THE CONTRIBUTION OF TECHNOLOGIES IN THE EDUCATIONAL AND MOTOR FIELDS

IL CONTRIBUTO DELLE TECNOLOGIE IN AMBITO EDUCATIVO E MOTORIO

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ABSTRACT
The integration of exergames into physical education is revolutionizing learning by promoting physical activity and combating obesity and sedentary behavior, especially in primary school children. These tools enhance motor and cognitive skills such as spatial awareness and attention, fostering overall well-being. A review of 41 studies confirms the effectiveness of exergames in improving physical activity, preventing obesity, and supporting balanced growth, including for children with disabilities.

L'integrazione degli exergames nell'educazione motoria sta rivoluzionando l'apprendimento, favorendo movimento fisico e contrastando obesità e sedentarietà, specialmente nei bambini della scuola primaria. Questi strumenti stimolano abilità motorie e cognitive come consapevolezza spaziale e attenzione, promuovendo il benessere generale. Una revisione di 41 studi conferma l'efficacia degli exergames nel migliorare l'attività fisica, prevenire l'obesità e supportare la crescita equilibrata, anche per bambini con disabilità.

KEYWORDS
Exergames, Physical Education, Primary School, Active Video Gaming, Technology, Students, Educational, Digital.
Exergames, Educazione Fisica, Scuola Primaria, Videogiochi Attivi, Tecnologia, Studenti, Educazione, Digitale.

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Introduction

The widespread use of technologies has significantly impacted everyone's lives, especially the new generations, generating educational debate about their implications. Considering the term coined by Prensky "digital natives", it is emphasized the importance of integrating technologies in school environments, thus providing a more balanced education (Calvani A., 2009).

Technologies are now ubiquitous in the living and learning environments of young people, and their spread seems to be unstoppable. The task of researchers and educators is therefore to understand the styles of exploration, use and interaction that the technological world stimulates in young people and to create balanced educational environments where children can grow up harmoniously, navigating the risks and opportunities offered by technology (Ripamonti D., 2016).

One of the promising applications is the integration of active video games, or exergames, into physical education to counter sedentary behaviours and their consequences. These games use theoretical models such as self-determination theory and expectation-value models to improve motor skills development and promote active lifestyles. Primary school is a crucial stage in which students acquire basic motor skills, making physical education an essential means of fostering the motor, cognitive, social, cultural and emotional skills necessary for holistic growth (Monacis D., 2023).

In Italy, 25% of people aged 0-18 are overweight, with 23% being overweight and 13% obese in the age group 9-11 years (Sgrò F. et al., 2017).

Experts argue that exergames can be a valuable option to integrate physical activity into everyday life, increasing energy expenditure and combating obesity, Thus, the development of motor skills and at the same time general well-being are promoted. The inclusion of these games in educational settings has shown positive effects on different dimensions related to learning and training. At the cognitive level, exergames can improve school performance by allowing skills learned to be transferred to other areas: among the most stimulated cognitive abilities is spatial awareness, attention, understanding of cause-effect relationships, space management, the ability to react to visual stimuli and the construction of mental maps of one's own movements (Calvani A., 2015).

The most used video games are the Microsoft Xbox and the Nintendo Wii: the first, thanks to the Kinect sensor, uses a tracking system that captures the player's movements without the need for a controller, While the Nintendo Wii requires the use of at least one controller with sensors that allow to sense the player's movements (Sgrò F. et al., 2019).

This article aims to evaluate the potential of exergames to counteract sedentary behaviors, promoting a healthy lifestyle and encouraging a psycho-physical development among young people integrating their use with exercise.
A systematic review has also been drawn up, taking into account 41 studies from European and non-European countries, offering a comprehensive and comparative view of the effects of exergames in different school settings, to examine in depth the impact of exergames on motor activity among students aged between 2 and 15, with the main aim of assessing the effectiveness of these tools, Not only in improving motor skills and encouraging participation in physical activity, but also in preventing childhood obesity, an increasingly important issue in contemporary society; The effect of these technologies on children with disabilities, particularly those with autism spectrum disorder, and how they can have a therapeutic effect was also examined.

1. The Evolution of educational technologies and their impact on teaching and learning

The video game industry has always aroused many signs of concern, but in the 1990s there were many. The criticism ranged from labeling them as tools of social disconnection to accusing them of being related to theft and violent acts, even murders. 1999 was a crucial year for video game detractors, especially after the Columbine High School tragedy, when some scientific studies attributed responsibility to them. However, It should be noted that one of the most cited studies was financed by firearms manufacturers, highlighting an attempt to divert attention from the weapons themselves (Ripamonti D., 2016).
For more than three decades, video games have been seen as scapegoats for various problems. Initially, it was Super Mario that was accused of inciting violence by eliminating opponents in the game (Muzzucchelli L., 2015). Later, it was the turn of Sonic, Carmageddon - against which the prosecutor Guariniello fought, ordering the kidnapping for alleged dangerousness and ability to encourage crime, the saga of Grand Theft Auto (GTA), and even Fifa and Pes, according to some coaches and managers, young people are deprived of the pleasure of playing football (Battistuzzi G., 2023). In essence, if sports champions are missing and the world seems a depressing place, video games are often targeted as the main cause (Battistuzzi G., 2023).
Bo Viktor Nylund, Director of UNICEF Innocenti (Tgcom24, 2024), said that for a long time it was believed that playing video games was harmful and that negative effects could be found; However, the study shows that video games can actually help improve the players' psycho-physical well-being.

The director continues, "But not all children are positively influenced by video games and, crucially, not all games have a positive impact on them. Indeed, for games to support their well-being, game designers must take into account children's needs and design games that support those needs" (Tgcom24, 2024).
Nylund study included 255 children between the ages of eight and twelve from the USA, South Africa and Chile for a period of six to twelve weeks; The results showed that using video games can have a positive impact on overall well-being, increasing self-awareness and self-esteem and developing specific skills.
The studies also showed that video games can be useful tools for understanding emotions, thus facilitating social interactions with peers.
However, for games to truly support general well-being, it is essential that they are designed with this in mind.
Antinucci, in the text: "Computer for a child. Playing, learning, creating" (1999) defines video games as "objects of cognitive interest", adding that video games are symbolic representations which, through images, they tell stories in a simple language that is accessible to most people.
It is important that an adult is present and there is a shared discussion about the game times. In addition, programs and environments that help develop logical thinking and cognitive skills are very useful. Today, a lot is being done to introduce programming and robotics activities for children, using physical tools or images; these initiatives start at preschool age and offer kits designed to teach how to program objects or characters.
In addition to the ecological aspects, the educational games sector raises questions about the effectiveness of digital interactions and when it is necessary to use them compared to more traditional media to achieve the same learning objectives (Antinucci F., 1999).
Despite the considerable value attributed to fundamental motor skills in the overall psycho-physical development of individuals, a critical analysis of scientific literature highlights a significant limitation within the school context: the lack of qualified personnel for physical education in primary schools (Eurydice Report, 2013), which results in the absence of specific programmes for teaching and learning these skills within the curricula, In favour of lessons that mainly focus on free play or team sports (Morgan & Hansen, 2008; Morgan P. et al., 2013).
In this context, schools should view the introduction of digital technologies as a positive step at all levels of society, it is believed that many of the digital devices with which new generations interact can be valuable tools to support the teaching action of the teacher and increase the involvement of students (Webb & Cox, 2004).
With particular reference to physical education, the National Association for

Physical Education and Sport (NASPE) has published an official document that invites teachers of this discipline to integrate digital devices into their lessons (Naspe, 2009).
Among these devices, exergames have been identified as a technology with high educational potential, as they can be effectively integrated into the teaching-learning process (Rovegno I., 2006).
Today, viewing video games as entertainment is an outdated opinion. Therefore, it is essential to highlight and value its educational, instructive and communicative potential (Pistolini S., 2022). It is important that the teaching staff be trained to overcome the video-playing illiteracy which is still widespread. It is possible to say that "Media and school: the future is already here" as the video game is a language able to overcome complexity" (Federici L., 2018).

2. Exergames: a new frontier for motor learning

Distance learning has stimulated reflections on the role of physical activity for pupils in both pre-school and primary schools. The integration between traditional physical space and online environment has led to a reevaluation of spaces and teaching-learning processes.
Despite numerous efforts to combat the rise of childhood obesity, no country seems on track to fully meet the targets set by the WHO's 2016 "Commission to end childhood obesity".
Globally, about 50 million girls and 74 million boys between 5 and 19 years old are obese (Istituto Superiore di Sanità, 2020). These young people face an increased risk of developing conditions such as diabetes, cardiovascular disease, cancer and obesity in adulthood. In addition, the COVID-19 pandemic has highlighted the links between infectious diseases and obesity, making it even more urgent to take effective measures to reduce childhood obesity.
The measures implemented to limit the spread of COVID-19, however, may have contributed to an increased risk of obesity due to reduced accessibility to healthy food, the increased time spent in sedentary activities and the increased exposure to online marketing of high-calorie, nutrient-poor foods. As a result, social and health inequalities have increased, further complicating the situation (Istituto Superiore di Sanità, 2020).
The World Health Organization (WHO) recommends at least 60 minutes per day of moderate or vigorous physical activity (MVPA) to maintain good physical condition and promote the development of social and cognitive skills in children (Casolo F., 2019). Sedentary lifestyle has immediate effects on body composition and indirect

consequences on the development of skills and competences essential for a balanced physical and mental growth in adulthood.

A new approach to promote physical exercise is the exergames, which combine physical exercise and video games, referring to "active" games as opposed to "inactive" ones. This category is a way to increase energy expenditure and movement, although it is not clear whether these tools can actually offer benefits in the acquisition of motor skills, due to the lack of scientific research on the subject (Calvani A., 2009).

According to Federici (2022) exergames are generally more expensive than other video games, because they often require special equipment, but the benefits they offer are manifold: they can improve the coordination between mind and body, similar to that obtained by practicing sports, and help maintain a physical shape.

According to Best (2013), they are described as interactive video games that promote an engaging and active whole-body gaming experience; Gao Z. et al. (2016) state that they are video games that require body movement and exercise in a playful way; This definition is reached considering that not all exergames require movements of the whole body, but they can involve only specific parts, also separately stimulated (Lo Piccolo et al., 2020).

Exergames are an innovative form of video games where the body itself becomes the controller, allowing interaction through movement, exercise and sport, making movement and exercise an integral part of the interaction (Staiano A. E., et al., 2012), representing an alternative to traditional games defined as sedentary, since it encourages the little ones to engage in motor activities without realizing it (Lewis, 2009), a good opportunity to counter the reduced levels of physical activity in the developing age, by encouraging new learning experiences, and by encouraging young people to actively participate in motor activities without being aware of it. This playful approach combines the fun of video games with physical movement, thus offering a more active and healthy entertainment experience.

The most used exergames are the Nintendo Wii and the Microsoft Kinect. The Nintendo Wii was introduced in 2006 and included in the category of so-called "fitness games", it was designed to promote physical activity while fighting sedentary lifestyle; The difference between the Microsoft Kinect and the Nintendo Wii is that the latter requires at least one controller to sense movements, which the Kinect does not have (Sgrò F. et al., 2016).

Moreover, the use of exergames can bring rehabilitative and cognitive benefits to a wide range of ages, from children in the developmental stage to the elderly, who, if involved in stimulating physical activities, benefit significantly (Lazzeri M., Porzia Z., 2021).

Exergames, argue Sgrò F. et al (2016) are suitable for all ages with the possibility of playing together or in competition, creating an experience that is similar to real interaction.

Exergames can also be a support mode for patients with mood disorders; in fact, they can provide the necessary motivation to dedicate time to physical activities, positively influencing psychophysical health (Monacis & Colella, 2022).

These tools are useful for people with cognitive or neurodevelopmental disorders, such as autism spectrum disorder or attention deficit hyperactivity disorder (ADHD), in that they promote the enhancement of cognitive functions and attention skills, thanks to their playful character, which, with the production of endorphins, reduces stress and anxiety (Rivoltella & Rossi, 2019).

Some scholars have seen the use of exergames as a valuable educational tool to address these difficulties, since they offer an engaging environment that can focus attention on one single goal. In particular, Benzing and Schmidt (2017) have highlighted the positive effects of exergames practice regarding improvement of executive functions, an increase of motor skills and sports and a consequent reduction of ADHD symptoms, ensuring the possibility of creating alternative inclusive routes, thanks to the extreme adaptability they are characterized.

An additional strength of exergaming is its affordable and practical: it can be practiced anywhere, both in school and family settings, at any time and players can learn movements both implicitly and explicitly, without direct instructions (Bnezing & Schmidt, 2017).

Despite the many benefits, there are also negative effects due to excessive and incorrect use. The time spent in front of video games, if excessive, can create a decrease in social interactions (Cavaliere, 2012), isolation and introversion, replacing relationships with peers, with the possibility of neglecting hobbies and other interests, Leading to a real addiction (Angelini, 2024).

It, commonly called "pathological video game" or "addiction to video games", produces negative consequences at the mental and physical level of the player, who has started to devote himself to video games only as a form of entertainment, ending instead succube of them. Currently this addiction is not officially a disorder included in the DSM, but an appendix appeared in the fifth edition, with the hope that research will be carried out in the future (Mazzucchelli L., 2015).

Increasingly aggressive behavior is observed in players as a result of excessive use of these technologies: this could be due to the fact that the player receives rewards whenever he hurts a character or makes aggressive gestures, believing that the repetition of that behaviour can be carried out in real life and failing to distinguish the two different realities.

Studies have linked the excessive use of technologies with greater problems at the attentional and executive level; it has been shown that those who play video games excessively show more problems at the cognitive and attentional levels, finding that those who have more of this type of problems are more attracted to video games (Sgrò F. et al., 2016).
Over time, health problems such as insomnia, obesity, cardiovascular disease or even epilepsy can also occur: some research has shown that these two components are associated. An article published in the Journal of Neurology, claims that epilepsy in 29% of subjects is caused by excessive use of video games and strong contrast of brightness, which can cause nervous overexcitation, capable of inducing convulsions in children (Mazzuchelli L, 2015).
Too long times dedicated to the use of technologies can cause consequences in different areas, as there would not be a normal development of control of impulses and sustained attention; in fact, video games, especially violent ones, contain a large number of stimuli, but this could lead to difficulties in focusing on other external stimuli (Di Tore & Raiola, 2012).
Despite these negative implications, several scholars argue that video games can have a positive impact on the brain of gamers by constructively influencing their behaviour. For example, they can help improve motor skills, concentration, impulse control and emotional management.
More in-depth analysis could help to better understand the long-term effects of using these tools in the context of the physical education curriculum (Lo Piccolo et al., 2020).

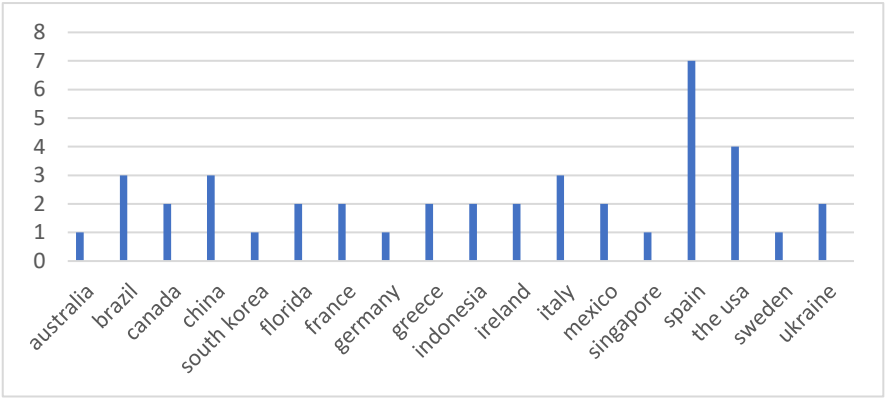
3. Systematic review on the use of exergames in physical education

The review includes 41 scientific studies conducted in European and non-European countries, providing an overview of the effects of exergames on motor education in different school settings. The sample selected includes children and adolescents aged between 2 and 15 years. Through the analysis of results, the aim is to understand whether exergames can be used as a means for acquiring motor skills or as an alternative to traditional physical education practices, contributing to the promotion of healthy lifestyles from early childhood, combating sedentary lifestyle and all its consequences.

3.1 Methodology

Forty-one scientific papers published between 2010 and 2024 were analysed from Australia, Brazil, Canada, China, South Korea, Florida, France, Germany, Greece,

Indonesia, Ireland, Italy, Mexico, Singapore, Spain, the USA, Sweden and Ukraine (Figure 1).



Graph. 1 (Countries analyzed)
Source: own elaboration

The review was designed according to a procedure consisting of several phases:
- Selection of the topic and formulation of the research hypothesis;
- Definition of objectives;
- Selection of keywords and concepts to search for;
- Search for scientific articles in various search engines;
- Selection of articles to analyze using inclusion and exclusion criteria;
- Detailed analysis of the various articles;
- Inclusion of articles in the table.

In the first phase of the search, using the selected keywords, a total of 89 studies were found, specifically 18 on PubMed, 14 on Science Direct, 20 on EBSCO, 10 on DOAJ, 5 on OAIster, and 22 on Google Scholar.
The study has been developed through several phases: starting from the initial results obtained by applying separately the search combinations for each database, a first selection was made based on the analysis of the titles and keywords of each result. Subsequently, a further selection was carried out by reading the abstracts carefully to ensure strong consistency with the objectives set.
Applying the inclusion and exclusion criteria, a total of 41 articles were found to be valid and consistent with the research, broken down as follows (Table 1):

DATABASE	TOTAL	CONSIDERED	EXCLUDED
PUBMED	18	6	12
SCIENCE DIRECT	14	8	6
EBSCO	20	15	5
DOAJ	10	1	9
OAISTER	5	1	4
GOOGLE SCHOLAR	22	10	12
TOTAL →	89	41	48

Table 1 (Databases used for article search)
Source: own elaboration

The inclusion criteria are as follows:

- Studies with or without experimental groups and control groups;
- Peer-reviewed articles;
- Systematic reviews;
- Expert-reviewed publications;
- Scientific articles;
- Experimental interventions involving the use of exergames aimed at promoting physical activity;
- Participants aged between 2 and 15 years old;
- Participants with or without disabilities.

As for the exclusion of articles, the decision was made after carefully evaluating their relevance to the thesis topic. The exclusion criteria are:

- Age of participants not in line with the topic (2-15 years);
- Articles published before 2010;
- Articles not related to the topic of educational technologies as innovative tools for physical activity.

In the development of the review, the risk of bias was considered and mitigated through (Table 2):

PUBLICATION BIAS	TIME BIAS	LINGUISTIC BIAS
Consideration of articles from both European and non-European countries.	Consideration of scientific articles published from 2010 to 2024.	Consideration of articles from different countries, both European and non-European.

Table 2 (the risk of bias)
Source: own elaboration

To answer the research question, the articles were selected following the PRISMA diagram (Fig. 1):

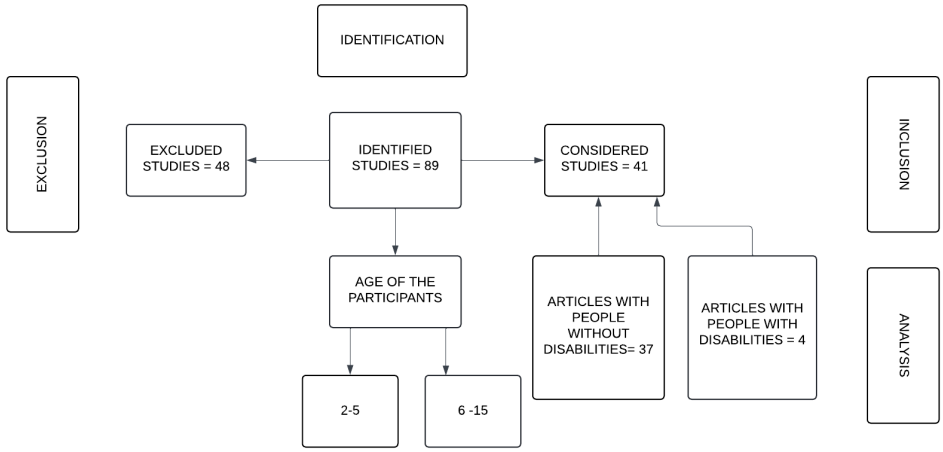


Fig. 1 (the PRISMA diagram)
Source: own elaboration

3.2 Objective

Identify the theoretical and didactic principles that guide the design of exergames, to highlight the beneficial effects of video games in the context of physical education in children aged between 2 and 15 years old, with or without disabilities,

Trying to determine whether exergames can be a valuable educational resource to reaffirm the central importance of physical activity in the learning path of students and as a means to combat overweight, obesity and sedentary. However, exergames should not replace the traditional physical exercise provided for in the physical and motor education programme, but rather complement it.
The PICO model (Table 2), structured according to four principles, will be used to highlight the key elements of the survey:

P	I	C	O
POPULATION	INTERVENTION	COMPARISON	RESULTS
Students aged between 2 and 15 years, with and without disabilities.	Use of video games, particularly exergames, for motor education.	Use of video games, particularly exergames, for motor education.	Improvements in motor skills, psychophysical health, and academic performance following the implementation of exergaming.

Table 2 (the PICO model)
Source: own elaboration

3.3 Characteristics and data summary

It presents a synthesis of 41 studies conducted in European and non-European countries on the potential use of technology in developing motor skills, including children with disabilities (Table 6). Thirty-eight studies focus on children aged 6 to 15, while the remaining 3 articles focus on preschool age children (2-5 years).
Joe O'Loughlin et al (2010): using digital video as a tool for self-assessment and motivation. Results: The digital approach increases the commitment to learning motor skills, such as basketball.

Dwayne Patrick Sheehan and Larry Katz (2010): using the exergames Wii Fit+ to improve balance in children. Results: Exergames made the educational practice more stimulating.
Victoria A. Fogel (2010): using Nintendo Wii Sport to combat childhood obesity, linked to sedentary behaviour. Results: the pupils were more motivated with exergames to exercise than in traditional physical education classes.
May O. Lwin and Shelly Malik (2012): use of Nintendo Wii Tennis, Nintendo Wii Boxe, DDR for integration in school physical education classes. Results: The use of exergames leads to greater involvement and cognitive and social benefits.
Sheehan and Katz (2013): using exergames (iDance, Wii Fit, XR - Board, Lightspace) to improve balance and posture in children. Results: Students in the experimental group significantly improved their posture and balance compared to the control group.
Joe O'Loughlin et al. (2013): using digital video to examine pupils' motivation in comparison with traditional methods. Results: Technology increases motivation in learning motor skills, particularly basketball.
Haichun Sun (2013): using Nintendo Wii, DDR, Gamercize, XrBoard to increase the intensity of physical activity. Results: exergames in physical education increase the intensity of movement in pupils compared to a traditional lesson.
Olena Lahno et al (2015): using innovative technologies such as Smart Ring, Happy Corners, Pairs to improve children's psychomotor skills. Results: The use of video games may improve psychomotor skills in preschool age.
Zan Gao et al. (2015): using the Nintendo Wii and Just Dance to show whether exergames increase levels of physical activity compared to traditional methods. Results: exergames increase physical activity compared to traditional physical education classes, thanks to the strong emotional charge they are characterized by.
Gunn Nyberga and Jane Meckbach (2015): using the Nintendo Wii, Dance Games to promote knowledge of movement. Results: exergames promote movement in children.
Johnson T. M. (2015) using Xbox Kinect to improve object control skills and motor skill development. Results: Using the Xbox Kinect significantly affects the object's control ability, but can help children with difficulties.
Rosenberg M. et al. (2016): Use of the Xbox Kinect game to promote exercise. Results: Studies have shown that video games have the potential to promote physical exercise and how they can be integrated into physical education programmes to support the development of basic motor skills.
Sgrò F., Barresi M., and Lipoma M. (2016): using Kinect Adventures to improve locomotion skills and object control. Results: significant improvements in both skills

for the experimental group, supporting the use of exergames in physical education programs.

Gao Z. et al. (2016): use of exergames (Nintendo Wii and Xbox Kinect) in the field of motors to investigate long-term effects. Results: They showed how exergames promote physical exercise and increase energy expenditure, confirming their potential to promote physical education among young people.

Chacón Cuberos R. et al. (2016): using exergames to analyse young people's attitudes towards video games and how they can best integrate into the field of motor education. Results: Most expressed interest and motivation in the use of video games in physical education, highlighting their potential to make physical education more engaging and motivating.

Francesco Sgrò et al (2017): use of Kinect Adventures to improve balance and locomotion skills. Results: exergames improved balance skills and how they could enrich physical education teaching while maintaining motivation and interest.

Caro K. et al. (2017): using FroggyBobby to support motor education for children with severe autism, particularly towards eye-hand coordination. Results: Exergames helped to maintain attention and improve arm movements, suggesting their usefulness in therapy for children with autism.

Subsequently, Caro K. et al. (2020): use of FroggyBobby for coordination problems related to autism. Results: Exergames can improve oculo - manual coordination in individuals with autism, showing a greater interest from children than traditional methods.

Canabrava K. L. R. et al. (2018): Using The Adventure Game on Xbox 360 to compare energy expenditure and intensity between physical activity with or without exergames. Results: exergames lead to increased energy expenditure with exergames, suggesting their potential in promoting physical activity.

The study by Ye S. et al. (2018): using Nintendo Wii, Kinect Ultimate Sports, Just Dance, Wii Sports, Wii Fit to see if children were more motivated to exercise and if there was improvement in motor skills. Results: The experimental group developed better motor skills than the control group which followed traditional lessons.

Sunyue Ye et al. (2019): use of exergames in school settings, particularly during recreation, to increase physical activity. Results: exergames increased physical activity, thus reducing non-activity times during recreation.

Gao Z. et al. (2019): use of exergames, such as Nintendo Wii, Just Dance for Kids, Wii Nickelodeon Fit, Xbox 360 Kinect on preschool children (3-5 years old), on the acquisition of motor skills. Results: the sample had a higher motivation to exercise than traditional activities.

The study by Bustamante et al. (2020): using Just Dance Now to analyze the effects of a program with exergames on motor coordination in children aged 10-12 years. Results: improvements in the processes related to motor coordination, suggesting that the use of exergames may have positive effects on brain function during physical education.

Quintas-Hijo s A. et al. (2020): use of Just Dance to improve the students' motor skills. Results: exergames can have positive effects on motivation and autonomy in motor education, thus increasing the energy expenditure compared to a traditional lesson.

Andrade A. et al. (2020): Using Xbox Kinect to promote the mental and physical health of young people and how it can affect mood. Results: positive impact on psychological variables, demonstrating how these tools can involve children more in physical exercise.

Quintas A. et al. (2020): use of Just Dance Now in physical education in primary school classes on psychological variables such as motivation, flow, basic psychology, needs and academic performance.

Results: positive psychological effects for physical education in primary school, leading to better learning.

Santos Diniz E. F. F. et al. (2021): Using Xbox Kinect to test the effects on motor performance in children with autism spectrum disorder. Results: improvements in motor skills after exergaming, especially balance and speed, suggesting how these tools can be useful for stimulating motor skills in students with difficulties.

Lau P. W. C. et al. (2021): using Sony Playstation to analyze whether it can combat sedentary behavior in boys. Results: improved motor skills and greater involvement, reducing time spent in sedentary activities.

The study of Quintas & Bustamante (2021): using Just Dance Now to test whether it can affect motivation and attitude towards exercise. Results: positive effects on intrinsic motivation and attitude towards exercise.

Juliantine T. et al. (2022): use of games of bowling, tennis, basketball, running, dance to test if they can improve movement. Results: the use of exergames is an effective resource to improve movement skills, since it arouses interest, even in children not particularly interested in physical education, motivating them to participate in sports activities.

Samsudin Gani R. A. et al. (2022): Using games of bowling, tennis, basketball, running and dancing to examine whether there can be improvements in motor skills. Results: improvements in motor skills, due to the interest of students in approaching technologies.

Martinez - Sontos V. C. et al. (2022): using the ClassDojo platform to examine the effects of gamification on young people. Results: They showed an increase in motivation, participation and cooperation in the experimental group.
Lee H. K. et al. (2022): using VZFit to test whether it can benefit motor skills of children with disabilities, examining how technologies may show improvements in motor skills. Results: positive effects in improving basic motor skills.
Monacis D. et al. (2022): Using the projector to increase engagement and levels of physical activity in primary school children. Results: These tools led the students in the experimental group to improve their motor skills compared with the control group.
Diekhoff & Greve (2023): using Videocatch to examine students' attitudes towards physical education compared to traditional methods. Results: greater motivation in the approach to physical education, demonstrating how video games are an alternative mode of promoting movement.
Zeng N. et al. (2023): use of LeapTv to examine the impact of exergames on children aged 2-5 years: Results: improvements in executive functions, reducing sedentary moments.
Kolovelonis A. et al. (2023): Using Just Dance Now to test the impact of exergames on executive functions in primary school students. Results: Improvements in attentiveness and motor skills, with greater involvement of students than traditional activities.
Goncalves A. et al. (2024): Using The Play LÜ to explore how technologies can further motivate children to participate in physical activity. Results: greater motivation to participate, improvement in attentiveness and motor skills compared to traditional methods of physical education.
Kapidis P. et al. (2024): Using Oculus Quest to examine the exergames in the manual oculo coordination. Results: improvements in motor and cognitive skills.
Blazhko O. et al. (2024) focused on how PoseNet and Scratch platforms motivate 9-year-olds in physical education classes. The results showed greater interest in the use of exergames for physical activity than traditional approaches.
Silva S. A. et al. (2024): Using Kinect Sports and Just Dance Now to examine motivation in students who do not usually attend physical education. Results: Exergames encouraged participation in physical education classes, demonstrating how these tools can be valuable allies in the promotion of physical exercise.

Below is the table summarizing the described studies (Table 3).

AUTHOR, YEAR AND COUNTRY	TITLE	NUMBER, AGE OF PARTECIPANTS AND DURATION	OBJECTIVES OF THE STUDY	RESULTS
O'Loughlin J, Nì Chroinin D., O'Grady D. 2010, Ireland	Digital video: The impact on children's learning experiences in primary physical education	22 9-10 10 weeks	Determine whether technology (digital video) can support teaching, learning, and assessment in physical education, particularly for learning basketball skills.	Technology can enhance motivation, feedback, and performance in learning skills in primary physical education, especially due to its distinctive motivating power.
Sheehan D., Katz L., 2010, Canada.	The Impact of a Six Week Exergaming Curriculum on Balance with Grade Three School Children using the Wii FIT+.	66 6-10 3 months	Analyze the effects of training based on exergames (Wii Fit) on the development of fundamental motor skills in a school environment.	The results show how exergame technology (Wii Fit+™) can represent a valid alternative to traditional teaching methods. This study highlights how this technology can improve postural stability.
Fogel V. A., Milternberger R. G., Graves R., Koehler S. 2010, Florida	The effects of exergaming on physical activity among inactive children in a physical education classroom.	4 9 30 minuts	The program aims to determine whether exergaming (Nintendo Wii Sport, Sony PlayStation, iTech Fitness XrBoard) increases physical activity in inactive children as a countermeasure against childhood obesity.	The study highlighted how exergaming increased the time spent on physical activity compared to a traditional physical education lesson.
Lwin M. O., Malik S. 2012, Singapore	The efficacy of exergames-incorporated physical education lessons in influencing drivers of physical activity: A	1112 10-12 6 weeks	The aim of the study is to investigate the positive effects of using exergames (Nintendo Wii Tennis, Nintendo Wii Boxing, DDR) in physical activity, particularly on cognitive and social factors.	The results demonstrated that the use of exergames significantly influenced attitudes toward physical activity, resulting in improved motor performance.

	comparison of children and pre-adolescents.			
Sheehan D. P., Katz L. 2013, Canada	The effects of a daily, 6-week exergaming curriculum on balance in fourth grade children.	64 9-10 6 weeks	Using exergames (iDance, Wii Fit, XR – Board, Lightspace) to improve students' balance and posture: the activity, which involves following movements to the rhythm of music, requires coordination, balance, agility, and a sense of rhythm.	The investigation revealed that students significantly improved their posture and balance compared to the control group, which attended physical education classes without exergames.
O'Loughlin J., Nı´ Chro´ını´n D., O'Grady D. 2013, Ireland.	Digital video: The impact on children's learning experiences in primary physical education.	23 9-10 anni 10 weeks	The aim of the investigation is to examine students' perceptions of using digital video during physical education lessons and how it can enhance student assessment by using video to provide feedback.	The use of video technology improves assessment and self-assessment by providing immediate feedback and enhancing motivation.
Sun H. 2013, Florida	Impact of exergames on physical activity and motivation in elementary school students: A follow-up study.	70 9-12 6 weeks	The aim of the investigation was to examine the effect of exergames (Nintendo Wii, DDR, Gamercize, XrBoard) on the quality and intensity of physical exercise, as well as the situational interest perceived by the students.	The study demonstrated that the use of exergames in physical education increases the intensity of movement in students compared to a traditional lesson.
Lahno O., Hanjukova O., Cherniavska 0., 2015, Ukraine.	Evaluation of the effectiveness of integrated psychomotor development of children in the age from 2 to 4.	322 2-5 6 weeks	The aim of the investigation is to confirm the use of innovative technologies (Smart Ring, Happy Corners, Pairs) for the development of psychomotor skills in preschool children's physical education.	There was an improvement not only in physical development but also in the development of psychophysiological skills.

Gao Z., Chen S., Stodden D. F. 2015, USA.	A Comparison of Children's Physical Activity Levels in Physical Education, Recess, and Exergaming	144 6-8 36 weeks	The aim of the investigation is to compare the intensity during a traditional physical education lesson and a lesson using exergaming (Nintendo Wii and Just Dance).	The study highlighted how the intensity of physical activity increased significantly during recess and exergaming.
Nyberg G., Meckbach J., 2015, Sweden.	Exergames 'as a teacher' of movement education: exploring knowing in moving when playing dance games in physical education.	20 7-15 3 hours	Exergames (Nintendo Wii, Dance Games) are used as a model to follow, with the aim of imitating the dance steps on the screen. The teacher uses exergames as a model for assessment.	It has been highlighted that the use of exergames as a pedagogical tool can improve students' understanding of movement.
Johnson T. M., Ridgers N. D., Hulteen R. M., Mellecker R. R., Barnett L. M. 2016, Australia.	Does playing a sports active video game improve young children's ball skill competence?	60 6-10 6 weeks	The program aims to demonstrate whether the use of Xbox Kinect improves object control skills and the development of motor skills.	The study highlighted that the use of Xbox Kinect does not significantly influence object control skills, but it can help children with difficulties in acquiring motor skills.
Rosenberg M., Thornton A. L., Lay S. B., Ward B., Nathan D., Hunt D., Braham R. 2016, France.	Development of a Kinect Software Tool to Classify Movements during Active Video Gaming	43 10-15 5 minutes per game station.	Use Xbox Kinect to develop fundamental motor skills during an interactive game activity.	The study demonstrates how the Microsoft Kinect can be used to analyze, in numerical terms, jumps and lateral movements and could be integrated into physical education programs as it is specific for developing fundamental motor skills.
Sgrò F., Barresi M., Pignato S.,	Analysis of the effects of a motor activity protocol	74 8-10 16 weeks	Determine the effects of a motor activity protocol, implemented through	The exergame-mediated protocol resulted in significant

Lipoma M. 2016, Italy.	mediated by exergames on the competence levels of fundamental skills in primary school children.		exergames (Kinect Adventures), on the competence levels of motor skills.	improvement in both motor skills for the experimental group between the pre- and post-treatment phases, as well as a significant post-treatment difference compared to the control group.
Gao Z., Pope Z., Lee J. E., Stodden D., Roncesvalles N., PascoD., HuanC. C., Feng D. 2016, USA.	Impact of exergaming on young children's school day energy expenditure and moderate-to-vigorous physical activity levels.	261 7-9 25 minutes per week.	The purpose of this study was to investigate the long-term impact of an exergaming intervention, using Nintendo Wii and Xbox Kinect, in a school setting.	The results show positive effects on physical activity due to the use of exergames, driven by motivation and enthusiasm to play.
Chacòn Cuberos R., Castro Sànchez M., Zurita Ortega F., Espejo Garcès T., Martìnez Martìnez A., 2016 Spain.	Videojuegos Activos como recurso TIC en el Aula de EducaciónFísica : estudio a partir de parámetros de Ocio Digital	520 8-12	The aim of the investigation is to analyze students' attitudes toward exergames as tools in physical education.	The data collected show that students have a positive attitude toward video games, even for physical education activities.
Sgrò F., Barresi M., Pignato S., Lipoma M., 2017. Italy.	The use of exergames in physical education to enhance balance skills in primary school children.	57 8-10 16 weeks	Analyze the effect of managing an exercise protocol mediated by exergames (Kinect Adventures) on the level of balance skills.	The effectiveness of technology in supporting physical education teaching and improving balance-related skill levels has been confirmed.
Caro K., Tentori M., Martinez – Garcia A. I., Alvelais M., 2017. Mexico.	Using the FroggyBobby exergame to support eye-body coordination development of	7 7-10 7 weeks	Analyze whether the use of exergames (FroggyBobby) can help develop hand-eye coordination and maintain attention	The investigation highlighted how exergames can help develop hand-eye coordination and maintain attention span in children

	children with severe autism		span in children with severe autism.	with severe autism, thanks to the visual stimuli provided by FroggyBobby.
Canabrava K. L. R., Faria R. F., De Lima J. R. P., Guedes D. P., Amorim P. R. S., 2018, Brazil.	Energy expenditure and intensity of active video games in children and adolescents.	72 8-13 3 weeks	The aim of this study was to compare energy expenditure and intensity between physical activity with and without exergames (Xbox Kinect 360).	The investigation demonstrated that the use of active video games is an interesting alternative to increase physical activity levels for both genders, compared to traditional physical activity.
Ye S., Lee J. E., Stodden D. F., Gao Z. 2018, USA.	Impact of Exergaming on Children's Motor Skill Competence and Health-Related Fitness: A Quasi-Experimental Study.	261 7-9 9 months	The investigation aims to determine whether exergaming (Nintendo Wii, Kinect Ultimate Sports, Just Dance, Wii Sports, Wii Fit), integrated into traditional physical education lessons, improves students' motor competence and psychophysical health.	The results suggest that the use of exergames can have a positive effect on students' motor competence and psychophysical health.
Gao Z., Zeng N., Pope Z. C., Wang R., Yu F. 2019, China.	Effects of exergaming on motor skill competence, perceived competence, and physical activity in preschool children.	65 3-5 8 weeks	Examine the effectiveness of exergames (Nintendo Wii, Just Dance for Kids, Wii Nickelodeon Fit, Xbox 360 Kinect) on psychophysical health, exercise quality, and motor competence, while analyzing gender differences.	The program showed a positive effect in promoting moderate to vigorous physical activity, especially in males compared to females.
Ye S., Pope Z. C., Lee J. E., Gao Z., 2019 China.	Effects of School-Based Exergaming on Urban Children's Physical Activity and Cardiorespirato ry Fitness: A	81 7-10 8 months	Examine the effects of using exergames on the acquisition of motor skills and the cardiorespiratory component.	The observations suggest that implementing exergaming in the school context can increase physical exercise and reduce sedentary behavior in children.

	Quasi-Experimental Study			
Caro K., Martinez – Garcia A. I., Kurniawan S., 2020. Mexico.	A performance comparison between exergames designed for individuals with autism spectrum disorder and commercially available exergames	14 6-15	The aim of the investigation is to assess whether exergames (Astrojumper and FroggyBobby) can influence hand-eye coordination in children with autism spectrum disorder.	The study demonstrated that the use of exergames leads to improvements in hand-eye coordination in children with autism.
Bustamante J. C., Hijòs A. Q., Berges M. S., Lozano C. P., Laborda J. L. A. 2020, Spain.	Impact of an exergame-based didactic intervention on supplementary motor area activation during motor coordination in primary school students: a pilot study	9 10-12 4 weeks	Analyze the effects of a physical education intervention using exergames (Just Dance Now) compared to a traditional teaching intervention, focusing on motor coordination and acquisition time.	The study reports positive effects of using exergames on motor coordination and acquisition time in the experimental group.
Quintas-Hijo´s A., Peñarrubia-Lozano C., Bustamante J. C. 2020, Spain.	Analysis of the applicability and utility of a gamified didactics with exergames at primary schools: Qualitative findings from a natural experiment.	417 10-12 4 months	Analyze the effects of using exergames (Just Dance Now) as an educational resource, stimulating students' motor skills, leveraging motivation, and promoting physical exercise.	It was highlighted that the use of exergames facilitated the promotion of physical exercise while simultaneously increasing fun, motivation, reducing embarrassment, and fostering creativity.
Andrade A., Da Cruz W. M., Correira C. K., Santos A. L. G., Bevilacqua G. G., 2020 Spain.	Effect of practice exergames on the mood states and self-esteem of elementary school boys andgirls during	213 7-11 3 lessons of 40 minutes each.	The aim of the investigation is to evaluate the use of exergames (Xbox Kinect) to promote the psychophysical health of children.	The use of exergames has a positive impact on the self-esteem and mood of the students.

	physical education classes: A cluster-randomized controlled natural experiment			
Quintas A., Bustamante J. C., Pradas F., Castellar C. 2020, Spain.	Psychological effects of gamified didactics with exergames in Physical Education at primary schools: Results from a natural experiment.	417 10-12 4 weeks	Analyze the effects of an intervention with exergames (Just Dance Now) in physical education in primary school classes on psychological variables such as motivation, flow, basic psychology, needs, and academic performance.	Exergames have proven to be resources capable of producing positive psychological effects for physical education in primary schools, leading to improved learning.
Santos Diniz E. F. F., Costa Moreira O., De Oliveira C. E. P., Torres Pereira E., 2021 Brazil.	Effect of exergames on motor performance and reaction time in a child with autism spectrum disorder.	1 6 8 weeks	The aim of the investigation is to verify the effects of using exergames (Xbox Kinect) on motor performance and reaction times in children with autism spectrum disorder.	The results suggest that the use of exergames leads to improvements in motor performance, but not in reaction time.
Lau P. W. C., Ransdell L., Wang G., Wang J. J. 2021, China.	Perceptions of the potential contribution of Active Video Games to school physical education in Hong Kong children and adolescents.	360 8-15 1 day	The study aimed to verify whether the use of exergames (Sony PlayStation) could increase interest in physical activity.	The study argues that combining technology with physical education lessons can lead to greater enjoyment for students compared to a traditional physical education program.
Quintas A., Bustamante J. C. 2021, Spain.	Effects of gamified didactic with exergames on the psychological variables associated with promoting phys	417 11-12	Analyze the effects of a school-based intervention using the exergame *Just Dance Now*, considering the psychological variables associated with promoting physical exercise.	The survey results showed a positive attitude among participants toward the exergame, increased motivation for success, and greater enjoyment, thereby

	ical exercise: results of a natural experiment run in primary scho ols.			promoting physical activity.
Juliantine T., Setiawan e., Jumareng H., Gani R. A., Asnaldi A. 2022, Indonesia.	Do fundamental movement skills, physical activity and Enjoyment among inactive student during the covid-19 era improve after exergame?	26 6-9 9 weeks	Verify whether the use of exergames (bowling, tennis, basketball, running, dance games) during the COVID-19 pandemic proves to be an effective resource for improving physical activity.	This study highlighted how the use of exergames is an effective resource for improving motor skills, as it sparks interest even in children who are not particularly interested in physical education.
Samsudin, Gani R. A., SetiawanE., Németh Z., Kardiyanto D. W., Winarno M. E. 2022, Indonesia.	Increasing Physical Activity and Fundamental Movement Skills of Primary School Students during the Covid-19 through Exergame.	120 10-12 7 weeks	The study aims to examine the effects of exergames (bowling, tennis, basketball, running, and dance games) on students during physical activity.	The results of this study demonstrated that exergames can enhance physical activity, thanks to the interest students show in engaging with technology.
Sotos – Martinez V. J., Tortosa Martinez J., Baena – Morales S., Ferriz – Valero A. 2022, Spain.	It's game time: Improving basic psychological needs and promoting positive behaviours through gamification in physical education	506 6-10 6 weeks	This study aims to examine the effects of gamification (ClassDojo) in physical education.	The study found improvements in autonomy, motivation, participation, cooperation, and motor skills in the experimental group compared to the control group.
Lee H. K, Jin J. 2022, South Korea.	The effect of a virtual reality exergame on motor skills and physical activity levels of children with a developmental disability.	23 7-12 12 weeks	The aim of the study is to determine whether the use of virtual reality (VZFit) can provide benefits to the motor skills of children with disabilities (intellectual disability, autism spectrum	The study highlighted that a virtual reality-based program is effective in improving locomotor skills among children with developmental disabilities.

			disorder, Down syndrome).	
Monacis D, Colella D., Limone P., 2022, Italy.	Non-linear didactic technology - based intervention to enhance basic motor competencies with MOBAK-5: a pilot study in primary school.	120 10-11 8 weeks	The study aims to verify whether the use of a projector during physical education lessons can be a useful tool to increase engagement and motivation towards physical exercise.	The results highlighted improvements in all scores, suggesting that the integration of technology in physical education lessons is a useful and effective way to develop motor skills in primary school.
Diekhoff H., Greve S., 2023 Germany.	Digital technology in game-based approaches: video tagging in football in PE	131 9-10 3 lessons of 90 minutes.	The analysis aims to investigate students' perspectives on physical education teaching through new technologies (Videocatch).	The results showed increased motivation toward the game, as well as a better understanding of the movements to be performed.
Zeng N., Lee J. E., Gao Z. 2023 USA.	Effect of home – based exergaming on preschool children's cognition, sedentary behavior, and physical activity: A randomized crossover trial.	34 3-5 24 weeks	Evaluate the effects of using exergames (LeapTV) at home on physical activity, sedentary behavior, and executive functions in preschool-aged children.	The study demonstrated significant improvements in physical exercise at home, reducing sedentary behavior. Additionally, improvements were also recorded in executive functions.
Kolovelonis A., Papastergiou M., Samara E., Goudas M. 2023, Greece.	Acute Effects of Exergaming on Students' Executive Functions and Situational Interest in Elementary Physical Education.	74 9-10 2 months	The research aimed to examine the effects of exergames (Just Dance 2015) on students' executive functions and how their interest could influence learning.	The results showed that a physical education session based on exergames attracted students' interest and positively activated their executive functions, while also improving their post-intervention scores.
Goncalves A., Lespiau F., Briet G., Vaillant –	Exploring the Use of a Learning-Based Exergame to	79 7-11 3 weeks	The research aimed to promote physical activity through the use of exergames (The	The results of the study indicate positive impacts during physical

Coindard E., Palermo A., Decobert E., Allegret – Bourdon N., Charbonnier E. 2024, France.	Enhance Physical Literacy, Soft Skills, and Academic Learning in School-Age Children: Pilot Interventional Study.		Play LÜ), evaluating the acquisition of motor skills and soft skills (motivation, self-efficacy, and concentration).	activity through exergames, as well as increased motivation and concentration in the study of mathematics and French.
Kapidis P., Giannousi M., Vernadakis N., Papastergiou M, Zetou E., Antoniou P. 2024, Greece.	Enhancing Elementary School Students' Visual Perceptual Skills: A Comparative Study of Oculus Quest 2 Exergames and Conventional Activities	40 10-12 6 weeks	The results of the study indicate positive impacts during physical activity through exergames, as well as increased motivation and concentration in the study of mathematics and French.	The study demonstrated that within a month, post-intervention scores were significantly higher compared to the pre-tests. This suggests that technology is an optimal tool for improving children's motor skills.
Silva S. A., Lourenço G. R., Niquini Caríssimo J. M. 2024, Brazil.	Educação física escolar e/o envolvimento dos alunos: o uso dos exergames.	25 11-14 8 weeks	The aim of this study is to verify whether the use of exergames (Kinect Sports and Just Dance) can reintegrate and motivate students who typically do not participate in physical education lessons.	The analysis demonstrated that exergames increase students' motivation and participation in sports activities.
Blazhko O., Podhorna V., Kokotieieva A., Ivanov O. 2024, Ukraine.	Scratch PoseNet Exergame Prototyping for Learning Process Support in Physical Education.	92 9 5 weeks	The aim of this study is to verify whether the use of exergames (Scratch and PoseNet) increases the level of physical activity in students.	The analysis showed that students felt more motivated towards physical education.

Table 3 (Summary and main characteristics of the studies)
Source: own elaboration

3.4 Reflections

This review reflects on how exergames have a strong impact on the child. Some findings include:

- The importance of physical exercise in preschool age. Studies such as that of Gao et al. (2019) point out that the introduction of physical activity in the age group between 3 and 5 years can have a significant impact on the prevention of diseases, such as obesity and cardiovascular problems. Given the increasing prevalence of obesity in countries such as the United States and elsewhere, the integration of physical activity programmes, such as exergames, may be an effective way and preventive tool for promoting movement.
- Development of motor competence. Introduction of new technologies, such as exergames, in the school context has the potential to improve students' motor skills, as observed in the survey by Monacis D. et al (2022). The use of interactive technologies can be a valuable alternative to traditional physical education lessons, making it more motivating and engaging.
- Exergames and cognitive skills: exergames help to develop neurocognitive skills (Bustamante et al., 2020); using these tools there have been improvements in motor coordination and changes in brain areas.
  This shows how the use of technology in school can support both physical and cognitive development.
- Gamification is a way to increase the motivation and interest of pupils in physical education. As observed in the study of Quintas A. et al. (2020), exergames can promote more motivating and fun learning. The use of tools, such as Just Dance, provides an alternative to sedentary video games, demonstrating how technologies can be an alternative way of stimulating physical exercise.
- Exergames and psychophysical health. The study by Andrade et al. (2020) confirms that the use of exergames not only contributes to the promotion of physical exercise but also to psychophysical health, psychological well-being, with positive effects on self-esteem and mood. In addition, positive effects on psychological variables such as intrinsic motivation and school performance have been recorded.
- Exergames and disability. The study by Santos Diniz (2021) shows that the use of Xbox Kinect has led to improvements in motor performance of children with autism spectrum disorder, resulting in a useful tool both in the family and educational environment to stimulate motor skills.
- Exergames against sedentary lifestyles. More and more obese children are being noticed in the world, due to sedentary lifestyles and lack of physical exercise. As demonstrated by Lau et al. (2021), exergames are tools that

can counter this phenomenon, offering an interactive and engaging experience, using video games to promote greater movement, both at home and in school.

3.5 Discussion

In the review, 41 studies from different countries, both European and non-European, were analysed to understand the benefits and criticalities of exergames related to their use in motor education, considering subjects aged between 2 and 15 years old, including disabled people.

The results suggest that integrating these new technologies into school environments will not only help to improve motor skills, but also overall school performance and child's psycho-physical well-being, The strong motivational force that characterizes them.

The great potential of exergames is the visual support they are characterized by, thanks to which pupils can immediately receive feedback regarding the movements they must perform, with the possibility of self-assessment.

Through games such as Wii Fit +, Kinect Adventures and Just Dance, which integrate physical exercise and movement, an improvement in motor skills, balance and coordination was suggesting how it is useful to integrate the playful approach in lessons of motor education, having a positive impact on students and their health, helping to combat phenomena such as childhood obesity, which is increasingly widespread in countries like the United States and elsewhere.

The studies analysed, starting with that of Caro K. et al. (2017), clearly show that the integration of interactive technologies, such as FroggyBobby and Just Dance, not only improves children's engagement and motivation, but contributes significantly to the development of their motor skills, particularly in hand-eye coordination. The use of exergames is therefore not only a playful and engaging alternative to the traditional context, but also an effective means to address the motor difficulties and attention problems typical of many individuals with DSA.

The results show that interactive experience and immediate feedback from video games can stimulate motor learning in a more fun context, Leading to significant improvements in motor skills and participation in daily activities.

In addition, Zeng N. and colleagues (2023) focus on the potential of exergaming in preschool age, how it is relevant to engage in physical exercise already in preschool age, with greater chances that the child becomes an active adult.

Physical activities promote the overall well-being of the individual, improving both physical and mental health, preventing disease, encouraging social interactions and quality of life, generating economic benefits and contributing to environmental

sustainability. Communities that promote physical activity to improve health can achieve many of these benefits by offering a variety of easily accessible opportunities in different living and working environments, for all age groups (Casolo F., 2019).

The lack of motor activity during the developing age, and in particular during the years of primary school, leads to a decrease in functional capacities and significantly reduces the stimulations necessary for a balanced development of the person, negatively affecting physical and motor skills as well as social and mental aspects (Monacis D., 2023).

To ensure that children are actively involved in technology from the very beginning, even at preschool age, it is essential to teach them how to use it in a non-passive way. The aim is to reduce sedentary behaviour and encourage physical activity among children, providing a useful tool for school professionals, proposing to include active video games in the teaching of motor education as a means to combat sedentary behaviour and obesity.

This approach is based on the theory of self-determination and the expectation value model as theoretical references. There is a consensus that exergames are an additional accessible physical activity option for children and adolescents, encouraging increased activity, improving motor skills, cognitive abilities and overall health. Exergames are presented as "anti-sedentary tools" and, despite being video games, they encourage movement, promoting both physical activity and the improvement of cognitive and mental performance (Valentini & Donatiello, 2023).

It was also highlighted that video games cannot replace motor activity, sports and outdoor play, but they can certainly be integrated with the physical education program, resulting in an alternative to traditional lessons, Thus, it can take on a complementary role in a quality school, helping to meet the various needs and preferences of students, with the aim of achieving national standards and objectives (Valentini & Pellegrini, 2019, p. 126).

Studies conducted by Ho and colleagues (2017), claim that exergames can decrease negative moods such as anger and depression. Exergames can act as a healthy channel for emotional release and mood improvement, helping children manage different types of stress.

However, further studies have been carried out (Braga et al., 2017), which argue that the use of exergames does not lead to greater motivation than traditional physical education lessons.

One limitation highlighted by numerous studies on exergames is that, in the long run, once the novelty effect has been overcome, they may become less engaging,

reducing their potential as video games and losing their ability to attract younger audiences, already accustomed to a large amount of stimuli. The integration of exergames into the school context, with possible practical applications, will depend on the training of teachers who must be able to select and advise them with judgement and rationality, adapting their use to the characteristics and needs of students, so that physical activity becomes an incentive for play (Sgrò F., 2014).

Conclusions

The digital revolution has changed many aspects of our society, including educational processes. The new generations have grown up with technology and have seen it become part of their everyday lives, opening up the debate about using it in school settings.

In schools, the use of technology can enrich traditional teaching activities, motivating students and providing teachers with new tools to create learning environments that they can adapt to improve the quality of teaching, with the possibility of customizing various routes.

Research has shown how technologies, especially video games, represent an alternative to traditional disciplinary methodologies, which also allows to approach interdisciplinarity, in line with today's socio-cultural evolution (Monacis & Colella, 2019).

Among the most discussed tools are exergames, which have proved to be tools for children and adolescents, with a deep potential in the field of motor education, demonstrating a new way of learning to promote physical exercise and mental health.

The article explored the influence of exergames in education, aiming to verify possible improvements at motor, cognitive and physical levels, including in cases of disability.

The systematic review, based on 41 studies from European and non-European countries and focused on boys aged 2 to 15 years, showed that exergames improve motor skills and encourage participation in physical activity, they also represent a valid alternative to tackle childhood obesity and the inclusion of disabilities, with the possibility of designing alternative and personalized routes.

Adapted exercise programs based on exergaming have also been shown to have a positive impact on motor, executive functions, the car - perceived effectiveness, on coordination and stereotyped and repetitive behaviors in subjects with autism spectrum disorder (ASD), especially immediately after the intervention period (Vayola P., 2013).

The results indicate that these video-games, which are more engaging and attractive in some ways, can encourage children and adolescents to be more physically active, overcoming some barriers that hinder their participation in physical exercise.
In addition, the use of exergames not only promotes physical activity, but also contributes to the improvement of psycho-physical well-being, with beneficial effects on self-esteem and mood, highlighting positive impacts on psychological aspects such as intrinsic motivation and academic performance.
It has also been shown that the introduction of physical exercise in the age group between 3 and 5 years old can have a decisive impact on the prevention of numerous diseases, including childhood obesity and cardiovascular disease.
The USA is one of the largest countries with the highest rate of childhood obesity, so it is essential to focus on health promotion from early childhood; it is essential to dwell on exercise and the acquisition of a motor routine, which contributes to the building of healthy habits, also limiting the possibility of developing diseases in adulthood.
Integrating exergames in school settings is a viable solution for promoting a healthy lifestyle.
Despite the many positive evidence, some critical points were also highlighted, due to the few studies in this field, such as the possibility of reduced social interactions or interest in hobbies, due to excessive use of technologies, Increased health risks, such as obesity and the emergence of aggressive and violent behaviour.
In addition, as with other video games, they can cause addiction to play, preferring them to social life and having a negative impact on mental health, causing stress and frustration, especially if the games are too competitive.
In the light of the results highlighted, exergames represent an alternative mode of activity design for physical education, with the potential to promote physical exercise while also countering sedentary lifestyles and improving students' lives.
The new technologies are intended to integrate the school system from early childhood, incorporating recreational activities that can offer educational and innovative opportunities in teaching - learning processes.
The overall evidence is that the exergame is a useful way to promote physical activity, to motivate young people to promote and consider their body, limiting to a minimum the health risks that may arise, as obesity and cardiovascular disease.
However, it is essential that teachers and educators continue to explore the potential of these tools, trying to make the most of the opportunities offered by technologies, but also considering the risks associated with excessive use of them.

With critical use, exergames can become fundamental tools for the promotion of an active and healthy lifestyle in the new generations.

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