



RESEARCH ARTICLE

A MINI REVIEW ON THE EFFECTIVENESS OF INNOVATIVE GAMING TECHNOLOGY IN PROMOTING WEIGHT LOSS AMONG ADOLESCENTS AND CHILDREN WITH OBESITY

Alovera A.G, Lozada G.C, Mortalla R., Sandico P.L and Yu M.C

Physical Therapy Department, School of Allied Medical Sciences, San Pedro College, Davao City, Philippines, 8000.

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Abstract

Background: Obesity is quickly turning into a global pandemic that affect children, adolescents, and adults. The two most common contributing variables such as a poor diet and a sedentary lifestyle may be the cause of this. Due to the fact that children and teenagers are more likely to engage in play activities, physical activity using games as exercise is an important technique to prevent and treat obesity in these populations.

Objective: The aim of this paper is to gather data to assess the efficacy of various innovative technologies being used and determine whether using these technologies as therapies for pediatric obesity is feasible.

Methods: The usefulness of cutting-edge gaming technology in reducing incidence was evaluated in this journal review by analysis and investigation of pertinent subjects, journal articles, and studies. To display research publications from 2012 to the present, the search criteria were created. The search started on February 10, 2023 and the following websites' published articles and journal reviews were used to compile related literature: 1. Google Scholar 2. PubMed 3. ResearchGate. Additionally, reliable supporting websites that presented pertinent ideas regarding the subject were included in the search.

Results: By developing games such as those based on neurocognitive characteristics that emphasize self-regulation, as well as the more recent programs that include the use of artificial intelligence that are addressing the many causes of obesity, the use of innovative gaming technology in addition to traditional exercise can help promote fitness, wellness, and optimal health among younger age groups.

Conclusion: According to the publications under consideration, technology has enormous potential for managing and preventing both childhood and adolescent obesity. These studies offer compelling evidence of how technology can be used to control obesity and its subsequent comorbidities.

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Corresponding Author:- Alovera A.G

Address:- Physical Therapy Department, School of Allied Medical Sciences, San Pedro College, Davao City, Philippines, 8000.

Introduction:-

Obesity is a condition fast becoming a global pandemic affecting adults, adolescents, and children. This may be due to the two most common contributing factors such as a wrong diet and a sedentary lifestyle. However, there are many factors that should be addressed such as what contributes to their physical inactivity and wrong choice in diet. In particular, there is a concern for obesity among the pediatric population as it has become a very important public health problem[5]. It has been identified that among the pediatric population, there is an increase in obesity due to some modifiable factors such as poor knowledge of nutrition, inadequate family support, poor motivation, and physical illiteracy[6].

Physical activity using games as exercise has been an important strategy to prevent and treat obesity among adolescents and children as they are more likely to engage in recreational physical activities[2]. However, preventive and therapeutic interventions to address the younger age cohort have been difficult to implement and maintain over time[33]. One of the methods that may be used to help in the intervention of obesity is the use of innovative gaming technology since it can be used in different settings such as in schools, centers, and even at home. It has been identified that the use of innovative technology such as the use of smartphones, virtual reality applications for gaming (exergames), wearable technology, and artificial intelligence may be used as novel interventions in the treatment or management of obesity in the pediatric population.

This study aims to search for available data in order to investigate the effectiveness of different innovative technologies being applied and determine if the use of these technologies as interventions is able to bring about a change in behavior, improvement in knowledge of nutrition, increased adherence to the physical activity program and an increase in executive functioning to address obesity in the pediatric population[2].

Methods:-

This journal review assessed the effectiveness of innovative gaming technology in decreasing the incidence of childhood obesity through the analysis and research of related topics, journal articles, and research. The search criteria were designed to show research articles from 2012 to present. The search started on February 10, 2023 and the related literatures were taken from published articles and journal reviews found on the following websites: Google Scholar, PubMed, ResearchGate and other credible supplementing websites that showcased relevant concepts about the topic.

Results and Discussion:-

The use of innovative technology to address obesity in the pediatric population has been relatively new. There has been evidence to support the use of different types of technology as intervention for obesity. These technologies include artificial intelligence, virtual reality, wearable technology and use of smart phones. Since children and adolescents grew up with technology, the use of media as a form of intervention to prevent obesity is current with the times^[36]. The use of new technology is beneficial for the younger population because they understand it, are more interested in new applications of technology and are more likely to use it as opposed to the adults who prefer conventional exercise methods promoting physical activity and successful weight loss^[9].

Some of these technologies have been shown to be effective and beneficial. In particular, wearable technology has been successful in tracking physical activity and providing feedback for daily activities such as step count, heart rate, and energy expenditure^[7]. Artificial intelligence has been used in applications to predict eating behaviors, weight loss, dietary lapses, and emotional eating^[9]. Artificial intelligence has also been used to create gesture recognition applications that can assess the effects of the application on calorie consumption, VO2 max as well as body mass index, and perceived exertion^[4]. Studies also show that the use of virtual reality equipment can lead to participants performing better as they are able to remove themselves from their bodily sensations allowing them to perform longer and better^[22]. Newer programs have been innovating using virtual reality to address the multi-factorial cause of obesity by making games based on neurocognitive factors that focus on self-regulation^[2]. With the proliferation of smartphone use among the pediatric population, there is a huge potential in using digitized interventions or applications to deliver weight loss programs for intervention among those who are overweight or suffering from obesity^[33]. The use of technology can be a useful adjunct to conventional exercise in promoting health, wellness and fitness among younger age cohorts.

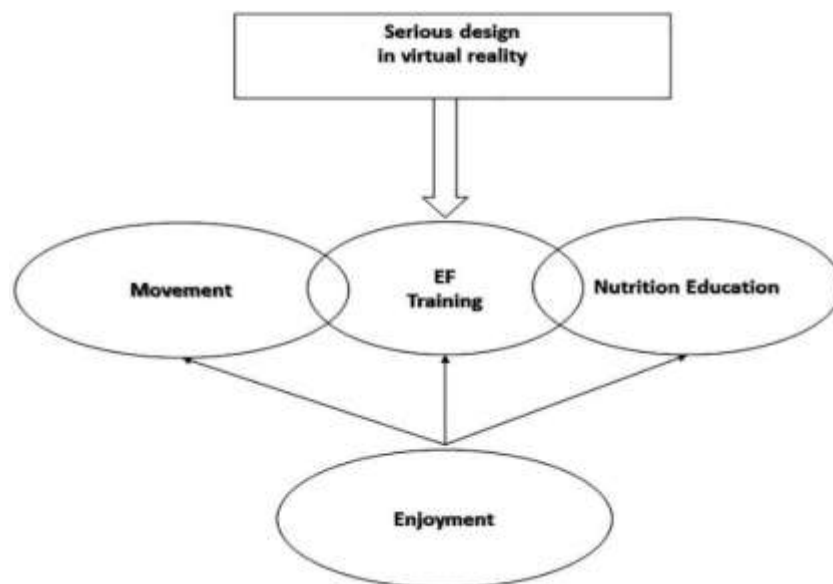
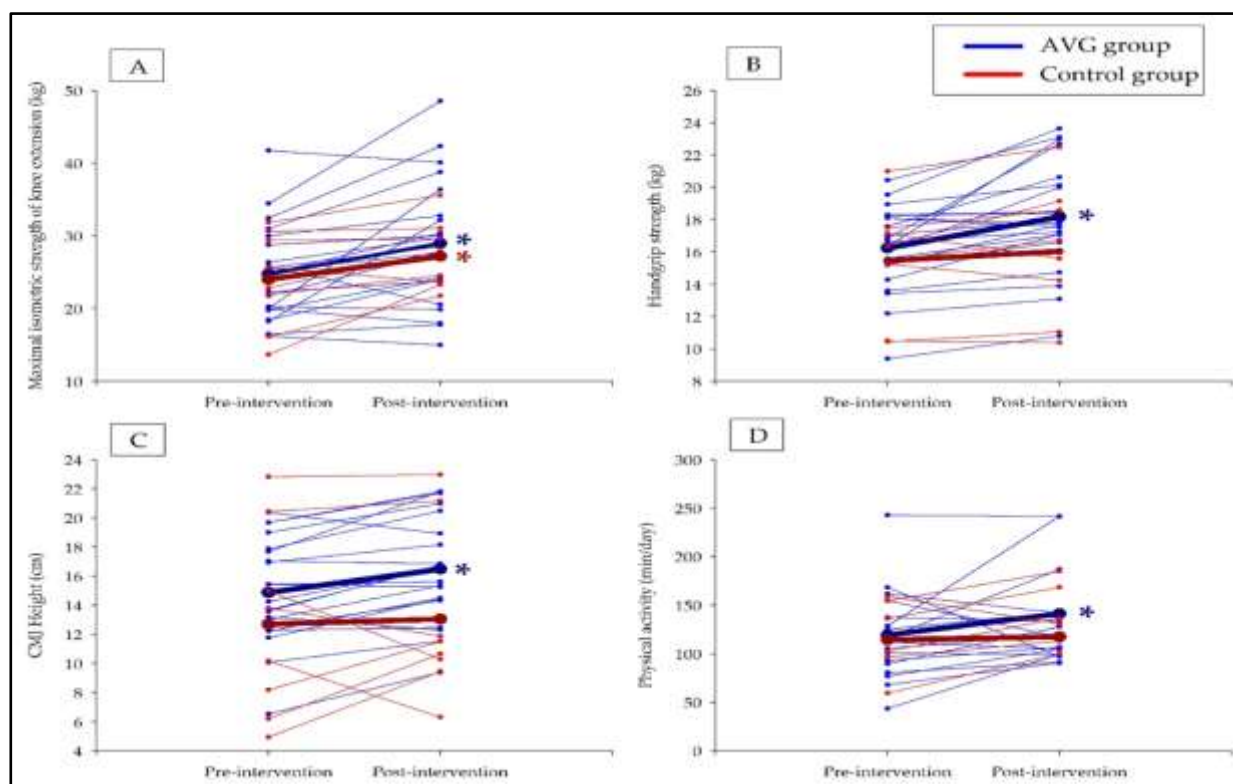


Figure 1:- The four-dimensional framework of a serious game in virtual reality: enjoyment, movement, nutrition education, and executive functioning (EF) training ^[2].



Author and Year	Methods	Intervention	Setting	Findings of the study
Al-Rasheed A. et al. (2022)	Systematic Review	Virtual Reality	n/a	Employing VR was effective in supporting weight loss

Shabeeb, R.Q. et al. (2021)	Systematic Review	Virtual reality	n/a	Virtual Reality was an effective tool in weight loss
McClure, C., & Schofield, D. (2020)	Article	Virtual Reality	n/a	This study explores how virtual reality affects heart rate and bodily sensations during exercise, as well as participants' ability to disengage from their bodily feedback.
Polechoński, J. et al. (2020)	Pilot Study	Immersive Virtual Reality	Metabolic Diseases Clinic, the Voivodeship Specialist Clinic Complex in Katowice	AVGs in IVR are attractive and appear to be a beneficial alternative to conventional video games played in an unhealthy sitting position. Due to the high intensity of PA while playing the AVGs tested, it can be assumed that obese children can benefit for their health if the games are played on a regular basis.
Ketelhut, S et al. (2022)	Random Control Trials	Exergaming	School	Exergaming in schools is an effective method for enhancing pupils' physical fitness.
Belghali, M. et al. (2021)	Scoping Review	Serious Games	n/a	Serious game in virtual reality may have potential to treat childhood obesity
Kracht, C. L., Joseph, E. D., &Staiano, A. E. (2020)	A scoping review	Exergame	n/a	there is preliminary evidence on the effectiveness of exergame(physically active) play for weight reduction and to attenuate weight gain
Gao Z, Zeng N, McDonough DJ, et al.	Systematic Review	Active Video Games	Home/ community	Looking at how Active video games can help promote physical activity and

(2020)				improve body composition in children and adolescence
Amminudin, N. et al. (2019)	Systematic Review	Exercise Gaming	n/a	Significant increase in physical activity level, reduction in BMI, reduction in fat composition, positive psychological impact after exercise gaming
Fang, Y. et al. (2019)	Scoping Review	S&G exercise intervention	School	Developed improvements in metabolic health and unhealthy behaviors among obese children
Staiano, A.E. et al. (2018)	Randomized Controlled Trial	Exergame	Home	Significantly reduced BMI z-score, improved systolic blood pressure, diastolic blood pressure, total cholesterol, low-density lipoprotein-cholesterol and moderate-to-vigorous physical activity (all p values <0.05).
Valeriani, F., Protano, Et al(2016)	Systematic review	Active video games (Exergames)	n/a	This study signified that exergames help in weight loss among overweight/obese children and adolescence through time.
Comeras-Chueca et al (2022)	Randomized Control Trial	Active Video Games using Xbox 360® with the Kinect, the Nintendo Wii®, dance mats, and the BKOOL® interactive cycling simulator	n/a	This study summarizes researches about physical fitness and motor competence in children
Comeras-Chueca, C. et al (2022)	Randomized Control Trial	Active Video Games	n/a	5-month active video group combined with exercise improved cardiorespiratory fitness.

Zhang, P. et al (2022)	Meta-analysis of RCTs	Active video games	n/a	Active video games should be added to promote physical activity.
Comeras-Chueca et al., (2021)	Systematic Review and Meta-Analysis	Active Video Games	School	AVG Intervention with multi-component exercise have positive effects on muscle fitness and motor competence, decreased sedentary time
Liang, Y. et al (2020)	Quasi Experimental Study	Active video games	School	AVG is an effective tool to promote movement and decrease sedentary behavior.
Norris,E. Et al (2016)	Systematic Review	Active Video Games	n/a	This study found that active video game in PT showed changes in physical activity and health outcomes.
Maddison, R. et al (2012)	Randomized Control Trials	Active Video Games	Active Video Games	Active videogames in aerobic fitness in overweight/obese children has shown changes in Cardiovascular Endurance and aided in weightloss
Kouviri, M. et al (2022)	Systematic Review and Meta Analyses	Technology	n/a	There was a significance in aiding children with weightloss when using digital health interventions such as mobile and web based platforms coupled by telehealth especially in compliance compared to conventional methods of exercise.
Oh, W. et al (2022)		Artificial Intelligence-based Interactive Home Exercise (SUKIA and	Home	SUKIA improve cardiopulmonary function and calorie

		NINS) [®]		consumption better in adolescents with obesity
Chew H. et al (2021)	Scoping Review	Artificial Intelligence	n/a	Use of AI for weight loss is still underdeveloped as of the moment
Marmett, B. et al (2018)	Review	Artificial Intelligence	n/a	Development of AI systems may be of help in reduction in the number of obese people
Dobbie, L.J. et al (2022)	Scoping Review	Wearable activity monitors and smartphone apps	n/a	Wearable can improve physical activity with moderate weight-loss effects in elderly people with less-favorable results in younger people
Fawcett, E. et al (2020)	Systematic Review	Wearable Technology	n/a	Showed some evidence that wearable devices can improve activity and weight loss outcomes
Godino, J. et al (2020)		Wearable Technology	Home and Community	Wearable technology such as the fitbit is sensitive enough to monitor moderate to strenuous physical activity. Although may not be as accurate in tracking heart rate during exercise as compared to sleep in children.
Cheatham, SW et al (2018)	Systematic Review	Wearable Activity Tracker	n/a	Short-term (<6 mos) weight loss program using activity trackers is more effective than the standard weight loss program in middle aged and older adults
Shannon, H. et al (2019)	Literature Review	Technology (smartphones, mobile applications, telemedicine/telehealth)	n/a	Adoption of technology in weight loss management had a positive outcome

Timpel P et al (2018)	Randomized Control Trial	Smartphone Application	Home	Mid-term effects on weight reduction for overweight and obese adolescents
Keles, B. et al (2020)	Systematic Review	Social Media	n/a	Key findings of included studies were classified into four categories of exposure to social media: time spent; activity; investment; and addiction. All these categories were found as correlated with depression, anxiety and psychological distress, with an acknowledgement for the complexity of these relationships.
Giakoni-Ramirez, F.(2022)	Case Review	Professional Esports Players: Motivation and Physical Activity Levels	n/a	According to the findings of this study, the majority of professional esports players in the sample studied engaged in high and moderate levels of physical exercise. At least 50% of the sample's individuals were normal weight in terms of their body composition.
Mack et al., (2020)	Randomized Controlled Trial	Kids Obesity Prevention Program®	school	Knowledge scores increased on nutrition and stress coping. no changes at behavioral level
Phan, T. et al (2019)	Scoping Review	N/A	n/a	Good association between time spent gaming and severe obesity
Ramirez, F. et al., (2022)	cross-sectional and observational study	Relationship between physical activity levels and motivational orientations in an international sample of professional esports players.	Home	92.7% of professional esports players have moderate and high levels of physical activity and that players with low levels of physical

				activity have positive values in all dimensions of motivation
Haupt et al.,	A Case Report	Effects of eSports on the cardiovascular system and on energy expenditure (EE) and to compare them with those occurring during dynamic exercise	n/a	During eSports, elevated HR is not related to energy expenditure as is the case during dynamic exercise. e-Sports, therefore, represents a pure mental stress response, which is supported by the opposite behavior of the glucose concentration in eSports compared to physical exercise.
Weihrauch-Blüher, S. et al (2016)	A Case Report	Electronic Media in Obesity	n/a	Active video games did not show a significant affectation in both weight loss and weight gain but did help with increase in movement
Staiano et al., (2022)	Case Report	Video games, Obesity and Children	n/a	The study did not find strong significant correlation in Video games and obesity within Children

Conclusion:-

In conclusion, the reviewed articles suggest that technology has significant potential to prevent and manage childhood and adult obesity. The studies reveal that interventions based on serious games, video games, exergaming, wearable technology, artificial intelligence, and virtual reality could improve physical fitness, motor competence, muscular fitness, and cardiorespiratory fitness in children and adolescents who are overweight or obese. Furthermore, gamification-based smartphone applications and social incentives are found to be effective strategies for weight loss in overweight and obese adolescents. The use of wearable activity tracking technology is a promising tool for the long-term management of overweight and obese adolescents. Additionally, virtual reality and interactive digital game technology have been proposed as new tools to address obesity, diabetes, and to enhance exercise motivation, affect, enjoyment, and engagement. Collectively, these articles provide moderate to strong evidence of the potential of technology in the management of obesity and its associated comorbidities.

Compliance with Ethical Standard

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Disclosure of Conflict of Interest

The authors declare that they never have any competing interests of their own.

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