 1, as guided by the PRISMA statement (Liberati et al., 2009; Moher, Liberati, Tetzlaff, & Altman, 2009).

### **Search Strategy**

The search took place in January 2014 and was conducted in the following 10 databases: Thomson Reuters Web of Science, ACM Digital library, IEEE Xplore Digital library, Health Games Research Database, AISEL, SPORTDiscuss, PubMed, The Cochrane Database of Systematic Reviews, The Database of Abstracts of Reviews of Effects, and Google Scholar. The search was repeated in February 2014 to ensure that no relevant articles were left unnoticed. In this second search, no additional articles were revealed.

The following keywords or their different forms were used alone or in combination in the search: ‘exergame’, ‘exergam\*’, ‘exertainment’, ‘active video game’, ‘console game’, ‘mobile game’,

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