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A Survey Review of Exergames in the Field of Game-Based Learning

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ABSTRACT - This article discusses a work in progress on a survey review of exergames in the field of game-based learning. It starts a discussion on a method to be used for filtering research articles. The survey review will follow steps that have been identified according to a systematic review which include a selection of appropriate keywords, i.e. “digital games”, “exergames”, “exergaming”, “digital games with physical movement”, and “game-based learning”. Next, these keywords will be mapped across three digital databases to explore and search intended articles. The filtering of articles will then be conducted using a set of inclusion criteria. Finally, a comprehensive discussion of the survey review will be examined further at the end of the survey review.

INTRODUCTION

In the 2019 Horizon Report, Alexander et al., 2019, reported that, digital gaming interest had been developing in the education sector as a tool for learning and academic research between the years 2012 and 2014. However, from the year 2015, interest in gaming and gamification in the education industry had been on the decline (Noraddin & Kian, 2015). It is evident in the lack of research studies that focus on the digital gaming within the education sector implying that digital games are not utilized despite positive attitudes of teachers towards digital games (Lester et al., 2023). This provides a barrier that prevents researchers from accessing knowledge that may help in understanding the acceptance of digital games in education. Digital games are generally known to lead to a sedentary lifestyle by increasing screen time (Kohorst et al., 2018). However, this perception may have changed since the introduction of digital video games such as the famously known Dance Dance Revolution and Just Dance which fall under the exergames genre (Zhao et al., 2024; Thin, Brown & Meenan, 2013).

The World Health Organization (WHO) urges for the construction of encouraging environments and opportunities to increase the physical activity of the youth, with the endorsement of at least 60 minutes of moderate to high intensity daily exercise in the form of games, play, sports and physical education. Furthermore, the WHO report mentions that “globally only 1 in 5 adolescents are estimated to meet these guidelines” and that “1 in 4 adults is not active enough” (WHO, 2024). Physical education is one of ways mentioned in combating the lack of physical activity among the youth. Digital games are known for increasing sedentary lifestyle through increasing screen time, nonetheless with the introduction of exergames, physical activity may also be associated with digital games. However,

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to the best of the researcher's knowledge few studies have investigated the intention to use exergames as tools for motivating physical activity or as tool for teaching or learning. This article is organized as follows: (1) introduction to exergames genre; (2) method to be used for filtering research articles; (3) discussion; and (4) the conclusion of this review.

Exergames Genre

Digital games have been around for decades, yet the lack of these games in education has been somewhat concerning. The 2019 Horizon Report mentions that gaming and gamification within the education context has declined significantly (Alexander et al., 2019). Further evident by the few studies devoted to understanding the acceptance of digital games for educational purposes (Stamm et al., 2022; Khundam & Nöel, 2021). Furthermore, even fewer studies have been conducted upon the intention to use digital games and even less the usage of active digital games such as exergames in the context of education.

Games that require performance of movement or physical activity to be played are known as exergames. Exergames enable players to increase their levels of physical activity and health through interaction with an onscreen avatar using body movements such as dancing, kicking, and jumping (Valeriani et al., 2021; Gao & Zeng, 2016). These games were first introduced in the 1980s and currently have emerged to a range of exergames from Dance Dance revolution in 1998 to the most popular exergaming consoles being PlayStation Move Eye, Nintendo Wii, and Microsoft Kinect (Amorim et al., 2018). The Just Dance Game Series is an exergame within the dance simulation genre that utilizes Microsoft Kinect. In the case of Just Dance 3 or Just Dance 4 during an interaction the virtual environment is being activated by the movements of the user, which are then captured by Kinect, i.e. a line of motion sensing input device and sent to the console of Xbox360 (Damianova & Berrezueta-Guzman, 2025; Dill et al., 2024).

Exergames are referred to as digital video games and are widely available to users in the market supported on a variety of platforms such as the gaming system consoles namely, Nintendo Switch, PlayStation 4 PRO, Xbox One X (Hills & Lennox, 2024). In addition, alternative gaming platforms are smartphone platforms such as Android and iOS usually played in combination with a laptop or smart TV screen. Currently, exergaming platforms available today have been two main types namely: console based and mobile-based.

Exergames for Physical Education

The selection of exergames by the Physical Education (PE) teachers may be managed in accordance with the list of gaming consoles with exergames which had been outlined by Vaghetti et al. (2018) as shown in Table 1. Firstly, the three types of gaming consoles namely: Nintendo Wii, Xbox Kinect and PS Move had been ordered into three columns, followed by the list of five examples of exergames below each column had been arranged based on the compatibility with that particular console. Secondly, the physical capabilities that each game offered had been represented by the plus (+) symbol. The physical capabilities which represent the Contents of Physical Education had been structured accordingly: Motor coordination had been represented by one plus (+) symbol; motor coordination and aerobic endurance had been represented by two plus (++) symbols; Motor coordination, aerobic endurance and strength had been represented by three plus (+++) symbols; Motor coordination, aerobic endurance, balance and strength had been represented by four plus (++++) symbols; Motor coordination, aerobic endurance, balance, strength, flexibility had been represented by five plus (+++++) symbols. Thirdly, the list of games had been divided into five rows with categories namely: games; gymnastics; fights (close combat); dance, and sports. Finally, the eighth row had been constructed to represent the full name of the following games: "Michael Phelps: Push the Limit1" signified by Michael Phelps[1] ++; "Michael Jackson: The Experience2" signified by Michael Jackson[2] ++; "The Black Eyed Peas Experience 3" signified by The Black Eyed Peas[3] ++; "Guitar Hero III Legends of Rock4"signified by Guitar Hero III Legends[4] +; "Jillian Michaels Fitness Ultimatum 20105" signified by Jillian Michaels Fitness[5] +++++; "Your Shape Fitness Evolved6" signified by Your Shape Fitness[6] ++++ in accordance with the superscript number adjacent to each game. Thus, PE teachers could manage which physical activity had been highlighted in the curriculum by matching it with the required physical activity that had been offered by the exergame (Vaghetti et al., 2018).

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Table 1. Classification of different games in accordance with the gaming consoles that each game is compatible, featuring contents of physical education and the physical capabilities required (Vaghetti et al., 2018)

	consoles		
	Nintendo® Wii	Xbox® Kinect	PS Move
Sports	Virtua Tennis 4 ++	Virtua Tennis 4 ++	Virtua Tennis 4 ++
	Wii Fit Plus +++++	Kinect Sports ++	Sports Champions 2 ++
	Tiger Woods: The Masters +	Michael Phelps[1] ++	Racket Sports ++
	Wii Resort Sports +	Tiger Woods: The Masters +	MotionSports Adrenaline ++
	Wii Sports +	London 2012 ++	Brunswick Pro Bowling +
Dance	K-Pop Dance Festival ++	Dance Central: Spotlight ++	Get Up and Dance ++
	Just Dance 2015 ++	Just Dance 2015 ++	Just Dance 2015 ++
	The Smurfs Dance Party ++	Grease Dance ++	Michael Jackson[2] ++
	Dance Dance Revolution ++	Zumba Fitness Rush ++	Dance on Broadway ++
	The Black Eyed Peas[3] ++	Michael Jackson[2] ++	Zumba Fitness ++
Games	Guitar Hero III Legends[4] +	Twister Mania Kinect +	Kung Fu Rider +
	Wii Play +	Kinect Adventure +	Eye Pet +
	Crazy Mini Golf 2 +	Wipeout 2 +	Start the Party! +
	Wii Play: Motion +	Harry Potter +	The Shoot +
	Rock Band ++	Kinect Star Wars +	Datura +
Fights	Ready 2 Rumble Revolution ++	Kung Fu High Impact ++	Sports Champions Sword ++
	All Star Karate ++	Fighters Uncaged +++	UFC Personal Trainer +++++
	Punch-Out!! ++	Fighter Within +++	The Fight: Lights Out ++
	Don King Boxing ++++	Kinect Sports Boxing ++	Sports Champions 2 Boxing ++
	Wii Sports Boxing ++	UFC Personal Trainer +++++	Kung Fu Live ++
Gymnastics	Jillian Michaels Fitness[5] +++++	Nike + Kinect Training +++++	Move Fitness +++++
	The Biggest Looser +++++	miCoach +++++	Get Fit With Mel B +++++
	Gold's Gym +++++	Your Shape Fitness[6] ++++	EA Sports Active 2 +++++
	Wii Fit Plus +++++	UFC Personal Trainer +++++	UFC Personal Trainer +++++
	Your Shape Fitness[6]++++	EA Sports Active 2 +++++	Fit in Six +++++
Michael Phelps: Push the Limit[1]; Michael Jackson: The Experience[2]; The Black Eyed Peas Experience[3]; Guitar Hero III Legends of Rock[4]; Jillian Michaels Fitness Ultimatum 2010[5]; Your Shape Fitness Evolved[6].			
Physical Capabilities	+++++ Motor coordination, aerobic endurance, balance, strength, flexibility ++++ Motor coordination, aerobic endurance, balance, strength +++ Motor coordination, aerobic endurance, strength ++ Motor coordination, aerobic endurance + Motor coordination		

In another study (Arufe-Giráldez et al., 2023) with a focus on dance exergames, it had been recommended that teachers analytically assessed which exergame to choose based on developing teaching strategies and situations which allowed students to experience interactive play with the avatar of the dance exergame. Thus influencing 'what and how students learn' during a physical education class, increasing the responsibility of teachers in knowing how exergames are used in teaching (Jastrow et al., 2022; Gibbs, Quennerstedt & Larsson, 2017).

Additionally, investigating the intentions to use digital games in teaching especially exergames would enhance the decision making process through knowledge. A previous study examining teachers' perspectives on exergames had mentioned how the goals and objectives of the curriculum should be taken into consideration in choosing an appropriate exergames (Sotoca-Orgaz, Arévalo-Baeza & Navia, 2025; Sheehan, Katz & Kooiman, 2015).

METHOD

As mentioned in the previous section, since 2016, researchers have analyzed the usage of exergames using several approaches and techniques (Mohamad Yatim, M. H., 2019; Lopes, Pereira & Maciel, 2017). Regardless, of how dynamic and diverse the field of games and gamification, exergames or exergaming games has become increasingly used in multiple fields including education especially in the field of game-based learning. This article will provide valuable insights by understanding the current gaps in this line of research.

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Exergames have been a focus of research in numerous fields such as health (Kebede et al., 2022; Chen et al., 2018), however fewer studies have been conducted within the context of education. Furthermore, investigating the usage of exergames have been abundant in the health sector however in contrast, the opposite has been the case in the field of education. This could indicate that there is a lack of usage of exergames for education purposes or a rejection of exergames as learning and teaching tools.

The most used keywords in this survey review are “digital games”, “exergames”, “exergaming”, “digital games with physical movement”, and “game-based learning”. These keywords will exclude any non-digital games, such as traditional games, sports, tabletop games, or board games (Laato, et al., 2020; Benzing & Schmidt, 2018). The keywords also exclude any digital games that falls under different game genres such as action, adventure, puzzle, role-play and others. We also limit our scope to articles that use English as the medium of language.

This survey review will make use of three digital databases to explore these keywords for searching intended articles. The first digital database is IEEE Xplore Digital Library, i.e. a scholarly research database in the fields of computer science, electrical engineering, electronics, and related fields (Camacho-Sánchez et al., 2023).

The database consists of journal articles, proceedings from conferences and seminars, accepted technical reports, standard documents, and related materials. The second digital database is the Web of Science (WoS), i.e. an online subscription-based indexing service for a comprehensive citation type of searching in the field of sciences, digital technologies, social sciences, and arts and humanities (Gkintoni et al., 2024; Staiano & Calvert, 2011). The third digital database is the ScienceDirect, i.e. a large database of scientific research consists of physical sciences and engineering, life sciences, health sciences, and social sciences and humanities (Aloizou et al., 2025; Althoff, White & Horvitz, 2016).

The survey review will follow steps that have been identify according to a systematic review (Castellano-Tejedor & Cencerrado, 2024). A systematic review is an approach that utilizes systematic methods to collect secondary data. It is believed that this approach may answer defined research questions by collecting and summarizing all empirical research evidence.

Figure 1 shows the steps involved in the survey review depicted in a flowchart diagram. The figure visually describes the steps for reviewing articles related to the survey review. It will begin with the use of keywords, i.e. “digital games”, “exergames”, “exergaming”, “digital games with physical movement”, and “game-based learning”. These keywords will act as the key selection to search for literature resources using three digital databases, i.e. IEEE Xplore Digital Library, WoS, and ScienceDirect.

Boolean operators or modifiers such as AND, NOT, and OR will be used to further produce more relevant results. In other words, to search these keywords through these digital databases, the survey review will implement a Boolean search. A Boolean search is useful in saving time by combining or limiting keywords.

The selection of articles involves three iterations of screening or filtering. The first screening involves with removing all unrelated articles by reading the title and abstract of the articles. The second screening involves with removing duplicate articles appeared from different databases, also by reading the title and abstract of the articles. The final screening involves with reading the full text of remaining articles filtered from the second screening exercise. Moreover, a set of inclusion criteria will be used for the screening purposes (see Figure 1).

The inclusion criteria will give limit the screening and filtering process by giving constraints in selecting relevant articles. The articles must be written in English and came from any journal or conference paper. The main focus is exergames, either one or more of the following aspects: (1) a review or survey pertaining on the new trend of exergames usage in the education fields, (2) design or development of exergames software application or apps reporting any related experience and/or lesson learned, (3) propose new exergames or exergaming techniques involving teaching delivery or learning approach, and (4) analyze, evaluate or test any exergames software application or apps through scientific study.

The outcomes of the survey review will be a classified taxonomy of literature on exergames in numerous fields including education, and a distribution of results according to four main categories, i.e. design, development, application, and survey review.

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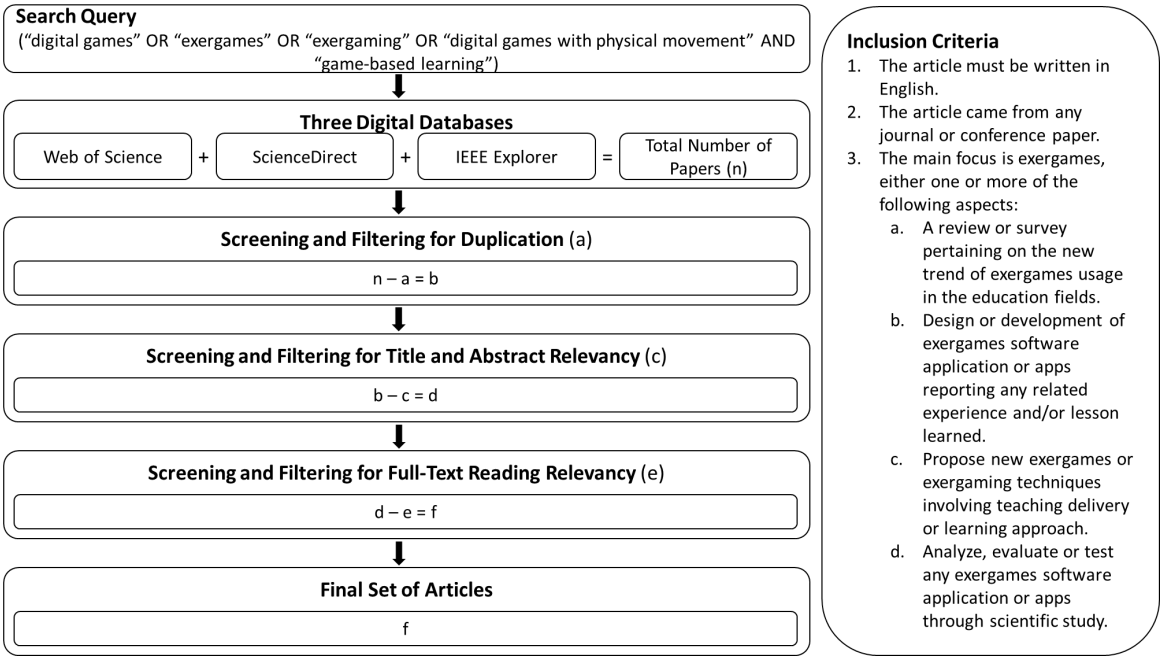

Figure 1. Flowchart of article selection, including the search query of the keywords and a set of inclusion criteria.

RESULTS AND DISCUSSION

Exergames are games that require physical activity to be played. The physical activity may be in the form of dance, sports or a form of exercise. A number of exergames have different forms of interaction with an avatar such for example using Microsoft Kinect, Wii mote etc. including mobile device, the smartphone acting as the accelerometer.

Numerous studies have been devoted to the acceptance or the intention to use exergames among populations such as the elderly (De Santis et al., 2023; Kappen, Mirza-Babaei & Nacke, 2019). In contrast, little research has been conducted to investigate acceptance of exergames among pre-service teachers. In the context of education, a quote stated that "Although the impact of exergames in the recreational and health areas has recently been studied, the incorporation of exergames in the curriculum is still a field lacking Investigation" (Cruickshank, Pill & Mainsbridge, 2021; Pedersen, Cooley & Cruickshank, 2017). Through the statement, the authors imply that exergames are generally not being considered as games for the physical education curriculum.

The few studies investigating intention to use exergames have highlighted gaps for further research such as user interface embodiment (Ramírez-Granizo et al., 2020). The intent to use digital video exergames to gamify the classroom has been a focus of research recently. In fact, many studies focus primarily on the effectiveness of exergaming on teaching and learning activities (Oppici et al., 2022; Lindberg, Seo & Laine, 2016; Chen, 2013) and neglect to study the intention to use exergames (Bae, 2023; Ennis, 2013).

Recent studies have focused generally on the acceptance of technology among pre- service teachers, highlighting the need to understand the usage of technology in education (Aloizou et al., 2025; Chow & Mann, 2023; Sheehan & Katz, 2013). However, very few studies focus on the acceptance of games as innovative teaching tools and especially exergames (Sotoca-Orgaz, Arévalo-Baeza & Navia, 2025; Castellano-Tejedor & Cencerrado, 2024).

Exergames, which combine physical activity with gameplay, represent a novel approach to teaching and learning that can enhance both engagement and health outcomes. Incorporating exergames into school or university curricula offers multiple educational advantages. For children, exergames can

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support physical education, cognitive development, and experiential learning by combining movement with problem-solving, strategy, and cooperative tasks. For example, exergames can teach concepts in math, science, or language learning by embedding educational content within interactive, movement-based activities. In university settings, exergames can be applied in courses related to health sciences, sports science, psychology, or education technology, providing adult learners with a hands-on, active learning experience that complements traditional lectures and theory-based learning.

CONCLUSIONS

There are recent trends blooming in the exergames field. Research on these trends are still ongoing and remain a promising field to be invested as a study. This article discusses a work in progress on a survey review of exergames in the field of game-based learning. The focus point of this article is a discussion on a method to be used for filtering research articles. The survey review will use a systematic review approach by using a selection of appropriate keywords, i.e. “digital games”, “exergames”, “exergaming”, “digital games with physical movement”, and “game-based learning”, and then map them with the three digital databases to explore these keywords for searching intended articles. It is intended that a comprehensive discussion of the survey review will be discussed further at the end of the survey review. It is believed that there is a lack of usage of exergames for education purposes or a rejection of exergames as learning and teaching tools.

In conclusion, while technology acceptance among teachers is well-studied, there is a research gap regarding exergames as educational tools. Schools and universities can leverage exergaming to foster active learning, engagement, and motivation, supporting both cognitive and physical development in learners of all ages.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

AUTHORS CONTRIBUTION

Author 1.: Conducted data collection and analysis, and prepared the initial draft of the manuscript. **Author 2.**: Reviewed the manuscript and performed copy editing to improve clarity, coherence, and academic writing quality.

AVAILABILITY OF DATA AND MATERIALS

Data available within the article or its supplementary materials.

DECLARATION OF GENERATIVE AI

2. During the preparation of this work, the author(s) used ChatGPT to enhance the clarity of the writing and generate the figure. After using ChatGPT, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

ETHIC STATEMENTS

Ethical approval and permission were obtained from the relevant educational authorities and participating schools before the study. Informed consent was obtained from teachers, and student

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participation was voluntary with confidentiality and anonymity assured. All data were used solely for research purposes.

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