

Applying the Theory of Planned Behavior to Computer Game Addiction of Adolescents

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Abstract: Social and emotional problems are critical features associated with excessive dependence on computer games. In this study, we applied the Theory of Planned Behavior (TPB) to computer game addiction in adolescents of Iran. This was a repeated-measures quasi-experimental study performed on 120 adolescents who were the steady customers of video game clubs and were diagnosed with computer game addiction. A self-administered questionnaire consistent with the TPB constructs as well as game addiction scales for teenagers was used for data collection. The questionnaires were filled out by participants at two stages-before and 6 months after the intervention. The validity and reliability of the questionnaire were evaluated through content validity and test-retest method, respectively. The data were analyzed using t, regression, Mann-Whitney, Chi-square and Wilcoxon tests through SPSS 20 at the significance level of 0.05. The results showed that intervention and control groups were significantly different in terms of the mean score of behavioral intention, subjective norm; perceive behavioral control and computer game dependence after the intervention ($p = 0.05$). The results of this study showed that the intervention is based on the theory of planned behavior can help alleviate computer game dependence in teenagers. The limitations of this study were not having a follow up and access to participants.

Key words: Games, interventions, behavioral health, participants, control groups, questionnaires

INTRODUCTION

Video or computer game addiction refers to an excessive obsession with computer games that may interrupt gamer's daily life. In this case, the gamers feel an obligation to play which may result in their alienation from other social communications and their concentration on successful performance in the game rather than real life events (Weinstein, 2010). Such dependence not only brings about financial problems for adolescents but also interferes with their school activities and interpersonal and social relationships (Griffiths and Wood, 2000).

The emergence of social and emotional problems caused by the excessive dependence on computer games is the most important side-effect of this addiction (Griffiths and Wood, 2000). In general adolescents are more likely to show signs of compulsive game dependence than any other age group (Ha *et al.*, 2007); it

is especially observed in teenage boys who are more susceptible to video game addiction than teenage girls (Gentile, 2009).

Several studies have shown that use of computer games is associated with a lot of different problems (Grusser *et al.*, 2006). Caplan for instance has shown that the amount of time spent on video games is associated with higher levels of depression and conduct problems (Caplan, 2006).

Previous studies about internet addiction have investigated several associated psychological variables such as shyness, loneliness, self-consciousness, anxiety, depression and interpersonal relations (Wallenius and Punamaki, 2008). Some studies revealed a significant association between Internet addiction and depressive symptoms among adolescents and high school students (Sanders and Williams, 2016; Ko *et al.*, 2012; Lemmens and Hendriks, 2016).

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Computer games may lead to long-term changes in the reward circuit which are basically similar to the effects of drug dependence (Young, 2004). In the study by Abdolkhaleghi *et al.* (2005) adolescents preferred exciting and violent games; most of them had over the 1 year experience of playing video games. The majority of the participants spent 1-5 h a week on video games and only 5.41% of parents were aware of the content of their children's games. The results by Abdolkhaleghi *et al.* (2005) suggested that persistent exposure to video games, especially the violent games, provoked aggression and exacerbated the academic performance of students. A great deal of research has been conducted to examine the negative life consequences associated with online gaming or other types of internet use. In some studies, negative consequences are part of the operationalization or diagnosis criteria of addictive or problematic by Charlton and Danforth (2007).

To alleviate computer game dependence, there is a need for educational programs to promote the health and change the behavior of dependent individuals. Healthy behavior change programs are only effective when their content is suitable for the target population and intended healthy behavior (Griffiths and Meredith, 2009). Research has shown that theory-based educational programs, rooted in the patterns of behavior change are the most effective ones (Tehrani *et al.*, 2016). One such theory is the Theory of Planned Behavior (TPB). TPB is used in a wide range of health behaviors such as dieting, consumption of contraceptive pills, exercise, participation in health screening programs, road safety, sex education, fast food intake and computer games (Tolma *et al.*, 2006). This theory is the best predictor of an individual's behavior based on the intention to perform a particular behavior. TPB argues that the intention is the underlying stimulus of a behavior which is in turn is influenced by the attitude toward the behavior, subjective norms of the behavior and the sense of control over behavior in terms of the extent of difficulty or convenience (Armitage, 2005).

The TPB posits that behavioral performance results from reasoned deliberations mediated by the intention to perform a specific behavior. Intention is predicted by the person's attitude in which attitude is defined as the positive or negative evaluation of the behavior in question by the Subjective Norm (SN) defined as the perception of whether important others wish or expect the individual to behave in a certain way and by Perceived Behavioral Control (PBC) defined as the individual's perception of how easy or difficult, it is to execute the behavior (Ajzen, 2011).

A review of studies on education programs suggests that few studies have addressed the effect of theories of

behavior change on computer game dependence. Given the importance of this subject and the lack of research on the effect of TPB-based education on computer game addiction, the present study seeks to bridge this gap by conducting a study on the adolescents attending the video game clubs in Iran.

MATERIALS AND METHODS

Participants: The population study of this quasi-experimental research consisted of adolescents attending video game centers. The 12 active video game centers were randomly chosen as the study sample. All 10-19 years old teenagers who were admitted to the club and were also addicted to computer games between June 2014 to December 2015 were selected as samples. Therefore, 120 teenagers were randomly assigned to two intervention and control groups-each consisting of 60 participants. To determine the samples of the intervention and control groups to be included in the TPB-based educational program, 6 video game clubs were randomly assigned to the experiment group and 6 to the control group. The inclusion criteria included; desire to participate in the study having 10-19 years of age and steady presence based on the knowledge of club director in the video game clubs. The exclusion criteria were the absence of more than two sessions in the educational classes, partial completion of the questionnaires and reluctance to continue participation in the study.

Measurements: The main research instrument was a questionnaire with three sections; the demographic characteristics of participants with 11 items, a questionnaire that measured the video game dependence with 21 items according to a 5 point Likert scale (never, rarely, sometimes, often, most of the times) over a 6 months period and 3) a set of questions about evaluating the theoretical TPB constructs that measured the attitudes (5 items) subjective norms (5 items), perceived behavioral control (5 items) and behavioral intention (4 items) based on a 5 point Likert scale (ranging from strongly disagree, disagree, neither disagree/not agree, agree and strongly agree scores).

Although, not part of the TPB constructs, knowledge was also assessed in this study. Knowledge of adolescents were measured through 6 items. The participants were expected to answer the items choosing yes (1 point), somehow (2 points) and no (3 points).

To determine the validity of the questionnaire, ten experts in the field of health education and psychology were asked to evaluate the statements of the questionnaire as "completely acceptable", "acceptable" and "inacceptable". Furthermore to determine the stability

coefficient of the TPB constructs and the questionnaire of computer games dependence among adolescents, the test-retest method was used. Therefore, the questionnaire was administered two times within 14 days interval to 15 adolescents who had been excluded from the study centers. The results showed a strong correlation of about 80% ($R = 0.84$) between two stages of the test.

Ethical considerations: The proposal of this study was approved and supervised by the research committee and medical ethic committee of Mashhad University of Medical Sciences. As for ethical considerations, before distributing the questionnaire, the required permissions were obtained from the directors of each video game club and the participants were assured about the confidentiality of their information and the voluntary nature of their participations.

Educational intervention: The main axis of educational intervention was based on linear regression analysis between dependence on computer games and constructs of the theory before the intervention. The educational intervention was presented in three theoretical sessions and 16 sports sessions which included futsal and karate exercises. The materials were presented in form of pamphlets, posters and short film screenings. To hold futsal and karate classes, two relevant sports trainers were invited to provide necessary instructions to the participants over the course of the study. The educational content was presented in 3, 60 min theoretical sessions over 14 days; it was followed by sports classes which were held two times a week for 8 consecutive weeks. Before the intervention being explained, schedule and conditions for participation in the theory sessions and exercise classes such as attending in all the classes were free of charges.

Data collection: Data collection in the first phase (pre-test) was simultaneously implemented in both experiment and control groups. After administering the pretest, the TPB-based intervention program was carried out for the experiment group. During the course of the study, the control group did not receive any special education about computer game addiction. To evaluate the intervention program, 6 months after the end of the training program, the questionnaires were filled out by the participants within 15-20 min in a self-report method.

Statistical analysis: The data were then analyzed by SPSS 20 using descriptive (frequencies, measures of central tendency and dispersion) and analytical

(independent t-test, regression, Mann-Whitney, etc.) statistical methods. A $p < 0.005$ was assumed as significant.

RESULTS

The median age of participants was 15 years. In terms of education, 11.7% of the mothers and 14.4% of the fathers had a BS degree or higher. Also, 22.7% of the fathers were government employees and mothers were mainly housewives; only 4.14% of them had an office job. According to the results, adolescents were more likely to spend their time in video game clubs in company with their friends in the evenings. Their favorite games were soccer and violent games, respectively. The most appealing feature of a game for adolescents was its level of excitement and competitiveness.

The average time spent on computer games was 15 h on weekdays and 8 h on weekends. The results show that there was a significant relationship between age and computer game dependence ($p = 0.001$). Also, the time spent on computer games during weekdays (per hour) was significantly correlated with computer game dependence ($p = 0.05$). On average, computer game dependent adolescents spent more time on playing computer games than non-dependent adolescent did.

According to the results, among TPB constructs, there was a significant correlation between age and the perceived behavioral control ($p = 0.05$). Furthermore, there was a significant positive relationship between attitudes and play time during weekdays ($p = 0.05$); meaning that adolescents who had a positive attitude toward computer games were more likely to spend greater time on computer games during weekdays. The results of linear regression suggested that among the demographic variables, weekly play time was a strong predictor of computer game dependence followed by age as the second important predictive demographic variable ($R^2 = 0.096$).

According to the results of the study, perceived behavioral control, attitudes, subjective norms and knowledge together explained 32% of the variance of the computer game dependence in the study population. Among TPB constructs, attitudes and knowledge had a significant effect on computer games dependence whereas subjective norms and perceived behavioral control did not have any effect on computer games dependence in the study sample ($R^2 = 0.324$) (Table 1).

The results showed that there was not any significant difference between scores of knowledge and attitude in both experiment and control groups before the

Table 1: Linear regression analysis of the impact of attitude, control perceived behavior, subjective norm on the dependence on computer games among the study population

Dependent variables	Independent variable	Standard β	p-values	R ²
Computer game dependence	Knowledge	0.132	p = 0.019	0.3240
	Attitude	0.277	p = 0.000	
	Subjective norms	0.530	p = 0.382	
	Perceived behavioral control	0.015	p = 0.806	

Table 2: Comparison between the median and interquartile range of scores of knowledge and attitudes before and after the intervention in both experiment and control groups during the study

Interventions	Scores of knowledge			Scores of attitudes		
	Control group (n = 60) median (Interquartile Range (IQR))	Experiment group (n = 60) Median (IQR)	Mann-Whitney test scores	Control group (n = 60) Median (IQR)	Experiment group (n = 60) Median (IQR)	Mann-Whitney test scores
Before	13 (2)	12 (3)	p = 0.433 Z = 0.768	16 (30)	16 (4)	p = 0.363 Z = 0.910
After	12 (5)	9 (2)	p = 0.000 Z = 5.504	15 (30)	18 (4)	p = 0.000 Z = 3.73
	Wilcoxon test result p = 0.452 Z = 0.752	p = 0.000 Z = 5.362		Paired t p = 0.000 Z = 4.04	Wilcoxon p = 0.904 t = 121	

Table 3: Comparison of the mean and standard deviation of behavioral intention and subjective norm scores before and after the intervention in experiment and control groups

Parameters	Behavioral intention			Subjective norm		
	Control group (n = 60) mean±SD	Experiment group (n = 60) mean±SD	Independent t-test results	Control group (n = 60) mean±SD	Experiment group (n = 60) mean±SD	Independent t-test results
Before	8.65±2.15	7.80±0.086	p = 0.086 t = 1.733	15.38±3.35	15.48±3.44	p = 0.746 t = 0.325
After	8.66±2.36	11.71±2.08	p = 0.000 t = 0.178	15.11 ±3.36	16.81±3.22	p = 0.006 t = 2.82
Test results	Paired t p = 0.931 t = 0.087	Wilcoxon p = 0.000 Z = 5.752		p = 0.980 t = 0.33	p = 0.025 t = 2.30	

Table 4: Comparison of mean and standard deviation of the perceived behavioral control before and after the intervention in control and experiment groups during the study

Parameters	Perceived behavioral control			Computer game dependence		
	Control group (n = 60) mean±SD	Experiment group (n = 60) mean±SD	Independent t-test results	Control group (n = 60) mean±SD	Experiment group (n = 60) mean±SD	Independent t-test results
Before	15.13±3.73	15.48 ± 3.44	p = 1.0	3.40 ± 0.24 t = 0.000	3.45 ± 0.27	p = 0.288 t = 1.06
After intervention	16.33 ± 4.23	16.81 ± 3.22	p = 0.1117 t = 1.580	3.40 ± 0.25	2.29 ± 0.49	p = 0.000 t = 15.31
Results of paired t-test		p = 0.142 t = 1.488	p = 0.000 t = 3.82		p = 0.142 t = 1.488	p = 0.000 t = 3.82

intervention but after the intervention, experiment and control groups were significantly different in this regard (Table 2).

As for behavioral intention and subjective norms, the results showed that experiment and control groups were significantly different in terms of the mean score of behavioral intention and subjective norm after the intervention (Table 3).

The results showed that experiment and control groups were significantly different in terms of the mean scores of perceived behavioral control and computer game dependence after the intervention (Table 4).

DISCUSSION

This study was an attempt to investigate the effect of TPB-based education on computer games addiction among adolescents who were the steady customer of video game clubs. Generally, before the intervention, experimental and case groups were similar in terms of distribution of demographic characteristics. The results showed a significant decrease in the computer game dependence of teens trained based on the TPB model compared with teens of the control group. This indicates that there was a

positive impact intervention based on the TPB model on prevention of the computer game addiction.

Joo and Park (2010) also investigated the effects of an empowerment education program in the prevention of internet games addiction in middle school students. By the end of their study, they suggested that the educational intervention should be used for adolescents to help them control their stress, internet games addiction and to increase their empowerment. The result of this study concurs with the results of Joo and Park's study.

With the rapid growth of digital media including the internet and mobile phones and the increasing number of people with access to such media it seems that educational interventions are necessary for the proper use of the media (Buckingham *et al.*, 2005).

In the present study in addition to a significant decrease of computer game dependence among the experimental group, teen's knowledge and attitude also significantly increased after the intervention; this was when no such increase was observed among the control group. This shows that interventions based on the TPB model also increase teen's knowledge and attitude toward the proper use of computer games.

Knowledge about risks of computer game addiction is the prerequisites of performing a behavior for prevention of computer game addiction. If teens lack the relevant knowledge they will not accept reasons for enduring difficulties associated with that behavior (Chiu *et al.*, 2004).

Hilgard *et al.* (2013) in their study "individual differences in motives, preferences and pathology in video games; the gaming attitudes, motives and experiences scales (GAMES)" also founded that attitudes (positive attitude towards drugs) were a powerful predictor of video game addiction. Positive attitude to the game will cause teens to spend more time on computer games. Thus, if their attitude towards computer games is modified it can be a positive step towards the prevention of video game addiction (Hartmann *et al.*, 2012).

The results of the study suggested that there was a significant correlation between hours weekly spent playing computer games and gaming addiction, meaning that greater dependency on computer games resulted in dedicating greater time to computer games during weekdays. This finding is consistent with the results by Joo and Park (2010).

Another important result of the present study was about subjective norms variations before and after the intervention. After the intervention a significant increase was observed in subjective norms among the experimental group compared to the control group. Thus, results

indicate that to perform proper behaviors for use of computer games, development of subject norms and social supports are essential.

Griffiths and Meredith (2009) found that 25% of adolescents played video games to become assimilated into their peer groups. They also found that teenage boy gamers were more likely to play video games under the pressure of their peer groups.

A comparison of the mean score of behavioral intention in the experiment group suggested a significant difference before and after the educational intervention. The results by Hajiagha *et al.* (2012) also indicate the effect of educational intervention on the mean score of behavioral intention which leads to a significant rise in the mean score of behavioral intention among the intervention group.

As regards that this study was performed among adolescent boys for their dependence on computer games, it is also recommended that in the future a research be done on adolescent girl's dependence on computer games. It is also recommended in the future, it would be interesting for experimental studies to apply other change behavior models and theories to analyze other factors affecting the gaming addiction.

CONCLUSION

A large portion of the beliefs, values and knowledge of adulthood are shaped at early ages. Besides the environment and the family, this learning is primarily transferred through media and sometimes video games. Thus, special attention needs to be paid to the adolescent exposure to media production. Finally, according to the results of this study concerning the effectiveness of TPB in predicting video game addiction in adolescents, it can be concluded that TPB-based interventions can be effective in long term.

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REFERENCES

- Abdolkhaleghi, M., A. Davachi, F. Sahbaie and M. Mahmoudi, 2005. Surveying the association between computer-video games and aggression in male students of guidance schools in Tehran, 2003. Med. Sci. J. Islamic Azad Univ. Tehran Med. Branch, 15: 141-145.

- Ajzen, I., 2011. Theory of Planned Behavior. In: *Handb of Theories of Social Psychology*, Lange, P.A.M.V., W. Arie, E. Kruglanski and H. Tory (Eds.). SAGE Publications, London, Uk., ISBN:978-0-85702-960-7, pp: 438-459.
- Armitage, C.J., 2005. Can the theory of planned behavior predict the maintenance of physical activity?. *Health Psychol.*, 24: 235-245.
- Buckingham, D., S. Banaji, D. Carr, S. Cranmer and R. Willett, 2005. The media literacy of children and young people: A review of the research literature. MA Thesis, Centre for the Study of Children, Youth and Media Institute of Education, University of London, London Knowledge Lab, London, England.
- Caplan, S.E., 2006. Relations among loneliness, social anxiety and problematic internet use. *CyberPsychology Behav.*, 10: 234-242.
- Charlton, J.P. and I.D. Danforth, 2007. Distinguishing addiction and high engagement in the context of online game playing. *Comput. Hum. Behav.*, 23: 1531-1548.
- Chiu, S.I., J.Z. Lee and D.H. Huang, 2004. Video game addiction in children and teenagers in Taiwan. *CyberPsychology Behav.*, 7: 571-581.
- Gentile, D., 2009. Pathological video-game use among youth ages 8 to 18: A national study. *Psychol. Sci.*, 20: 594-602.
- Griffiths, M. and R.T. Wood, 2000. Risk factors in adolescence: The case of gambling, videogame playing and the internet. *J. Gambling Stud.*, 16: 199-225.
- Griffiths, M.D. and A. Meredith, 2009. Videogame addiction and its treatment. *J. Contemp. Psychotherapy*, 39: 247-253.
- Grusser, S.M., R. Thalemann and M.D. Griffiths, 2006. Excessive computer game playing: Evidence for addiction and aggression?. *CyberPsychology Behav.*, 10: 290-292.
- Ha, J.H., S.Y. Kim, S.C. Bae, S. Bae and H. Kim *et al.*, 2007. Depression and internet addiction in adolescents. *Psychopathology*, 40: 424-430.
- Hajiagha, P.A., M.I. Zeidi and M.B. Zeidi, 2012. The impact of health education based on theory of planned behavior on the prevention of the AIDS among adolescents. *Iran. J. Nurs.*, 25: 1-13.
- Hartmann, T., Y. Jung and P. Vorderer, 2012. What determines video game use?. *J. Med. Psychol.*, 24: 19-30.
- Hilgard, J., C.R. Engelhardt and B.D. Bartholow, 2013. Individual differences in motives, preferences and pathology in video games: The Gaming Attitudes, Motives and Experiences Scales (GAMES). *Front. Psychol.*, Vol. 4, 10.3389/fpsyg.2013.00608
- Joo, A. and I. Park, 2010. Effects of an empowerment education program in the prevention of internet games addiction in middle school students. *J. Korean Acad. Nurs.*, 40: 255-263.
- Ko, C.H., J.Y. Yen, C.F. Yen, C.S. Chen and C.C. Chen, 2012. The association between Internet addiction and psychiatric disorder: A review of the literature. *Eur. Psychiatry*, 27: 1-8.
- Lemmens, J.S. and S.J. Hendriks, 2016. Addictive online games: Examining the relationship between game genres and internet gaming disorder. *Cyberpsychology Behav. Soc. Networking*, 19: 270-276.
- Sanders, J.L. and R.J. Williams, 2016. Reliability and validity of the behavioral addiction measure for video gaming. *Cyberpsychology Behav. Soc. Networking*, 19: 43-48.
- Tehrani, H., F. Majlessi, D. Shojaeizadeh, R. Sadeghi and M.H. Kabootarkhani, 2016. Applying socioecological model to improve women's physical activity: A randomized control trial. *Iran. Red Crescent Med. J.*, Vol. 18,
- Tolma, E.L., B.M. Reiningger, A. Evans and J. Ureda, 2006. Examining the theory of planned behavior and the construct of self-efficacy to predict mammography intention. *Health Educ. Behav.*, 33: 233-251.
- Wallenius, M. and R.L. Punamaki, 2008. Digital game violence and direct aggression in adolescence: A longitudinal study of the roles of sex, age and parent-child communication. *J. Appl. Dev. Psychol.*, 29: 286-294.
- Weinstein, A.M., 2010. Computer and video game addiction a comparison between game users and non-game users. *Am. J. Drug Alcohol Abuse*, 36: 268-276.
- Young, K.S., 2004. Internet addiction: A new clinical phenomenon and its consequences. *Am. Behav. Sci.*, 48: 402-415.