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The effect of planned behavior theory-based education on computer game dependence in high school male students

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Abstract:

BACKGROUND: Teenagers are increasingly interested in computer games, and the adverse effects of these games are dependent on the execution of these games. The theory of planned behavior (TPB) is one of the most important theories in behavior change. This study aimed to determine the effect of educational planning based on TPB on the level of dependence on computer games in high school male students in Gonabad, Iran.

MATERIALS AND METHODS: This was a randomized controlled trial. The study population was students of computer games in Gonabad. Sixty-four students were selected by a multistage random sampling method and were randomly divided into intervention ($n = 32$) and control ($n = 32$) groups. Data-gathering tool was the standard questionnaire of computer game dependency and researcher-made questionnaire according to TPB constructs that were completed before, immediately, and 3 months after the intervention. The intervention consisted of eight 90-min training sessions. Data were analyzed using the Chi-square test, Fisher's, *t*-test, repeated measures ANOVA, and Bonferroni *post hoc* test.

RESULTS: Before the intervention, the intervention and control groups were matched for the mean score of model constructs. However, after the intervention, the mean score of computer game addiction significantly decreased (≤ 0.001). However, the mean score of knowledge, attitude, perceived behavioral control, and behavioral intention increased, which was statistically significant. Furthermore, the mean changes of model structures were statistically significant ($P < 0.05$).

CONCLUSION: The findings revealed that TPB can be used as a good theoretical framework for designing and implementing educational programs to reduce the dependency of computer games on students.

Keywords:

Computer games, dependency, educational intervention, student, theory of planned behavior

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Introduction

Computer games, as one of the new forms of entertainment, are very popular among children and teenagers. The increasing interest in the use of computers and computer games has influenced children's social life.[1] The Internet and mobile and computer games are useful on the one hand and provide many opportunities for users and on the other hand pose a threat to users.[1]

In fact, computer games are an educational tool and can facilitate learning, problem-solving skills, visual accuracy, and creative thinking. In addition, it is a means to fill leisure time for children and adolescents, but disadvantages such as enhancing the sense of aggression, Isolation, laziness of mind, negative consequences in family

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relationships, and academic achievement decline have been observed in computer game addiction.[1,2]

Addiction to computer games is a behavioral addiction that refers to a persistent and maladaptive pattern that is seen in the range of obsessive–compulsive disorder.[3] The importance of this issue has led the World Health Organization to consider game disorders in the 11th draft version of the International Classification of Diseases-11 that the member states of this organization pay attention to this when they are planning their health issue.[4]

The prevalence of computer game disorders varies from country to country, with differences not only in age and gender but also in geographical location. The results of most studies show that boys are more prevalent in computer games than girls.[2] The prevalence of computer game dependence disorders among young people in European and North American countries is between 1% and 10%; in Europe and in Switzerland, it is 15% (among 15–34 years old); in South American and Africa, its prevalence is between 1% and 9%; and in East and Southeast Asia, it is around 10%–15%, and in Hong Kong, almost 16% dependence on computer games is observed.[4]

Given the vulnerability of teenagers and the adverse effects of computer game addiction, appropriate measures need to be taken to improve student's knowledge. Health education in order to make its programs effectively requires understanding the behavior and its effective factors in order to change or modify existing behaviors and to replace new ones. In this circumstance, the role of behavioral study models in health education becomes prominent.[5]

The theory of planned behavior (TPB) is the most important one among theories of behavioral change. Fishbein, the designer of the TPB, showed that attitude is a strong predictor of behavior. According to this theory, one of the most important determinants of one's behavior is one's intention. An individual's intention leads to acting behavior and is a combination of attitude toward behavior and subjective norms. TPB is used to predict and understand behavior and behavioral outcomes. It also shows important concepts for health education in examining behaviors related to health, intervention, and promotion of prevention programs. This theory is used to predict and understand behaviors such as weight loss, alcohol consumption, smoking, and physical activity.[6]

The validity of this theory has been empirically confirmed in many studies. Based on the TPB, intention to perform a behavior is a function of (1) a person's attitude toward a behavior; (2) the views of the individuals who care about the behavior; and (3) the person's perception of the difficulty or ease of performing that behavior. TPB is the broad state of the theory of reasoned action.[7]

Since computer games depend on a set of internal factors (one's beliefs and attitudes) and external factors (peer group and subjective norms), therefore, given the aforementioned material and the theoretical constructs mentioned, they can help individuals to overcome external and affective factors by planning and setting specific goals and changing the attitudes and control of individual and internal factors, and as a result, people's dependence on computer games is reduced.

Since it has been found no research study on the effect of educational intervention based on the TPB on the reduction of dependence on computer games, this study aimed to determine the effect of educational intervention based on TPB on the dependence on computer games in high school male students.

Materials and Methods

The present study is a randomized controlled trial which was conducted in 2019. The study population consisted of first-grade male high school students in Gonabad. The sample size was determined based on the comparison of two means formula and the results of Delshad *et al*.'s study.[8] In the construct of knowledge, 23 people were considered, and with considering probability of 30% loss, the sample size was determined as 36 people in each group. Finally, according to the exclusion criteria, only 32 patients remained in each group

$$N = ([Z_{1-(\alpha/2)} + Z_{1-\beta}]^2 [s_1^2+s_2^2]^2)/(\mu_1-\mu_2)^2.$$

Inclusion criteria were computer game dependency and parents' informed consent for their child to participate in the study. Exclusion criteria were students' unwillingness to continue study, absent more than two sessions, and incomplete completion of the questionnaire.

In this study, the standardized questionnaire of game addiction and a researcher-made questionnaire based on TPB were used to collect data.

The questionnaire consisted of four sections: the first part related to demographic questions (23 questions), the second part related to knowledge questions (13 questions), the third part related to computer game dependency questionnaire (21 questions), and the fourth section deals with the questions of the TPB constructs (37 questions).

The computer game dependency questionnaire included 7 items with 21 questions.[9] The original design of this questionnaire was in 2009 by Limenz *et al*. translated and localized by 3 faculty members of Isfahan University for

localization. Cronbach's alpha coefficient for the whole scale was 0.84. On a 5-point Likert scale ranging from 1 to 5 for each question, the total questionnaire score was 21–105. The cutoff point for this scale for people with and without computer games is as follows: people with scores below 29.5 (with or without addiction to computer games), between 29.5 and 73.5 (moderate addiction to computer game), and above 73.5 (severe addiction to computer games).[10]

Knowledge questions consist of a three-option answers. Each item had three options "right", "wrong", and "I do not know". Each correct answer received one score and wrong answers or I do not know option got zero. The TPB of the structured questionnaire were designed based on a 5-point Likert scale with a score of 1 to 5.

Attitude questions had 9 questions, subjective norms had 5 questions, perceived behavioral control had 5 questions, and behavioral intention had 5 questions that ranged from strongly disagree to strongly agree.

The researcher-made questionnaire questions were designed based on theories of planned behavior theory with the help of reliable books and resources. Then, its validity was confirmed by content validity method by summing up the opinions of ten faculty members and health experts (four health education, two epidemiologists, one community health, and three neurologists) with content validity index = 0.88 and content validity ratio = 0.84.

To determine the reliability of the researcher-made questionnaire, the questionnaire was completed by twenty individuals who matched with the sample and out of the sample and Cronbach's alpha coefficient for the whole scale to be 0.80.

The educational content is based on the TPB in eight 90-min training sessions (7 sessions for intervention students and a workshop for parents) to create and enhance students' knowledge and attitude toward computer games and their impact on health, self-awareness and effective communication skills, anger control skills, ways to build and improve physical and mental health by reducing dependence on computer games, reviewing barriers by students, and introducing alternatives to computer games. Furthermore, a workshop on parental supervisory role on adolescents' dependence on computer games was conducted with the aim of more parental monitoring of their children's behavior and the use of alternative methods. In the educational sessions, lectures, questions and answers, group discussion, and hands-on training using poster, tractor, film, and slideshow assistive devices using data projector were applied for the intervention group.

Data analysis was performed by SPSS 19 software (SPSS Inc., Chicago, Illinois, USA) using the Chi-square test, Fisher's exact test, independent *t*-test, repeated measures ANOVA, and Bonferroni *post hoc* test. Significance level was considered less than 0.05 ($P < 0.05$).

It should be noted that in order to comply with ethical principles, the purpose of the research was explained before collecting data for each sample, and the individual was assured that the obtained information was completely confidential and that information was collected only from those who were willing to participate and those who have a parental written consent form. In order to prevent the control group from being deprived of educational subjects, after the end of the study, one educational session was held for the control group.

Results

The mean age of the participants was 13.8 ± 0.9 years. Six (18.8%) participants were in the seventh grade, 13 (40.6%) in the eighth grade, and 13 (40.6%) in the ninth grade. The Kolmogorov–Smirnov test was used for normality of data distribution, and by considering the result of this test, parametric tests were used ($P < 0.05$). There was no significant difference between the two groups in terms of demographic variables and were similar [Table 1].

A comparison of mean dependence on computer games and constructs of the TPB was similar before and after the intervention in both the intervention and control groups for the mean score of model constructs. Although the mean score of computer game addiction decreased from 54.4 ± 12.2 to 49.1 ± 10.7 after the intervention, the mean score of knowledge increased from 5.4 ± 2.8 to 7.7 ± 1.8, attitude raised from 28.1 ± 3.3 to 29.4 ± 2.6, perceived behavioral control increased from 15.3 ± 5.3 to 16.2 ± 4.2, and behavioral intention increased from 16.8 ± 4.3 to 17.8 ± 3.3, respectively, which were statistically significant ($P < 0.05$) [Table 2].

A comparison of the mean changes of pre- and postintervention dependency scores in the intervention group was significantly lower than the control group (≤ 0.001). Furthermore, the mean of dependency score changes before and 3 months after the intervention in the intervention group, which was significantly lower than the control group, but these changes were not statistically significant. Comparing the mean changes in the dependency score immediately after the intervention was significantly lower in the intervention group than in the control group, which was statistically significant ($P = 0.023$). Furthermore, the mean changes of model structures were statistically significant ($P < 0.05$) [Table 3].

Table 1: Comparison of frequency distribution of demographic variables in intervention and control groups (*n*=32)

Group variable	Intervention	Control	*P*
Student age (years), mean±SD	13.8±0.9	13.8±1.1	1
Parental age (years), mean±SD			
Father	45.7±7.8	44.5±8.9	0.57
Mother	40.9±7.2	40.4±4.7	0.74
Student mean scores, mean±SD	17.38±1.8	17±2.1	0.46
Students' educational grade, *n* (%)			
Seventh	6 (18.8)	6 (18.8)	1
Eighth	13 (40.6)	13 (40.6)	
Ninth	13 (40.6)	13 (40.6)	
Parental education level, *n* (%)			
Father			
Elementary	6 (18.8)	7 (21.9)	0.35
Guidance	5 (15.6)	9 (28.1)	
Diploma	10 (31.3)	11 (34.4)	
Academic	11 (34.4)	5 (15.6)	
Mother			
Elementary	10 (31.3)	7 (21.9)	0.65
Guidance	6 (18.8)	9 (28.1)	
Diploma	8 (25)	10 (31.2)	
Academic	8 (25)	6 (18.8)	
Type of housing			
Villa	26 (81.2)	28 (87.5)	0.49
Apartment	6 (18.8)	4 (12.5)	
Father's job			
Employee	8 (25)	5 (15.6)	0.37
worker	6 (18.8)	11 (34.4)	
Shopkeeper	4 (12.5)	6 (18.8)	
Other Jobs	14 (43.7)	10 (31.3)	
Mother's job			
Housewife	21 (65.6)	29 (90.6)	0.06
Employee	6 (18.8)	3 (9.4)	
Others	5 (15.6)	0 (0)	

SD=Standard deviation

Discussion

The results of the present study showed a significant reduction in the score of computer game dependency in the intervention group. In other words, the designed educational intervention in this study reduced the mean score of dependency in the intervention group. In the study of Aeran Joo *et al.*, it was found that educational intervention to empower teens reduces stress and addiction to computer games.[11] A study by Çelik *et al.* in Turkey showed a similar result in reducing Internet addiction.[12] The results of this study can be attributed to the study of Park *et al.*[13] and Mun *et al.*[14] Like other studies, our study revealed that systematic educational intervention along with self-determination and self-regulation can decrease Internet dependency in students.

The findings of the current survey showed a significant change in the knowledge score in the intervention group immediately and 3 months after the intervention. In other words, the educational intervention designed in this study increased the knowledge of the intervention group. In fact, increasing students' knowledge of how to use the Internet is effective in reducing teenager's Internet addiction.

In line with the results of the present study, the results of Delshad Noghabi *et al.*,[8] Çelik *et al.*,[12] and Apisitwasana *et al.*[15] can be mentioned.

Overall, the results of this study and most of the investigations showed that systematic educational intervention can increase people's knowledge by considering important factors which are affecting behavior. Therefore, in order to increase students' knowledge of preventive behaviors, model-based educational interventions can be effective in the health system.

According to the results of the current study, there was a significant difference in the mean scores of attitude before, immediately, and 3 months after education in the intervention group compared to the control group. However, after the educational intervention, the intervention group's knowledge of the complications and consequences of computer games increased, which affected their attitude toward computer games and reduced their dependency on the game. In the study by Ismaili *et al.*,[16] they mentioned that attitude alone cannot guarantee behavior. Hubley and Copeman also pointed out that because of the complexities of behavior, changing knowledge does not always lead to changing attitudes and changing attitudes will not always lead to changing behavior.[17] Therefore, in order to reduce the dependency on computer games, in addition to modifying students' attitudes, attention should be paid to other influential factors.

The results of Zendetalab *et al.*,[18] Mohammadi Manesh *et al.*,[19] Mohammadi Zeyidi *et al.*,[20] and Delshad Noghabi *et al.*[8] studies were in agreement with the results of this study. Another consistent result was Vafaeinajar *et al.*'s study[10] which found that attitude was a significant predictor of computer game dependency.

There was also a positive correlation between attitude and playing time during the week, which was statistically significant. It means that the more positive the teenager's view of computer games, the more likely they were to play computer games and to increase their hours of use during the week. Further consistent results can be found in Zende Talab *et al.*[18] and Mohammadi Manesh *et al.*[19] studies in which using interventions based on planned behavioral model as a framework of work improves attitudes. Since attitudes are one of the predisposing

Table 2: Comparison of mean score of dependency, knowledge, and constructs of theory of planned behavior before, immediately, and 3 months after the intervention in two study groups (*n*=32)

Variable	Group	Mean±SD			*P*	Bonferroni test
		Time 1	Time 2	Time 3		
Dependency	Intervention	12.2±54.4	9.4±44.8	10.7±49.1	≤0.001	Time 1 > time 2 and time 2
	Control	10.9±46.8	9±45.9	11.7±44.5	0.56	-
t-test		*P*=0.01	*P*=0.64	*P*=0.11	-	-
Awareness	Intervention	1.8±7.7	1.7±8.7	2.8±5.4	≤0.001	Time 1 < time 2 and time 3
	Control	2.3±6.4	2.6±5.9	2.4±6.2	0.4	-
t-test		*P*=0.22	*P*≤0.001	*P*=0.017	-	-
Attitude	Intervention	3.3±28.1	3±31.4	2.6±29.4	≤0.001	Time 1 < time 2 and time 3
	Control	2.8±27.5	3±27.2	2.8±27.5	0.78	-
t-test		*P*=0.19	*P*≤0.001	*P*=0.007	-	-
Subjective norms	Intervention	3.3±17.2	3.8±18.6	3.7±17.4	0.05	Time 2 > time3
	Control	3.1±17.3	2.9±17.3	3.5±17.4	0.99	-
t-test		*P*=0.97	*P*=0.15	*P*=0.87	-	-
Perceived behavior control	Intervention	4.2±16.2	4.2±18.25	5.3±15.3	≤0.001	Time 1 < time 2
	Control	5.4±14.2	4.1±13.7	4.4±15.9	0.03	Time 1 > time 2
t-test		*P*=0.61	*P*≤<0.001	*P*=0.11	-	-
Behavioral intention	Intervention	3.3±17.8	3.3±19.5	4.3±16.8	≤0.001	Time 1 < time 2
	Control	5±15.2	4.3±16.9	4±19.1	≤0.001	Time 1 > time 2 and time 3
t-test		*P*=0.03	*P*=0.008	*P*=0.02	-	-

P<0.05 is significant. Time 1=Before the intervention, Time 2=Immediately after the intervention; Time 3=3 months after the intervention, SD=Standard deviation

Table 3: Comparison of mean changes of computer game dependency score and theory of planned behavior in the two study groups

Variable	Group	Mean±SD		
		Time 1	Time 2	Time 3
Dependency	Intervention	11.3±9.5	9.7±5.3	8.3±4.3
	Control	10.5±0.9	14±2.3	11.4±1.4
Independent *t*-test		*P*=0.003	*P*=0.23	*P*=0.027
Knowledge	Intervention	2.4±3.3	3.12±2.3	2±1
	Control	2.25±0.3	2.2±0.21	2.3±0.5
Independent *t*-test		*P*=0.001	*P*=0.003	*P*=0.007
Attitude	Intervention	4.6±3.3	3.6±1.25	2.3±2.1
	Control	3.8±0.2	3.8±0.46	3.6±0.2
Independent *t*-test		*P*=0.005	*P*=0.40	*P*=0.007
Subjective norms	Intervention	3.6±1.12	3.4±0.25	3±1.4
	Control	3.26±0.06	3.7±0.09	3.4±0.3
Independent *t*-test		*P*=0.17	*P*=0.86	*P*=0.11
Perceived behavior control	Intervention	4.8±2.9	4.8±0.84	2.6±2.1
	Control	4.11±2.8	5.6±1.72	4.5±0.5
Independent *t*-test		*P*=0.001	*P*=0.054	*P*=0.007
Behavioral intention	Intervention	3.27±2.65	4.3±0.93	3.1±1.7
	Control	3.9±2.8	5.3±3.8	4.1±1.7
Independent *t*-test		*P*=0.001	*P*=0.001	*P*=0.94

P<0.05 is significant. Time 1=Before the intervention; Time 2=Immediately after the intervention; Time 3=3 months after the intervention.

factors for initiating and sustaining health behaviors and are related to behavior, modifying the attitudes of computer-dependent students can reduce their dependency on these games. Therefore, this issue should be considered in educational programs.

The study revealed a significant increase in the score of subjective norms in the intervention group immediately after the study, indicating a positive effect of the educational program and a positive effect of influential individuals (such as parents and friends) on individual behavior. In other words, peer support and parental supervision had a significant effect on students' choice to play online. Students who were more supported by their peers were more likely to play online games, and with parental supervision, it was significantly reduced.

The results are consistent with the study findings of Mohammadi Zeydi,[20] Pakpour *et al*.,[21] Delshad Noghabi *et al*.,[8] Bashirian *et al*.,[22] and Wang *et al*.[23]

The results of this study and other studies indicate that in addition to the dependent individual, the role of others influencing one's behavior should be taken into account in order to include school-based and family-centered educational interventions in the anticipated programs. For this purpose, the present study was organized a workshop for all parents of school students.

Results showed that perceived behavioral control variable significantly increased immediately after educational program. Video games appear to be addictive among some users through rewards and processes that help them lose control of the game.[24]

The results of Vafaei Najar *et al*. showed that among the variables related to TPB, attitudes and perceived behavioral control had a significant predictive power in computer game dependency and intention to use computer games in teenagers.[10]

Nonconventional studies can be attributed to the study of Delshad Noghabi *et al*., where after the educational intervention, there was a significant difference in the scores of theories of TPB except the perceived behavioral control construct in the intervention group.[8]

The result of the studies by Pakpour *et al*., Mohammadi Zaidi *et al*.,[20] Zendetalab *et al*.,[18] and Mohammadi Manesh *et al*. were in line with present study, where the use of TPB-based interventions as a framework of work could improve perceived behavioral control.

Therefore, educational interventions based on the TPB that emphasizes perceived behavioral control constructs can be effective in preventive behaviors of dependency to computer games in students.

Health researchers should consider when designing interventions that reinforce the commitment to action and sense of empowerment of individuals is strengthened, and by providing information in an interactive environment along with providing appropriate feedback from teachers and observing progress, it can increase perceived control and reduce students' dependency on computer games.

The results of the present study showed that increasing the variables of knowledge, attitude, and perceived behavioral control is effective in promoting intention and decreasing the level of students' dependency on computer games.

In this study, there was a significant difference in the mean score of students' behavioral intention and their dependence on computer games before, immediately, and 3 months after education in the intervention group compared to the control group. However, there was no significant change in the control group. These findings indicate the effectiveness of the designed educational program. Given that intention is the main determinant of behavior and is influenced by three independent constructs of attitude, subjective norm, and perceived control, designing a TPB-based intervention can be effective.

The results are consistent with the study findings of Delshad Noghabi *et al*.,[8] Mohammadi Zeydi *et al*.,[20] Mohammadi Manesh *et al*.,[19] and Shakeri Nejad *et al*.[25]

Therefore, implementing an effective educational intervention on behavioral intention can be effective in reducing students' dependency on computer games. Furthermore, when students have sufficient and correct knowledge, along with positive attitudes about the impact of reducing computer game addiction on their physical, mental, and social health, and feeling that reducing their dependence on games as well as playing less is at their disposal, the intention to reduce their playing computer games has become more pronounced, and as a result, their dependence on computer games has diminished.

Limitation

One of the limitations of the present study was the use of self-report tools for measuring students' addiction to computer games. Furthermore, due to time limitation, follow-up was performed 3 months after the educational intervention, and long-term follow-up was not performed to maintenance of behavior.

Conclusion

The results of this study showed the effectiveness of the TPB-based educational intervention on the constructs of attitude, perceived behavioral control, and behavioral intention related to computer game dependence.

Therefore, by adopting the valuable strategies of this model, education managers can design and implement measures more effectively in educational programs to reduce adolescent dependency in computer game.

Furthermore, this educational model can also be used to correct other behavioral problems in adolescents.

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Conflicts of interest

There are no conflicts of interest.

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