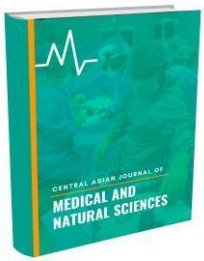

CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES
https://cajmns.centralasianstudies.org/index.php/CAJMNS
Volume: 05 Issue: 04 | *October 2024 ISSN: 2660-4159*

Article

Efficacy of Stage-Matched Intervention Based on The Transtheoretical Model of Behavior Change in Enhancing High School Students' Decisional Balance of Digital Gaming Behavior: A Randomized Controlled Trial

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Abstract: Social media and other digital technology are undoubtedly being used by individuals more regularly for informational and entertainment purposes. To alter the internet gaming habits of male high school students, the researcher employed The Transtheoretical Model of Change. Objective: This study aims to examine the effectiveness of the Stage-Matched Intervention in altering the digital gaming behavior of male high school students. Methods: A controlled, randomized trial as the basis for the experimental design. The tenth, eleventh, and twelfth grades of a male high school (16–18 years old) were the classes from which the study participants were selected. The study group and the control group, each consisting of 72 students, were chosen from a randomly assigned of participants. The study instrument consists of Lemmens questionnaire (problematic gaming measure), The Stage of Change for problematic gaming, Decisional Balance of digital game use, Oasis measure (anxiety measure), Barratt impulsiveness measure (impulsivity measure), and Cantrill Scale (wellness measure). A self-reporting questionnaire was used to gather the data. Results: Over time, statistically significant differences have been observed between the study and control groups in regard to the Stage of Change, Processes of Change, Decisional Balance, and Self-Efficacy for study group participants. Conclusions: As a result of the intervention that was given, participants were moved to higher Stages of Change. As participants advance through the stages of change, they employ more change processes. ClinicalTrials.gov Identifier: NCT05949905 Registration Date: July 9th, 2023.

Keywords: Adolescents, Problematic Digital Gaming, Gaming Disorder, Addiction

Citation: Malak Obaid Nghaimesh, Mohammed Baqer Habeeb Abd Ali. Efficacy of Stage-Matched Intervention Based on The Transtheoretical Model of Behavior Change in Enhancing High School Students' Decisional Balance of Digital Gaming Behavior: A Randomized Controlled Trial. Central Asian Journal of Medical and Natural Science 2024, 5(4), 221-229

Received: 16th Oct 2024
Revised: 17th Oct 2024
Accepted: 22th Oct 2024
Published: 31th Oct 2024

1. Introduction

According to modern society, children are raised in an environment where they are exposed to both conventional and contemporary technology (1,2). Technology have rapidly become important in our world. In recent years, the utilization of contemporary technical equipment, such as laptops, tablets, and cellphones, has gotten exceedingly prevalent. These technologies facilitate daily tasks, although they can also give rise to issues as a result of negligent utilization (1,3). Computers serve as tools for communication and education, while also being recognized as a significant source of enjoyment (4). Young adults utilize social media as a means of communicating with their peers (5) and engaging in digital gaming for pleasure and recreational purposes (6).

Computer and video gaming have become integral components of human lifestyle. Therefore, it is worthwhile to investigate whether they contribute to human development or pose a threat to human well-being. The personality factors that influence human behaviors are analogous to the behaviors exhibited by players in video games. Essentially, gamers exhibit same behavior in daily life as they do in their video games (7).

Gaming disorder is defined in the International Classification of Diseases, Eleventh Revision (ICD-11) as a pattern of gaming behavior ("digital-gaming" or "video-gaming") characterized a lack of ability to manage gaming behavior, gaming is becoming a preference above alternative activities to the extent that gaming becomes the primary focus over other hobbies and daily responsibilities, if gaming continues or intensifies despite adverse effects (8).

The amount of time dedicated to playing is not significant in an absolute context, but rather in relation to gaming's ability to disrupt other interests. A healthier individual may engage in extensive gameplay due to their strong interest in a particular video game. However, they will have the ability to manage their Time Spent Playing (TSP) in order to fulfill other responsibilities and obligations. Alternatively, individuals with addiction may lack the ability to regulate their desire to play and may persist in playing beyond the originally planned periods. This is because addicted individuals typically struggle with self-control and exhibit cognitive biases when it comes to factors like duration and usage (9). Socioeconomic status, when interpreted in many ways, such as parental education and poor family income, has a major impact on addictive behaviors in students (10). Mohammed (2023) concluded that students experiencing moderate level of aggressive behavior towards others, self and properties. The stressful life event that the students experiencing due to recovery from pandemic COVID as well the deteriorating socioeconomic status, and even the social media which may play an important role in creating aggressive behavior among adolescents especially the action movies and so on (11).

Some individuals get involved with sedentary activities (commonly called "screen time") over physical activity (PA) (12-14) due to the fact that their physical and social surroundings is conducive to this type of lifestyle. Sedentary behavior encompasses activities that do not significantly elevate energy consumption beyond the resting state.

Sedentary behavior and physical inactivity are not equivalent (15), Although these phrases are used synonymously. This is because individuals who engage in sedentary activities for extended periods of time can still engaging in PA. Physical inactivity refers to those who are performing insufficient quantity of Moderate to Vigorous Intensity Activity (MVPA) (16).

Sedentary actions, such as engaging in digital gaming, watching the big screen, using a smart phone, or accessing high-speed internet recreational activities, have become a popular kind of inactive enjoyment in everyday lives of individuals (17). This is concerning, as prolonged sitting and physical inactivity have a strong correlation with numerous significant illnesses, including weight gain, diabetes mellitus, and heart disease (18). Unregulated absence of vigorous physical activity throughout the early years is also associated with immediate and prolonged mental and physical negative consequences (19). Digital gaming is an ideal representation of being sedentary, as the energy expended during digital gaming amounts to only 1.5 Metabolic Equivalent (MET), which aligns with the MET value for a sedentary lifestyle (15,16).

Digital games are played daily by individuals under the age of 20 years and a minimum of once a week by 69.8% of them (20). According to brain imaging research, the stimulation of the brain through electronics and gaming is like cholinergic (dopamine-activating) as sexual activity, gambling, and the consumption of addictive substances. The mechanistic interpretation suggests the gaming experience overwhelms the brain's pleasure center with numerous stimuli (21). A significant aspect of digital gaming is the

capacity to establish relationships inside a virtual environment (22). At 110 minutes a day on average, male participants played digital games much longer than female participants. Gender and addictive behavior have not been found to be significantly associated (23) and Facebook is the social media platform that users use the most (42%). Additionally, more people use mobile devices (49.5%) than their laptops (53.8%), and responses in general to the psychological health area are highly impacted (68.8%) of the study participants (24).

Internet Gaming Disorder (IGD) has been recognized as a potential disorder listed in the third section of the Diagnostic and Statistical Manual for Mental Disorders, 5th Edition (DSM-5) (25). Gaming disorder, in both its online and offline forms, was lately included in the ICD-11 as a clinically identifiable and serious condition. The World Health Organization (WHO) states that "When the gaming behavior pattern is characterized by its nature and intensity, it leads to noticeable distress or serious problems in personal, family, social, educational, or occupational functioning" (8).

The utilization of web-based technologies and internet access has experienced a significant increase globally, resulting in the internet user population surpassing 2.3 billion in 2011. Inexpensive internet services have facilitated convenient access to electronic devices, and the internet has emerged as an amplifier for the rise of non-substance addictions, such as video gaming and gambling. Individuals who identify as "gamers" frequently engage in gaming to an excessive degree, disregarding other hobbies or activities. Their ongoing and repetitive involvement in online gaming leads to noticeable negative consequences, such as severe impairment or distress that meets clinical criteria (26).

The issue of Internet Addiction (IA) has emerged as a global concern among adolescents. This addiction not just impacts the physical well-being of individuals, but also has a negative impact on their mental health. This occurrence can give rise to many forms of physical and psychological distress, which will have an impact on the general population as well (27). It is anticipated that the amount of time adolescents spend to digital gaming will not diminish in future decades, as these games now serve a purpose beyond mere entertainment and enjoyment (28). The study concluded There is increasing evidence that prolonged exposure to drugs of abuse produces long-lasting effects in cognitive and drug-rewarding circuits. For this reason. addiction should be considered a chronic medical illness (29,30).

2. Materials and Methods

An experimental, randomized controlled trial was used to guide this study. The most conclusive technique to prove causation is to use experimental designs. Researchers use these designs because they ensure a high level of internal validity because random assignment creates very similar experimental and control groups [(31)]. The study was conducted at Al-Subtain High School for males in Basra City in Iraq. The study included a simple random sample of high school male students who agreed to participate in this study. The study subjects were recruited from three grades in this school which Fourth Grade, Fifth Grade, Sixth Grade. Participants were randomly assigned into both study and control groups; 72 students for the study group and 72 students for the control group. The simple random sampling involved having the lists of students' names in Al-Subtain High School for males generated on Microsoft Office Word software. The names of students in each grade were cut in identical pieces of paper, in the same color of paper, and folded in the same way. The names of students of each grade were put in a separate container. One of the student researcher's colleagues started stirring well the pieces of paper and drawing one piece alternatively. The first piece drawn would be in the study group and the second one would in the control group till obtaining the required sample size for each grade for each of the study and control groups.

Decisional Balance of digital game use. This measure contained 24 items to assess both the Pros and Cons of reducing problematic game use. These questions were modeled from previous Decisional Balance questionnaires on problem behaviors such as smoking, as well as questionnaires incorporating healthy behaviors, such as weight reduction. The Pros questions tended to ask participants if they viewed potential positive impacts of gaming as important reasons to play digital games (e.g., "Digital games are a good way for me to spend time with family and friends.") Some of the Pros items also addressed a potential absence of any negative impacts from digital gaming (e.g., "I can balance school and/or work activities and recreational digital game use without any problems.") The Cons questions tended to ask participants if they viewed potential negative impacts of gaming as important reasons to avoid playing digital games (e.g., "I feel uneasy when I am not playing digital games"). Some of the Cons questions also indicated common negative symptoms that many gamers would commonly experience (e.g., "Occasionally, I end up playing digital games longer than I expected.").

Both the Pros and Cons measures were tallied to indicate a raw score of total Pros and a raw score of total Cons, where a higher score indicated a greater level of Pros or Cons.

Data were collected using a self-reported instrument. The pretest was conducted for the period from October 8th, to October 11th, 2023. The Transtheoretical Model of Change-Based Intervention was administered only to subjects in the study group for the period from October 15th, 2023 to October 19th, 2023.

The Transtheoretical Model of Change-Based Intervention considered the following steps:

Before implementing the intervention, the study subjects were randomly assigned into two groups (the study group and the control group). The intervention was presented in five lectures within one-week period. The lectures were delivered in Al-Subtain High School. For (29) student in the Precontemplation – Contemplation Stages of Change, the TTM-based intervention focused on the Processes of Change (Consciousness Raising, Dramatic Relief, Self-Reevaluation, Environmental Reevaluation), for (20) those in the Contemplation – Preparation Stages of Change, it focused on Self-Reevaluation, Environmental Reevaluation, Self-Liberation, Self-Efficacy, Stimulus Control, for (17) those in the Preparation – Action Stages of Change, it focused on Self-Liberation, Self-Efficacy, Stimulus Control, Counterconditioning, Helping Relationships. The time for each lecture is 45-50 minutes. Lectures were presented in the form of lecturing and interactive discussion. These lectures were presented using photos and videos using the computer and data show projector.

Ten weeks after administering the Transtheoretical Model of Change-Based Intervention (December 27th, 2023) the researcher performed posttest-I for all study participants. Then, twelve weeks later (March 18th, 2024) the researcher performed posttest-II.

3. Results

Table (1): Descriptive statistics of Pros of refraining from problematic digital gaming over time

Stages of Change	Mean	Std. Deviation	N
Study Pretest	37.36	10.45	72
Study Posttest I	47.52	8.45	72
Study Posttest II	52.38	5.82	72
Control Pretest	36.18	9.67	72
Control Posttest I	34.61	9.89	72

Control Posttest II	34.65	9.86	72

N: Number, Std. Deviation: Standard Deviation

The study results display that there is a remarkable, consistent increase in the values of the Pros of refraining from problematic digital gaming for participants in the study group (Pretest = 37.36, Posttest II = 47.52, Posttest II = 52.38) respectively. While for participants in the control group, there was a fluctuation in these values over time (Pretest = 36.18, Posttest II = 34.61, Posttest II = 34.65) respectively.

Table (2): Descriptive statistics of Cons of refraining from problematic digital gaming over time

Cons	Mean	Std. Deviation	N
Study Pretest	46.12	8.59	72
Study Posttest I	40.93	4.94	72
Study Posttest II	35.44	4.94	72
Control Pretest	43.75	9.97	72
Control Posttest I	40.59	10.18	72
Control Posttest II	40.61	10.15	72

N: Number, Std. Deviation: Standard Deviation

The study results display that there is a remarkable, consistent increase in the values of the Cons of refraining from problematic digital gaming for participants in the study group (Pretest = 46.12, Posttest II = 40.52, Posttest II = 35.44) respectively. While for participants in the control group, there was a fluctuation in these values over time (Pretest = 43.75, Posttest II = 40.59, Posttest II = 40.61) respectively.

Table (3): Pairwise comparison of the Pros of refraining from problematic digital gaming values between study and control groups

Pairwise Comparisons						
Measure: MEASURE_1						
(I) Pros Study	(J) Pros Study	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	-10.167*	1.185	.000	-13.072	-7.262
	3	-15.028*	1.192	.000	-17.951	-12.105
2	1	10.167*	1.185	.000	7.262	13.072
	3	-4.861*	.618	.000	-6.377	-3.346
3	1	15.028*	1.192	.000	12.105	17.951
	2	4.861*	.618	.000	3.346	6.377
Measure: MEASURE_1						
(I) Pros Study	(J) Pros Study	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	

					Lower Bound	Upper Bound
1	2	1.569	.729	.104	-.219	3.358
	3	1.528	.731	.120	-.264	3.320
2	1	-1.569	.729	.104	-3.358	.219
	3	-.042	.024	.250	-.100	.016
3	1	-1.528	.731	.120	-3.320	.264
	2	.042	.024	.250	-.016	.100

Based on estimated marginal means

*. The mean difference is significant at the .05 level.
b. Adjustment for multiple comparisons: Bonferroni.

Participants' Pros of refraining from problematic digital gaming in the study group in the pretest time statistically differ from such Pros in the posttest I (p = .000) and posttest II (p = .000). Such Pros in the posttest I statistically differ from these in the pretest time (p = .000) and posttest II (p = .000). Such Pros in the posttest II statistically differ from these in the pretest time and these in the posttest I (p = .000) and (p = .000).

For the control group, the Pros of refraining from problematic digital gaming in the pretest time do not statistically differ from such Pros in the posttest I (p = .104) and these in the posttest II (p = 0.120). Such Pros in the posttest do not statistically differ from these in the pretest time (p = .104) and posttest II (p = .250). Ultimately, such Pros in the posttest II do not statistically differ from these in the pretest time (p = 0.120) and these in the posttest I (p = .250).

Discussion:

The results showed that the participants of study group affected by the Transtheoretical Model of Change Intervention and moved to high levels of Stages of Change reverse to control group whom stayed at the same levels. These results similar to the findings that concluded by Faust [32]. The study group's Decisional Balance values for problematic digital gaming demonstrate a discernible increase over time, with notable variations in its values. The omnibus effect for this analysis was.601, meaning that the variation in the administered intervention accounts for about 60% of the whole variance in the Decisional Balance of problematic digital gaming values. The study of pairwise comparisons revealed the presence of variations in their values over time. These results show that the TTM-based Stage-matched intervention's effects were constant and unchanging throughout time. Over time, there was a noteworthy variation observed in the benefits of abstaining from hazardous digital gaming for the control group. For the present study, the omnibus effect (measure of association) is.060, meaning that chance accounts for around 0.6% of the variance in the Pros values. The Stages of Change for the gym user's use of performance-enhancing substances would be higher the more pros there were. The gym patron would experience higher Stages of Change for performance-enhancing substance use in relation to more social liberation [33,34]. Most of students have an average level of internet addiction, and males are more affected than females. Additionally, there was a study concluded that the longer the duration of using smartphone, the worse the health and behavioral aspects as perceived by. The longer the average of daily smartphone use, the poorer the school achievement [35-37].

4. Conclusion

Participants in the stage-matched intervention successfully advance from lower to more advanced Stages of Change. The participants employed more Processes of Change that

enable them to move to higher Stages of Change as a result of receiving the TTM Stage-matched intervention. Following the TTM Stage-matched intervention, the participant's Decisional Balance on refraining from harmful digital gaming enhanced invariantly and consistently.

Implications

Replicating the Transtheoretical Model of Change-Stage-matched intervention with a large number of students in Iraq and potentially in other countries is crucial. The primary benefit of thinking about behavior in terms of Stages of Change is that it makes it simpler to recognize obstacles and related psychological and cognitive components at each Stage. This facilitates the creation of stage-based therapies, which have the potential to be more effective than non-stage-matched interventions.

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