Cognitive Content of Commercial Exergames

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ABSTRACT

The objective of study was to identify and describe the cognitive content of commercial Exergames through the evaluation of five experts in cognitive functions. The method used to delineate the relevance of the executive functions in Exergames involved the concordance between judges. Based on the evaluation of the experts, regarding the representativeness of the cognitive functions for each modality, 60% agreed moderately that logical reasoning was present in soccer. In athletics, logical reasoning in the launching of dart stands out (60%). In the long jump, 60% of the experts moderately agreed that logical reasoning is present, while in skiing 60% stated that participants used selective attention. In Tennis, 40% of experts agreed that cognitive flexibility is demonstrated. There was great agreement by the experts that the aquarium game involved the presence of selective attention (100%), except in the case of the winding stream. It is concluded that there is a representation of executive functions in the commercial Exergames analyzed.

KEYWORDS
Attention, Cognition, Cognitive Skills, Education, Evaluation, Executive Function, Judges, Video Game

INTRODUCTION

The Exergames (EXG) are a new generation of video games that require the user to exercise in order to play. This modality arose from the merger of video games with gymnastic apparatus, gaining popularity from the middle of 2006 when there was a growing interest in physical activity associated with gaming (Sinclair, Hingston & Masek, 2007). It presupposes that the player performs movements, which may involve fine motor skills or actions with the whole body, in order to participate in virtual sports, fitness exercises or other interactive physical activities proposed by the games (ACSM, 2013).

Initially, these games were developed from technological advances designed to make products more entertaining, however, the caloric expenditure in this practice has been viewed as a differential of this category of digital games (Staiano & Calvert, 2011). This differential, combined with growing concern about rising rates of childhood obesity in Western societies, has made this playful technology...
well accepted by children and their caregivers who encourage them to engage in physical activity (Sinclair, Hingston & Masek, 2007). The Kinect™ is the first exergame system which a camera captures body movements in real time, without the need for worn or handheld devices (Chen et al., 2018).

It is known that the skills acquired by interaction with these digital games are materialized in the real world because the Exergames interpret the player’s body movements, with respect to the specific functions of the game, and translate these three-dimensional real world movements for the two-dimensional video game screen (Di Tore & Raiola, 2012). In this way, the Exergame player, who is distanced from the on-screen character, must use visual-spatial skills, eye-hand or eye-pedal coordination, and quick reaction time to successfully operate and reproduce game emulations (Staiano & Calvert, 2011; Di Tore & Raiola, 2012).

These games are being used in primary school, according to Yilmaz and Bayraktar (2018) because the Kinect-based exergames can be exploited as effective and motivational learning environments. Electronic games, in general, offer a fictional space that allows players to interact with real-life scenarios such as, coming and going instantly to distant places, crossing oceans in seconds, and so on. In order, to be able to connect with people from all over the world in real time or, to assume identities that can give the game a different dimension. These are the characteristics that validate the insertion of the game in the school context as a fun and dynamic pedagogical resource, with the teacher having a strategic function, to incorporate the tool into their teaching practices, to increase and diversify learning (Cruz & Ramos, 2018).

Executive functions can be understood as a set of cognitive skills that are integrated, enabling the individual to maintain attention, make decisions, evaluate and adjust their behaviors and strategies, resist temptations and solve problems (Malloy-Diniz, Sedo, Fuentes & Leite, 2008; Diamonds, 2015). It is known that these functions can be trained and improved with practice, including several methods such as the use of video games (Mackey, Hill, Stone & Bunge, 2011; Diamond, 2013; Nouchi, Hashizume H, Nozawa, Kambara, Sekiguchi, Miyauuchi, Kotozaki, Nouchi & Kawashima, 2013).

In this context, to evaluate the cognitive aspects arising from the practice of Exergames, it becomes necessary to know what content in the cognitive area can be exercised in each of the games. Following identification of the abilities that are potentially exercised in each game, the possible dimensions of these abilities can be established through evaluation by invited judges possessing a technical-scientific training in the area. Using this method, the objective of the present study was to identify and describe the intrinsic cognitive content of the following commercial exergames: Kinect Sports 1 (Athletics and Soccer modalities), Kinect Sports 2 (Tennis and Ski) and Kinect Adventure, based on the evaluation provided by area experts.

BACKGROUND

Exergames have been used in interventions to improve motor and cognitive aspects of people who have some type of disorder or difficulty (Pradhan, 2019; German et al., 2019, Fang, Aiken, Fang, & Pan, 2018). In this context, Pradhan (2019) used commercial games in interventions for individuals with Parkinson’s disease. The three participants of the study were tested on the outcome measures before and after the six exercise sessions and performance improvements were observed in various physical and cognitive tests.

In other study German et al. (2019) present a medical recovery exergaming that includes a Microsoft Kinect Motion Sensor applies for old people with brain disorders. When comparing performance before and after use of the game, it concludes that exergaming represents a useful tool in physical and cognitive rehabilitation for people with motor impairments or brain disorders, considering the advantage of home-training.

Fang, Aiken, Fang and Pan (2018) argue on the basis of a literature review that the exergaming presents several advantages over autism spectrum disorder intervention in children, such as flexible play, a private space for exercise, and diverse types of physical activity.
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