ORIGINAL PAPER

Health Prob Civil. 2025, Volume 19, Issue 4
ISSN 2353-6942, eISSN 2354-0265

EFFECT OF STRUCTURED PHYSICAL ACTIVITY PROGRAM ON DIGITAL GAME ADDICTION AND AWARENESS: A STUDY OF A GROUP WITH HIGH-LEVEL DIGITAL GAME ADDICTION

Korhan Kavuran[1(A,B,C,D,E,F,G)]

[1] School of Physical Education and Sports, Bitlis Eren University, Bitlis, Türkiye

Authors' contribution:

A. Study design/planning
B. Data collection/entry
C. Data analysis/statistics
D. Data interpretation
E. Preparation of manuscript
F. Literature analysis/search
G. Funds collection

Summary

Background. This study aimed to investigate whether a structured physical activity program would affect the levels of digital game addiction and awareness of individuals with high digital game addiction.

Material and methods. The study used a longitudinal experimental research method with 68 sedentary individuals. The participants were given the Digital Game Addiction Scale (DOC-7) and the Digital Game Addiction Awareness Scale (ADGAS) before and after completing the 12-week structured physical activity program. The program had three phases – the first phase included warm-up exercises, the second phase involved structured physical activity designed to increase understanding of digital gaming addiction, and the final stage had competitive games. The data collected from the DOC-7 and ADGAS was analyzed using t-tests.

Results. The results of the posttest showed a significant decrease in digital game addiction and a significant increase in awareness of digital game addiction with the structured physical activity program.

Conclusions. The study also revealed that the structured physical activity program increased the level of awareness of digital game addiction from low to moderate levels.

Keywords: digital game addiction, digital game addiction awareness, structured physical activity program, physical activity, awareness

Introduction

The origins of games can be traced back to ancient times. Technology and the Internet have today wrought a permanent change in children's understanding of games. Over time, technology, which is used to play games, has become dominant in life, and playing digital games has almost become the most preferred in spare time activity [1]. Digital games are games played online or offline with the use of computers or other electronic devices [2]. Digital gaming offers unique coping strategies to distract individuals' attention and energy from real-life problems and stress [3]. Playing digital games hinders people's participation in active life [4]. Digital games, which draw the attention of almost everyone today, can turn into addiction/digital gaming disorder over time.

Tables: 4
Figures: 0
References: 41
Submitted: 2024 May 15
Accepted: 2024 Aug 21
Published Online: 2024 Sep 13

Kavuran K. Effect of structured physical activity program on digital game addiction and awareness: a study of a group with high-level digital game addiction. Health Prob Civil. 2025; 19(4): 440-453. https://doi.org/10.5114/hpc.2024.142409

Address for correspondence: Korhan Kavuran, School of Physical Education and Sports, Bitlis Eren University, Rahva Yerleşkesi Beş Minare Mah. Ahmet Eren Bulvarı, 13100 Merkez/Bitlis, Türkiye, e-mail: korhan1kavuran@outlook.com, phone: +90 (434) 222 00 00, https://orcid.org/0000-0002-8924-2182

Digital gaming disorder/digital game addiction (DGA) was recognized worldwide in 2018, and the World Health Organization named it an official diagnosis [5]. DGA, which is among the behavioral addictions, is defined in DSM-V as the intensive and repetitive use of the Internet, mostly to play games with other players. While DGA is daily becoming a more serious problem, studies on this subject are increasing day by day, and studies are being carried out to understand addiction and reveal its causes and consequences [6]. In addition, research on preventing addiction to digital games is also of interest [7,8].

Individuals need to be careful to protect themselves from the negative effects of digital games. It is stated in the literature that these negative effects continue from adolescence into adulthood [9]. Considering the large youth population in many countries, raising awareness of the problems that digital gaming behavior may cause is important [10]. Raising digital game players awareness of DGA may induce individuals to initiate behavioral changes. 'Digital game addiction awareness (ADGA) is important in acquiring healthy lifestyle behaviors, maintaining physical, emotional, mental and social well-being, and preventing problems that may occur due to DGA'. In addition, individuals need to have a high awareness of addiction throughout their lives [11].

According to Dimidjian et al. [12], "Awareness involves a set of skills that are an internal process of observing, describing, and participating in reality without judgment". Awareness is the regular observation of the individual's inner voice and external environment; it acts as a radar that enables the background of awareness to mature [13]. To protect young people and children from the negative effects of DGA, their awareness needs to be increased [14]. High awareness strengthens the relationship between behavior and attitude [15]. Demir [15] states that participation in physical activity behavior and a positive attitude towards physical activity distance the individual from DGA and increase the individual's ADGA.

Physical activity can play a crucial role in addressing behavioral addictions, particularly DGA, and raising awareness about addiction. Physical activity is the activity that happens when the body uses energy to move muscles, increases the breathing and heart rate, and leads to fatigue [16]. Physical activity is an important fact that supports the physiological, emotional, social, motor and mental development of the individual through movement and ensures energy balance and a healthy life [17]. Structured physical activity is planned, structured and repetitive physical activities performed to improve or maintain physical fitness [16]. Nowadays, participation in physical activity, an important factor for human health, is decreasing due to various reasons. One of these reasons is participation in digital games, which leads to a sedentary life and health problems such as addiction [17].

It is thought that there is a relationship between physical inactivity and behavioral addictions. Therefore, the relationship between these two phenomena arouses curiosity. It is known that DGA symptoms negatively affect the individual's social and mental health. These symptoms can include sadness, anxiety, sleep disorders, stress, shyness, loneliness, suicidal ideation, decreased social participation, obesity, insufficient physical activity, and other factors that prevent overall well-being [15,18,19]. It is stated that insufficient physical activity can negatively impact both physical and mental health, whereas regular and adequate physical activity can have positive effects on overall health [20]. Additionally, it has been suggested that physical activity and sports play a vital role in increasing awareness about DGA. Engaging in regular physical activity and participating in sports can make individuals more sociable, happier, and healthier. This, in turn, can help individuals understand the harms of DGA and its impact on mental and physical health [15]. In this context, it aroused interest in using physical activity as an intervention in raising awareness about digital game addiction and in investigating its results. Research indicates that

physical activity promotes psychological, mental, physical, and emotional well-being, making it a potential intervention for DGA and the raising of awareness [21].

Aim of the work

Physical activity is believed to be important in reducing the risk of DGA and raising awareness about addiction. However, more research is needed to verify this idea. One interesting question is whether physical activities designed to raise awareness about the harmful effects of DGA can reduce addiction and raise awareness. Currently, there is no study which examines both the level of DGA and the change in awareness of it with the participation of individuals with high levels of DGA in structured physical activities, simultaneously through an experimental study. This reveals the importance of the study because it is unique. In addition, the limited number of awareness studies on DGA in the literature increases the importance of the study [1,3,14]. In this study, in which individuals with high DGA participated, it was aimed to examine the effect of 12-week structured physical activity practices on digital game addiction and its awareness. In line with this, the research aimed to answer the following sub-problems:

1. Is there a significant difference between the pre-test (Q1-Q3) ADGAS score averages of individuals in the application and control groups?
2. Is there a significant difference between the pre-test (Q1-Q3) DOC-7 score averages of individuals in the application and control groups?
3. Is there a significant difference between the pretest-posttest (Q1-Q2) ADGAS and DOC-7 score averages of individuals in the application group?
4. Is there a significant difference between the pretest-posttest (Q3-Q4) ADGAS and DOC-7 score averages of individuals in the application group?

Material and methods

Research model

The 'longitudinal experimental study using an initial and follow-up evaluation protocol based on criterion sampling' model was used in the research. According to this model, two groups were created: application and control group [22]. In this research, which was prepared by adopting the game-based learning approach to increase permanent learning through physical activities and was designed to reveal the effect of structured physical activities on ADGA, specific criteria were considered when selecting these two groups. These criteria were the inclusion and exclusion criteria for the study.

Then, the pre-test and post-test used in the longitudinal experimental study were applied. A longitudinal experimental study is a powerful design that provides high statistical power to the researcher in terms of testing the effect of the applied procedure on the dependent variable, allows the interpretation of the findings in the context of cause and effect, and is frequently used in behavioral sciences [23]. What the pre-test or posttest measurements are and how they are taken depends on how the dependent variable of the research is measured. However, while the application is made in the application group, it is not done in the control group, supposing, there is no difference between the pre-test and posttest scores of the control group (Q4-Q3=0). If there is a difference between the pre-test and post-test scores of application group (Q2-Q1≠0), this difference is attributed to the independent variable application made by the researcher [24]. Before reaching this conclusion, it has to be shown that the pre-test results of the application and control groups are also equal (Q3-Q1=0) [23]. Information about the experimental setup of the research is given in Table 1.

Table 1. Pretest-posttest control group pattern

Group	Pretest	Process	Posttest
Application group	Q1	A physical activity program consisting of only 72 hours was applied to the participants	Q2
Control group	Q3	No physical activity	Q4

Table 1 contains information about the experimental study steps of the research. The study has two groups: the application group and the control group. These two groups were shown different approaches. Accordingly, while a physical activity program was applied to the application group for 2 hours with a one-day interval for 12 weeks, no physical activity program was applied to the control group. The pre-test and posttest scores of the application and control groups were obtained with the ADGAS and DOC-7.

Study group

Firstly, G.Power-3.1.9.2 was used to determine the study group of the research. In this context, the power analysis conducted using the G.Power-3.1.9.2 program estimated that 98% power would be established with 68 participants when the effect size was 0.25, and the significance level was 0.05 [24]. Then the study group was informed about the purpose of the research, its content, and the application process. In this context, participants were informed in writing that the study was scientific, that they were expected to give objective answers, and that no individual information (name, surname, etc.) would be collected. Additionally, informed/voluntary consent was obtained from the participants.

A total of 455 students aged between 17-18 were reached. However, there were criteria for selecting students in the study. The following steps were followed when selecting the sample of the research and excluding some students from the research:

Inclusion criteria: subjects were to be between the ages of 17-18 and having a high DGA score, getting a minimum score of 30 or more from DOC-7, and having a habit of playing digital games for 3 hours or more daily. Sixty-eight students who met these criteria were included in the study. These criteria were taken into account since students in the 17-18 age group, who have a high level of addiction and can easily use technological devices to play digital games, are expected to dismiss DGA and not develop awareness about this issue.

Exclusion criteria: scoring below 30 points on DOC-7, having a low DGA score, having a harmful habit (smoking, etc.), having health problems, and being reluctant to participate in the structured physical activity program. Three hundred nineteen students with these characteristics were not included in the research. Since these participants have a low DGA score, they are likely to be aware of the harms of DGA. It was thought that the perceptions of those with harmful habits about establishing a connection between DGA and addictions such as cigarettes and alcohol and resisting it would affect the results of the study. It was thought that those who did not want to participate in the structured physical activity program or planned to participate in different activities during the program would negatively affect the study. Therefore, participants who met these criteria were excluded from the study. In the selection of these groups, which were created according to the impartial assignment method, factors such as ease of access to the school, existing physical conditions of the school (presence of an indoor sports hall, sufficient game materials, etc.) and course hours (student entrance and exit times) were also taken into account.

Considering the inclusion criteria, 68 students were included in the study. Then, the participants were divided into two groups according to the unbiased assignment method. One of these groups is the application group (n=34), and the other is the control group (n=34). The participants were assigned to either the application group, with 15 female and 19 male participants, or the control group, with 14 female and 20 male participants. The structured physical activity program, whose effects were examined in the research, was applied to the application group. No program was applied to the control group. In the results of this model research, if there is a difference between the scores obtained before and after the research, it is accepted that this is due to the applied program.

Data collection tools

Personal Information Form, Digital Game Addiction Scale (DOC-7) and Digital Game Addiction Awareness Scale (ADGAS) were used as data collection tools in the research.

Personal Information Form

This form was prepared to collect personal information about the individuals who constituted the research groups. The form contains statements about age, gender and harmful habits.

Digital Game Addiction Scale (DOC-7)

The scale adapted to Turkish by Yalçın Irmak and Erdoğan [25] was used in the study. The scale consists of seven items, each rated on a five-point Likert scale. The highest score that can be obtained from the scale is 35, and people who score 20 or more are motivated by the scale developers to receive psychiatric counseling as sufferers of game addiction. The Cronbach Alfa (α) of the scale is 0.91.

Awareness of Digital Game Addiction Scale (ADGAS)

The scale developed by Demir and Cicioğlu [26] consisting of 12 items was used. The 11th item of the scale is the reverse item. Examples of ADGAS scale items are as follows: "DGA alienates the person from society. DGA reduces communication with the environment (family, friends, etc.). DGA causes problems in school or business life". 12-28 points from ADGAS indicate a low level of awareness, 29-44 points indicate a medium level and 45-60 points indicate a high level of ADGA. The Cronbach Alfa (α) of the scale is 0.98.

Data analysis

The Kolmogorov-Smirnov (K-S) test was used to assess the normality of distributions, given that the sample size exceeded 50 participants. As a result of the analysis, the data showed a normal distribution, as it was distributed between ±2, and parametric tests were used to analyze the data [27]. In this context, the data was analyzed by t-test. The significance level was set at 0.05.

Conditions of structured physical activity program

The structured physical activity program was implemented by the researcher in Bitlis province, Türkiye, between January and March 2024. All necessary materials and arrangements were made before the program. The participants' health was carefully evaluated before each structured physical activity. Since the research was conducted in the winter months, the entire program was held in the indoor sports hall. In case of any injury, an emergency aid kit and first aid specialist were kept ready in the indoor sports

hall (no injuries occurred). Additionally, for the comfort of the participants, the indoor sports hall was equipped with basic needs such as water, food and juice.

Structured physical activity program

This program includes structured physical activities. In this context, the physical activities in the program are designed with content and fiction that draws attention to the terrible, destructive nature of DGA. The aim of the program is to raise awareness among participants with low ADGA and lower their level of addiction. For this reason, in this study participants with high digital game addiction (DOC-7) and low awareness of digital game addiction (ADGAS) were selected.

Table 2 provides information on the systematic implementation of the physical activity program. The above-mentioned program was applied to the application group. In the study, to draw attention to the awareness of individuals in the physical activity program application group about DGA, the program was shaped with structured physical activities and competitive games three days a week for 12 weeks. This program has three phases and includes aerobic exercises (50%-90% HRmax). Warm-up exercises (jogging, etc.) were performed in the first stage. In the second stage, physical activities structured to raise awareness about DGA were played. In the third stage, competitive games were played. Games to increase awareness about DGA were played every week (these games are described in Table 2 below). For example, in the first week, 1 – the game of "Get rid of digital game addiction" and 2 – the game of "Monster that is a prisoner of digital game addiction" were played on Wednesday. 3 – the game of "Mill", and 4 – the game of "Horses and riders" were played on Friday. On Monday, 5 – the game of "Giving up playing digital games" and 6 – the game of "Be free" were played. This program was applied to the participants for four consecutive weeks. The program was prepared in line with the opinions and suggestions of three academics who are experts in physical education and sports (2 professors and an associate professor working in the field of DGA and physical activity).

Table 2. Structured physical activity program (3 weeks * 4)

Week	Day	Hour	Exercise type	Exercise content
1st week	Wednesday	2	Structured physical activity + Competitive games	Warm-up and games structured to raise ADGA (1-2) + Competitive games
	Friday	2	Structured physical activity + Competitive games	Warm-up and games structured to raise ADGA (3-4) + Competitive games
	Monday	2	Structured physical activity + Competitive games	Warm-up and games structured to raise ADGA (5-6) + Competitive games
2nd week	Wednesday	2	Structured physical activity + Competitive games	Warm-up and games structured to raise ADGA (1-2) + Competitive games
	Friday	2	Structured physical activity + Competitive games	Warm-up and games structured to raise ADGA (3-4) + Competitive games
	Monday	2	Structured physical activity + Competitive games	Warm-up and games structured to raise ADGA (5-6) + Competitive games
3rd week	Wednesday	2	Structured physical activity + Competitive games	Warm-up and games structured to raise ADGA (1-2) + Competitive games
	Friday	2	Structured physical activity + Competitive games	Warm-up and games structured to raise ADGA (3-4) + Competitive games
	Monday	2	Structured physical activity + Competitive games	Warm-up and games structured to raise ADGA (5-6) + Competitive games

The purpose of the structured physical activities in the research is to increase knowledge and ADGA. For this reason, while preparing the contents of physical activities, it was emphasized that DGA is a phenomenon that should be avoided, that it enslaves the individual and is harmful and should be gotten rid of. The games structured to raise awareness about DGA are as follows:

Game of "Get rid of digital game addiction"

Two groups are created: digital game addicts and non-addicts. Groups are placed in different areas marked in blue and red, with a distance of at least 15 meters between them. A line is drawn between the blue and red regions. The non-addicted group tries to catch the digital game-addicted group only when they leave their region. The caught player joins the group that is not a digital game addict. The game continues until the group of digital game addicts runs out of members. The game is sometimes played in two groups.

Game of "Monster that is a prisoner of digital game addiction"

One player is chosen from the group to act as the "monster that is a prisoner of digital game addiction". The other players portray individuals who do not play digital games. They hold hands and form a circle. The "monster that is a prisoner of digital game addiction" is outside the circle and is trying to get inside the circle. However, the group members, hand in hand, try to prevent him/her. When the "giant who is a prisoner of the digital game" manages to enter the circle, he/she is declared "to be free from digital game addiction". The game is sometimes played in two groups and there are two "monsters that are prisoners of digital game addiction".

Game of "Mill"

In the game, two groups with similar physical strength are formed. One person from each group participates in the game. Accordingly, two players from each group stand in front with the soles of their feet touching each other. Movement directions are only left or right according to command. In this case, the feet touch each other like a clock's minute and hour hands and draw a circle in the middle. The game aims to "catch and exclude the digital game addict". The person caught is eliminated. The game is sometimes played in two groups.

Game of "Horses and riders"

Two groups with similar physical strength are formed. The first group (the group that is not addicted to digital games) lines up outside the basketball court lines. This group is trying to take the second group of players out of the lines of the field. The second group (the digital game addict group) wanders around the field. The first group, waiting outside the field, calls out to the second group members, "Let's stop playing digital games; let's play outside". Members of the second group answer "ok" or "no". If the answer is "no", the question is repeated. If the answer is "yes", the first group runs towards the second group and tries to catch them. The second captured group member joins the first group. The game continues until all second group members join the first group. The game is sometimes played in two groups.

Game of "Giving up playing digital games"

There are two groups of players: Group A consists of non-addicted digital game players, and Group B consists of addicted digital game players. Group A waits at the finish line of the basketball court. Group

A shouts, "Let's stop playing digital games; let's play games". The players representing Group B answer "okay" or "no". If the answer is "no", the question is repeated by Group A. If the answer is "yes", Group A runs towards the Group B players in the middle of the court and tries to catch them before the basketball reaches the bottom line. The Group B players who are caught join Group A. The game continues until all the players from Group B are caught by the players from Group A.

Game of "Be free"

There are two groups: Digital game addicts (A) and non-addicts(B). Group B escapes Group A. When Group A catches one of their running away players and says, "Don't move", that person remains motionless. If someone from Group B touches this person and says, "Be free", that person will be free from freezing and will join Group B.

The purpose of all structured games is to draw attention to DGA and to increase ADGA. In addition, another objective of these games is to counteract DGA through physical activity and to instill the idea of subconsciously overcoming and eliminating DGA through the selection of group names in the games.

Results

In the research, the t-test findings for the pretest results of the ADGAS and DOC-7 score averages of the application and control groups are shown in Table 3. As a result of the analysis, no statistically significant difference was found (p>0.05). The awareness of the participants in the application and control groups about digital game addiction is similar and at a low level ($Q1_{mean}$ and $Q2_{mean}$<28). In addition, the digital game addiction levels of the participants in the application and control groups are similar and high ($Q1_{mean}$ and $Q2_{mean}$>30).

Table 3. Comparison of pretest points of participants in application and control groups (ADGAS and DOC-7)

Pretest	Groups	Mean	SD	MD	t test	*p*
ADGAS	Q1	16.21	2.22	0.02	0.05	0.95
	Q3	16.17	2.18			
DOC-7	Q1	31.52	1.54	0.61	0.91	0.36
	Q3	30.91	3.63			

Notes: * p<0.05.

Table 4 shows the results of the pretest-posttest t-test comparison of the difference in the scores between ADGAS and DOC-7 (Q1–Q2). As a result of the analysis, a statistically significant difference was found (p<0.05). Accordingly, it was determined that the ADGAS posttest score of the application group ($Q1_{ADGAS}$=29.79±4.90) was significantly higher than the pretest score of the application group ($Q2_{ADGAS}$=16.17±2.18). Additionally, Table 4 shows that the application group's awareness level about digital game addiction increased from low to medium. It was determined that the pre-test DOC-7 score of the application group ($Q1_{DOC-7}$=31.52±1.54) was significantly higher than the posttest score of the application group ($Q2_{DOC-7}$=14.88±2.23).

Table 4. Pretest-posttest analysis results of the groups the application and control groups (ADGAS and DOC-7)

Tools	Groups	Pretest		Posttest		MD	t test	*p*
		Mean	SD	Mean	SD			
ADGAS	Q1-Q2	16.21	2.22	29.79	4.90	-13.58	14.71	0.00*
	Q3-Q4	16.17	2.18	16.29	2.11	-0.11	-0.22	0.82
DOC-7	Q1-Q2	31.52	1.54	14.88	2.23	16.64	35.69	0.00*
	Q3-Q4	30.91	3.63	31.79	1.55	-0.88	-1.30	0.19

Notes: * $p<0.05$.

Discussion

The study aimed to examine the effect of 12-week structured physical activity practices on DGA and awareness in individuals with high DGA values. This study was conducted on individuals with high DGA values.

In the first finding of the research, no significant difference was detected in the DGA level and ADGA level of individuals in the application and control groups before the structured physical activity program was implemented. In addition, it was determined that ADGA in both groups was low and the level of DGA was high. To protect the individual from the effects of DGA, ADGA must be increased, and individuals with high ADGA values are expected to stay away from attitudes and thus the behaviors that develop into addiction [15]. Although awareness does not have a direct effect on behaviors, it is an important indicator in determining the factors that affect behaviors. Awareness is effective in strengthening attitudes and positive behavior [28]. The awareness gained through physical activity interventions is likely to reduce sedentary behavior. Therefore, reducing sedentary behavior through physical activity interventions and increasing awareness of this issue may provide a solution to sedentary behavior, which is an important problem nowadays [15]. As a matter of fact, high awareness is expected to positively affect correct attitude, behavior, and consciousness of personal responsibility [29]. In addition, considering the addictive effect of digital games, awareness studies on digital games are needed to protect individuals from this effect and ensure that they play controlled digital games. However, studies on ADGA are limited in the literature [25].

Another finding of the research is that, after participating in the structured physical activity program, the posttest average score of the individuals in the application group (ADGAS) was significantly higher than the pretest average score. In addition, it was determined that at the end of the structured physical activity program, the addiction awareness level of the application group increased from low to medium level. Accordingly, it can be concluded that the structured physical activity program helped participants become more aware of DGA, which is a performative addiction. There are studies in the literature that support the view that physical activity and interventions in this direction increase cognitive features such as awareness. For example, a physical activity program distracts attention from addiction, repairs nerve cells, and increases the ability to adapt to the environment and their awareness [30]. As a matter of fact, participants may be more likely to gain knowledge and awareness while having fun. Participants with the motivation to have fun may be more open to learning while participating in physical activity, which is less likely to produce boredom. This allows the development of not only motor, emotional and social skills, but also cognitive skills [11], and may facilitate learning and the gaining of awareness [31]. Thus, the awareness gained allows the correct attitudes and behaviors to emerge over time [32]. It is important for individuals

to raise awareness of addiction symptoms so that games played in the digital environment do not create addiction [15]. Young [33] argues that recognizing the signs of addiction is vital in stopping the progression of the addiction process. Additionally, a useful approach to the increase of awareness of addictive behaviors is through physical activity programs as supplemental treatments [34].

In the last finding of the study, a significant difference was found in the pretest-posttest analysis of the DOC-7 score averages of the individuals in the application group after the structured physical activity program. It was determined that the posttest DGA score average of the application group was significantly lower than the pretest DGA score average. Accordingly, it was determined that the mean scores of the participants whose DOC-7 score averages were thirty or above before participating in the structured physical activity program decreased after the program that no longer qualified as an "addiction" [25]. This significant decrease may be attributed to the structured physical activity program, which included aerobic activities that led to reduced DGA levels in the participants. In studies examining behavioral addictions with a physical activity program, it is stated that the physical activity program significantly reduces the level of behavioral addiction [35]. In the literature, it has been seen that the effects of physical activities on DGA have been examined through experimental studies and results similar to the research findings have been achieved. For instance, a study found that implementing a 12-week physical exercise program among university students led to a significant reduction in addiction and a balance in the sympathetic and parasympathetic functions [30]. In a meta-analysis study examining the results of physical activity interventions in the treatment of GDA, it was revealed that physical activity programs "are a positive method as an additional treatment and are effective in reducing the severity of GDA, particularly in adolescents and young adults" [36]. In a recent meta-analysis study, it was found that intervention with physical activity had positive effects in treating digital addiction [35]. Additionally, a study involving university students as a sample showed that the implementation of a physical activity program had a significant effect on DGA and reduced the DGA level [37]. It states that intervention carried out with a physical activity program can reduce the level and symptoms of addiction [38]. It has also been reported that intervention through a physical activity program can decrease the severity and symptoms of addiction [38]. Pirwani et al. [7] state that experimental studies involving physical activity programs/interventions reveal significant positive effects on behavioral addiction. However, they underlined that there are not enough experimental studies in the literature and that there needs to be a greater number of such studies, because all addictive behaviors are a disease/psychological problem [39]. Physical activity interventions are a potential treatment for addiction and significantly improve health [40]. Despite the known psychological and physical benefits of physical activity intervention, Landale et al. [41] state that addiction programs do not sufficiently incorporate physical activity interventions and that physical activity lags behind drug treatments and other therapy methods. On the contrary, Kim [34] states that it is futile to question the effect of the physical activity program and underlined that it is important to reduce DGA and raise awareness. Some researchers argue that ADGA should be increased to keep the individual away from the effects of DGA through physical activity programs [14].

Limitations

The research has a few limitations. Firstly, the main limitation of the research is that although there are quantitative studies in the literature to raise awareness about DGA, no experimental studies can be found. If any, this is another limitation of the study. Additionally, the research and development process takes 12

weeks, which is a limitation. Another limitation of the research is that the number of samples used in the study is small, that is, the inability to use at least a medium-sized sample to prevent statistical errors in generalizing the findings.

Conclusions

It has been observed that ADGA increases and at the same time, the level of DGA decreases with structured physical activity programs that offset the harms of DGA. A possible reason why structured physical activity program interventions were effective in reducing DGA and increasing awareness in this study is that providing participants with latent learning/gains through the information structured in physical activities and structured physical activity replaces a large portion of the time spent on digital games. In addition, the correct perception by the participants of the messages regarding the harms of DGA in aerobic activities in the structured physical activity program contributed to the effectiveness of the interventions in reducing DGA and increasing ADGA.

The structured physical activity program supported the DGA treatment, and the participants were not exposed to any side effects, because this type of intervention does not require the use of medication. It is thought that such interventions can both distract participants from DGA and contribute to the holistic health of the individual in many aspects, such as the spiritual, physical and emotional. However, it is necessary to be careful about the intensity of aerobic physical activity performed in these interventions, as it may lead to exercise addiction.

Recommendations

Although the use of physical activity programs for DGA and other addictions has been a growing field of study in recent years, there is a need for practices aimed at ADGA. Correlation studies only imperfectly demonstrate the effect of physical activity on DGA, whereas intervention studies realistically demonstrate this effect [15]. It is recommended that similar research be conducted on larger and different age groups.

Disclosures and acknowledgements

The author declares no conflicts of interest with respect to the research, authorship, and/or publication of this article.

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

The study used the principles of the Declaration of Helsinki for Human Rights. Before obtaining the necessary official permissions, meetings were held with school administrators and the participants' families, and as a result, official permissions were obtained. In this context, a signed document was received from the participants' families stating that they allowed their children to participate in this research. The ethics committee permission numbered E-14679147-663.05-633907 was obtained for the study.

Artificial intelligence (AI) was not used in the creation of the manuscript.

References:

1. Can HC, Demir GT. Digital gaming addiction and awareness levels regarding digital gaming addiction of athletes and e-sports players. Gaziantep Univ J Sport Sci. 2020; 5: 364-84. https://doi.org/10.31680/gaunjss.770600

2. Martinez-Garza MM, Clark DB, Killingsworth SS, Adams DM. Beyond fun: Pintrich, motivation to learn, and games for learning. In: Information Resources Management Association, editor. Gamification in education: breakthroughs in research and practice. Hershey, PA: IGI Global; 2018. https://doi.org/10.4018/978-1-5225-5198-0.ch003
3. Kneer J, Rieger D, Ivory JD, Ferguson C. Awareness of risk factors for digital game addiction: interviewing players and counselors. Int J Ment Health Addict. 2014; 12: 585-99. https://doi.org/10.1007/s11469-014-9489-y
4. Tekkurşun Demir G, Cicioğlu Hİ. The relationship between motivation for physical actıvity participation. J Phys Educ Sports Sci. 2019; 17: 23-34. https://doi.org/10.33689/spormetre.522609
5. WHO. Gaming disorder. Department of communication. [Internet]. Geneva: WHO; 2018 [access 2024 Feb 29]. Available from: https://www.who.int/news-room/q-a-detail/gaming-di
6. Bhagat S, Jeong EJ, Kim DJ. The role of individuals' need for online social interactions and interpersonal incompetence in digital game addiction. Int J Human-Computer Interact. 2020; 36: 449-63. https://doi.org/10.1080/10447318.2019.1654696
7. Pirwani N, Szabo A. Could physical activity alleviate smartphone addiction in university students? A systematic literature review. Prev Med Rep. 2024; 42: 102744. https://doi.org/10.1016/j.pmedr.2024.102744
8. Szabo A, Demetrovics Z. Passion and addiction in sports and exercise. 1st edition. New York: Routledge; 2022.
9. Turkish Statistical Institute. [Information and communication technology (ICT) usage survey on households and individuals] [Internet]. Turkish Statistical Institute; 2020 [access 2024 Feb 29]. Available from: https://data.tuik.gov.tr/Bulten/Index?p=Survey-on-Information-and-Communication-Technology-(ICT)-Usage-inHouseholds-and-by-Individuals-2020-33679 (in Turkish).
10. Turkish Statistical Institute. [Information and communication technology (ICT) usage survey on households and individuals] [Internet]. Turkish Statistical Institute; 2021 [access 2024 May 15]. Available from: https://data.tuik.gov.tr/Bulten/Index?p=Survey-on-Information-and-Communication-Technology-(ICT)-Usage-inHouseholds-and-by-Individuals-2021-37437 (in Turkish).
11. Namli S, Demir GT. The relationship between attitudes towards digital gaming and sports. Turk Online J Educ Technol – TOJET. 2020; 19: 40-52.
12. O'Donohue WT, Fisher JE. Cognitive behavior therapy: applying empirically supported techniques in your practice. Hoboken, New Jersey: John Wiley & Sons; 2008.
13. Brown KW, Ryan RM. The benefits of being present: mindfulness and its role in psychological well-being. J Pers Soc Psychol. 2003; 84: 822-48. https://doi.org/10.1037/0022-3514.84.4.822
14. Çebï M, Albay F. Investigating the awareness of faculty of sport sciences students with respect to digital game addiction. J Acad Soc Sci. 2022; 127: 72-81.
15. Demir GT. Sports, e-sports and digital game addiction and "striking comments of e-athletes in Generation X, Y and Z". 1st edition. Ankara: Gazi Kitabevi; 2022.
16. Zorba E, Saygın Ö. [Physical activity and physical fitness]. 4th edition. Ankara: Perspektif; 2017 (in Turkish).
17. Demir TG, Cicioğlu Hİ. Motivation Scale for Participation in Physical Activity (MSPPA): a study of validity and reliability. International Journal Hum Sci. 2018; 15: 2479-92. https://doi.org/10.14687/jhs.v15i4.5585

18. Cho KS, Lee JM. Influence of smartphone addiction proneness of young children on problematic behaviors and emotional intelligence: mediating self-assessment effects of parents using smartphones. Comput Hum Behav. 2017; 66: 303-11. https://doi.org/10.1016/j.chb.2016.09.063
19. Bian M, Leung L. Linking loneliness, shyness, smartphone addiction symptoms, and patterns of smartphone use to social capital. Soc Sci Comput Rev. 2015; 33: 61-79. https://doi.org/10.1177/0894439314528779
20. Carson V, Hunter S, Kuzik N, Gray CE, Poitras VJ, Chaput JP, et al. Systematic review of sedentary behaviour and health indicators in school-aged children and youth: an update. Appl Physiol Nutr Metab Physiol Appl Nutr Metab. 2016; 41: S240-265. https://doi.org/10.1139/apnm-2015-0630
21. Surawska M. Sport activity as a significant element of preventing addictions. Pol J Appl Sci. 2017; 2: 112-6.
22. Patton MQ. Qualitative research & evaluation methods: integrating theory and practice. New York: SAGE Publications; 2014.
23. Büyüköztürk Ş. [Data analysis handbook for social sciences statistics, research design SPSS applications and interpretation statistics] [Internet]. Pegem Akademi; 2018 [access 2024 Feb 29]. Available from: https://pegem.net/urun/Sosyal-Bilimler-icin-Veri-Analizi-El-Kitabi-Istatistik-Arastirma-Deseni-SPSS-Uygulamalari-ve-Yorum/61926 (in Turkish).
24. Tabachnick B, Fidell L. Using multivariate statistics. Boston: Pearson; 2019.
25. Yalçın Irmak A, Erdoğan S. Digital game addiction among adolescents and younger adults: a current overview. Turk J Psychiatry. 2016; 27: 128-37. https://doi.org/10.5080/u13407
26. Demir GT, Cicioğlu Hİ. Awareness of Digital Game Addiction Scale (ADGAS): validity and reliability study. Eurasia J Sports Sci Educ. 2020; 2: 1-17.
27. Cohen L, Manion L, Morrison K. Validity and reliability. In: Cohen L, Manion L, Morrison K, editors. Research methods in education. 8th edition. London: Routledge; 2017.
28. Üstündağlı E, Güzeloğlu E. Young green consumer profile: an analysis of awareness, attitudes and behaviour. Glob Media J Turk Ed. 2015; 341-362.
29. Kok G, Siero S. Tin recycling: awareness, comprehension, attitude, intention and behavior. J Econ Psychol. 1985; 6: 157-73. https://doi.org/10.1016/0167-4870(85)90019-4
30. Ye GZ, Liu WA, Xu XM. Quantitative analysis of rectus femoris, vastus medialis and vastus lateralis muscles under different exercise patterns in Chinese adults. Chin J Mod Med. 2019; 9: 1-5. https://doi.org/10.1097/00029330-900000000-99975
31. Tomporowski PD, McCullick B, Pendleton DM, Pesce C. Exercise and children's cognition: the role of exercise characteristics and a place for metacognition. J Sport Health Sci. 2015; 4: 47-55. https://doi.org/10.1016/j.jshs.2014.09.003
32. Çeyiz S, Alagül Ö, Kara İ. A related research on the sport awareness of local government employees and their attention to sports activities: the case of Istanbul. J Phys Educ Sports Sci. 2023; 21: 63-72. https://doi.org/10.1016/j.jshs.2014.09.003
33. Young K. Understanding online gaming addiction and treatment issues for adolescents. Am J Fam Ther. 2009; 37: 355-372. https://doi.org/10.1080/01926180902942191
34. Kim H. Exercise rehabilitation for smartphone addiction. J Exerc Rehabil. 2013; 9: 500-5. https://doi.org/10.12965/jer.130080

35. Liu H, Soh KG, Samsudin S, Rattanakoses W, Qi F. Effects of exercise and psychological interventions on smartphone addiction among university students: A systematic review. Front Psychol. 2022; 13(2022). https://doi.org/10.3389/fpsyg.2022.1021285
36. Aryani A, Kusuma KS, Saputra MJ. Physical exercise intervention for gaming disorder: a systematic review of clinical trials. Int J Ment Health. 2024; 23: 1-15. https://doi.org/10.1080/00207411.2024.2347672
37. Ademoyegun AB, Ibitoye AG, Afolabi J, Idowu OA, Fawole H, Awotidebe TO, et al. Can physical activity attenuate the impact of internet addiction on anxiety in young adults? A moderation analysis. J Affect Disord Rep. 2024; 16: 100718. https://doi.org/10.1016/j.jadr.2024.100718
38. Hong JS, Kim SM, Kang KD, Han DH, Kim JS, Hwang H, et al. Effect of physical exercise intervention on mood and frontal alpha asymmetry in internet gaming disorder. Ment Health Phys Act. 2020; 18: 100318. https://doi.org/10.1016/j.mhpa.2020.100318
39. Dodes LM. Addiction as a psychological symptom. Psychodynamic Practice. 2009; 15: 381-393. https://doi.org/10.1080/14753630903230468
40. He Q, Wu J, Wang X, Luo F, Yan K, Yu W, et al. Exercise intervention can reduce the degree of drug dependence of patients with amphetamines/addiction by improving dopamine level and immunity and reducing negative emotions. Am J Transl Res. 2021; 13: 1779-88.
41. Landale S, Roderick M. Recovery from addiction and the potential role of sport: using a life-course theory to study change. Int Rev Sociol Sport. 2014; 49: 468-84. https://doi.org/10.1177/1012690213507273