Gaming Duration and Preferences: Relationships with Psychiatric Health, Gaming Addiction Scores and Academic Success in High School Students

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Abstract

Problematic gaming behavior is an important problem that may lead to a recently introduced psychiatric condition named internet gaming disorder (IGD). Gaming addiction has been reported to have major influence on the lives of adolescents and young adults affected by it. Our aim was to determine relationships between gaming-related parameters, academic success, levels of depression, anxiety and stress, and gaming addiction scores. We performed a cross-sectional study comprised of 499 non-senior high school students from the Bakırköy district of Istanbul. Depression, anxiety and stress were measured with the DASS-21, gaming addiction was measured via the IGDS9-SF. A single questionnaire form was prepared to record demographics, game play behavior and preferences, DASS-21 scores and IGDS9-SF scores. Girls comprised 80.2% (n=400) of the participants in this study. Eighty-eight (17.6%) students reported that they did not play games. There was a statistically significant worsening in IGDS9 scores and all subscales of the DASS-21 with increased game playing time. Gaming addiction score was higher in those that reported being academically unsuccessful. Multivariate regression analysis revealed that the factors that increased IGDS9 scores were: time spent gaming, and preference of action, simulation or social media games. Whereas, smartphone gaming was found to be independently associated with lower IGDS9 scores. The association of higher IGDS9 scores with gaming time and preference of action, simulation and social media games, and lower scores with smartphone gaming are interesting results and may have implications in the approach to and treatment of those with IGD.

Keywords: internet gaming disorder, depression, anxiety, stress, academic success, smartphone

1. Introduction

Since the advent of the first commercial games in the 1970s, video games (or computer games) have become one of the most important modes of amusement (Cade & Gates, 2017). The growth of the video game industry has surpassed the growth of any other industry in the entertainment sector, especially in the last decade (Marchand & Hennig-Thurau, 2013; Wong, 2011). The flexibility of the industry in terms of providing universally acclaimed titles for almost all interests and any electronic platform with input and visual output devices has led to an increase in the number of persons playing video games in all age groups (Quandt, Grueninger, & Wimmer, 2009). However, the industry is still driven by the adolescent and young adult age groups (Griffiths, Davies, & Chappell, 2004).

Recent studies focusing on gaming, report conflicting findings regarding their influence on behavior and psychological characteristics (Cade & Gates, 2017). While some studies have suggested a propensity for aggressive behavior among those playing violent games (Anderson & Bushman, 2001), others have shown that video games contribute to attributes such as dexterity and decision-making (Lynch, Aughwane, & Hammond, 2010). Although the different views on this matter remain to be discussed, it is undeniable that gaming addiction has become an important problem as it has been shown to reduce academic success, isolate individuals from social surroundings and negatively affect inter-personal relationships, particularly among adolescents and young adults (Jacobsen & Forste, 2011; Lo, Wang, & Fang, 2005).

It is now known that the traits of individuals with problematic levels of game playing behavior are, in essence, closely related to the characteristics of persons with other types of addictive disorders (Gentile, 2009; Kuss & Griffiths, 2012). The DSM-V introduced the term 'internet gaming disorder' (IGD) in 2013, and this condition has been incorporated into the ICD-11 as 'gaming disorder' diagnosis (Petry & O'Brien, 2013). After these

recognitions, the interest in IGD (or gaming addiction) has increased with many studies aiming to determine the effects of gaming addiction on the social, personal and psychological features of those affected by the condition. Although the literature on this topic has shown adverse consequences such as skipping school, reduced academic standing and social/psychological problems including depression, anxiety and stress (Kaess et al., 2017; Kim et al., 2016; Wang, Cho, & Kim, 2018), there is still much to be discovered on the effects of gaming addiction and its influence on young individuals, particularly regarding game playing behaviors and preferences.

Therefore, this study was planned to address the following questions: (1) Is game playing time associated with students' characteristics and their levels of gaming addiction and stress? (2) Are there any differences between academically successful and unsuccessful students in terms of gaming addiction scores? (3) Is there any association between game type and gaming addiction score?

2. Method

2.1 Research Method

A general survey model has been employed in the study. Survey models refer to research approaches that aim to describe past or existing situations. The situation, event, individual, or object related to the study is used to determine their own terms (Karasar, 2009).

2.2 Population and Sampling

This cross-sectional study included 499 high school students from high schools located in Bakırköy, İstanbul.

2.3 Sampling Procedures

We randomly selected schools from all high schools located in Bakırköy using Microsoft Excel, and we aimed to reach all students in these schools except for those in their senior year (12th grade). The students, who attended school on the day of inclusion for each high school and agreed to participate, were included into the study. Those who did not complete at least 90% of the questionnaire and those who did not fill and sign the written consent form were excluded from the study.

2.4 Data Collection

Data collection was performed using a questionnaire which was filled by students in their classes under the supervision of researchers. Filling the questionnaire lasted around 15-20 minutes.

2.5 Data Collection Tools

The questionnaire included students' age, gender, grade, school performance, DASS-21 scale and IGDS-9 scale. In addition, the students were asked what kind of games they played and preferred, how long they played on average in one day, and on what platform they played. The questionnaire included students' age, gender, grade, school performance, DASS-21 scale and IGDS-9 scale. In addition, the students were asked what kind of games they played and preferred, how long they played on average in one day, and on what platform they played.

The school performance of students was evaluated by self-assessment as a part of the questionnaire. They were asked if they felt themselves to be successful while taking into account their average GPA in comparison to their peers. Game types were categorized as sport games, car racing games, desktop games, simulation games, strategy/roleplaying games, social media games and others. They were also asked to sort game types in order from favorite type to least favorite. Game platforms were defined as: computer, gaming console, mobile phone and tablet. The IGDS9-SF is a 9-item scale that grades gaming addiction based on the respondent's gaming activities (online or offline) within the past 12 months. All questions are answered on a Likert scale ranging from 1 to 5 (never to very often). Higher scores show higher gaming addiction (Arıcak, Dinç, Yay, & Griffiths, 2018; Pontes & Griffiths, 2015). The DASS-21 is a 21 item scale that grades depression, anxiety and stress based on the responses to each statement. All statements are answered on a Likert scale ranging from 0 (does not apply at all) to 3 (applies very much, or most of the time). Statements 3, 5, 10, 13, 16, 17 and 20 assess depression, statements 2, 4, 7, 9, 15, 19 and 20 assess anxiety, and the remaining questions assess stress. In the short form, the Likert scale values are multiplied by 2, and overall score for each scale is calculated by summing. The resultant values are used to determine severity groups (normal, mild, moderate, severe, extremely severe) (Henry & Crawford, 2005; Yılmaz, Boz, & Arslan, 2017).

2.6 Statistics and Data Analysis

All analyses were performed on SPSS v21. The evaluation of normality of distribution was performed with the Kolmogorov-Smirnov test. Non-normally distributed variables were analyzed with the Kruskal Wallis test. For pairwise comparison, the Bonferroni correction method was used. Categorical variables were evaluated by using

Chi-square tests. Data is given as median (minimum - maximum) for continuous variables and frequency (percentage) for categorical variables. Relationship between IGDS9-SF scores and game type preferences were assessed by calculation of the Spearman Correlation Coefficient. We performed multiple regression analysis with stepwise selection method to determine factors that were significantly effective on IGDS9-SF scores. $p<0.05$ values were accepted to demonstrate statistically significant results.

3. Results

A total of 99 boys and 400 girls completed the questionnaire. All participants were attending 9th, 10th or 11th grade. Students were grouped based on the amount of time they spent gaming per day (none, < 1 hour, 1–7 hours, and > 8 hours). Gender distribution, IGDS9 score, and all subscales of the DASS-21 score showed significant differences among these groups. Boys were found to spend significantly more time gaming compared to girls ($p<0.001$). Among the 99 boys, 32 (32.3%) reported that they played games in excess of 8 hours every day; whereas, among the 400 girls, only 41 (10.3%) reported this amount of time spent gaming. The scores of the IGDS9 and DASS-21 scales showed a statistically significant increase (worsening) as gaming time increased ($p<0.001$) (Table 1).

Table 1. Summary of volunteers' characteristics regarding time spent playing games per day

	None	< 1 hour	1 - 7 hours	> 8 hours	Total	p
N	88	165	173	73	499	N.A
Gender						
Girl	84 (95.45%)[a]	148 (89.70%)[a]	127 (73.41%)[b]	41 (56.16%)[c]	400 (80.16%)	<0.001
Boy	4 (4.55%)	17 (10.30%)	46 (26.59%)	32 (43.84%)	99 (19.84%)	
Grade						
9th	18 (20.45%)	40 (24.24%)	37 (21.39%)	11 (15.07%)	106 (21.24%)	
10th	16 (18.18%)	36 (21.82%)	47 (27.17%)	24 (32.88%)	123 (24.65%)	0.264
11th	54 (61.36%)	89 (53.94%)	89 (51.45%)	38 (52.05%)	270 (54.11%)	
Education Performance						
Unsuccessful	54 (61.36%)	112 (67.88%)	116 (67.05%)	54 (73.97%)	336 (67.33%)	0.405
Successful	34 (38.64%)	53 (32.12%)	57 (32.95%)	19 (26.03%)	163 (32.67%)	
IGDS9	10 (9 - 27) a	11 (9 - 36) b	14 (9 - 41) c	21 (9 - 45) d	13 (9 - 45)	<0.001
DASS-21 scores						
Depression	2 (0 - 18) a	2 (0 - 18) a	3 (0 - 17) ab	5 (0 - 21) b	3 (0 - 21)	0.001
Anxiety	2 (0 - 15) a	2 (0 - 19) ab	4 (0 - 19) bc	5 (0 - 19) c	3 (0 - 19)	<0.001
Stress	2 (0 - 15) a	3 (0 - 18) a	4 (0 - 16) a	6 (0 - 20) b	3 (0 - 20)	<0.001
DASS-21 groups						
Depression						
Normal	64 (72.73%) a	117 (70.91%) a	103 (59.54%) b	31 (42.47%) c	315 (63.13%)	
Mild	5 (5.68%)	13 (7.88%)	29 (16.76%)	13 (17.81%)	60 (12.02%)	
Moderate	11 (12.50%)	22 (13.33%)	28 (16.18%)	15 (20.55%)	76 (15.23%)	0.001
Severe	8 (9.09%)	13 (7.88%)	13 (7.51%)	14 (19.18%)	48 (9.62%)	
Extremely Severe	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	
Anxiety						
Normal	57 (64.77%) a	90 (54.55%) ab	85 (49.13%) b	23 (31.51%) c	255 (51.10%)	
Mild	9 (10.23%)	24 (14.55%)	25 (14.45%)	14 (19.18%)	72 (14.43%)	
Moderate	11 (12.50%)	17 (10.30%)	26 (15.03%)	9 (12.33%)	63 (12.63%)	0.010
Severe	3 (3.41%)	16 (9.70%)	15 (8.67%)	9 (12.33%)	43 (8.62%)	
Extremely Severe	8 (9.09%)	18 (10.91%)	22 (12.72%)	18 (24.66%)	66 (13.23%)	
Stress						
Normal	73 (82.95%) a	128 (77.58%) a	131 (75.72%)a	42 (57.53%) b	374 (74.95%)	
Mild	6 (6.82%)	17 (10.30%)	22 (12.72%)	10 (13.70%)	55 (11.02%)	
Moderate	6 (6.82%)	10 (6.06%)	15 (8.67%)	9 (12.33%)	40 (8.02%)	0.002
Severe	3 (3.41%)	9 (5.45%)	5 (2.89%)	9 (12.33%)	26 (5.21%)	
Extremely Severe	0 (0.00%)	1 (0.61%)	0 (0.00%)	3 (4.11%)	4 (0.80%)	

Note. Data given as median (minimum - maximum) for continuous variables and frequency (percentage) for categorical variables.

When we evaluated the relationship between self-assessed academic performance and gaming addiction (as measured by IGDS9), we found that IGDS9 scores were significantly higher among those that reported being unsuccessful (p=0.020).

Table 2. IGDS9 scores regarding education performance

	Unsuccessful	Successful	Total	p
N	336	163	499	N.A
IGDS9	13 (9 - 45)	12 (9 - 41)	13 (9 - 45)	0.020

Note. Data given as median (minimum - maximum)

We then evaluated whether game preference had any influence on IGDS9 scores, we found that any type of game preference (most played games) was positively correlated with IGDS9 score (p<0.001 for all). However, those that stated they preferred (and more frequently played) action and simulation games had higher correlation coefficients (r=0.406 and r=0.395) compared to other game types.

Table 3. Relationship between igds9 scores and game type preferences

		Sport Games	Car (Racing) Games	Action Games	Desktop Games	Simulation Games	Strategy/Rolling Games	Social Media Games	Other Games
IGDS9	r	0.214	0.294	0.406	0.305	0.395	0.366	0.303	0.232
	p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	N	499	499	499	499	499	499	499	499

r: Spearman Correlation Coefficient.

We performed multiple regression analysis with IGDS9-SF scores as the dependent variable, while gender, game type preference, time spent gaming, and gaming platform were defined as independent variables. We found that time spent gaming (p<0.001), action games (p=0.003), simulation games (p<0.001) and social media games (p=0.014) were significantly related with increased IGDS9 scores. Also, playing games on smartphones (p<0.001) was significantly related with lower IGDS9 scores compared to other gaming platforms. On the other hand, gender (p=0.290), sport games (p=0.253), car/racing games (p=0.946), desktop games (p=0.734), strategy/rolling playing games (p=0.100), and playing games on gaming consoles (p=0.577), computers (p=0.483) or tablets (p=0.832) were not found to be significant factors.

Table 4. Multiple linear regression model with IGDS9-SF as the dependent variable

	Unstandardized Beta Coefficients	Standard Error	Standardized Beta Coefficients	95.0% Confidence Interval for Beta		t	p
(Constant)	6.327	0.953		4.454	8.200	6.637	<0.001
Action Games	0.684	0.228	0.133	0.235	1.133	2.995	0.003
Simulation Games	1.093	0.260	0.183	0.582	1.605	4.201	<0.001
Social Media Games	0.517	0.209	0.098	0.106	0.928	2.471	0.014
Time	2.320	0.295	0.323	1.741	2.899	7.876	<0.001
Smartphone	-2.164	0.602	-0.135	-3.346	-0.982	-3.596	<0.001

$R^2 = 0.342$; F = 52.78; p = <0.001.

4. Discussion

Although there was no significant difference in terms of self-assessed academic performance in regard to time spent gaming, students that deemed themselves academically unsuccessful were found to have higher IGDS9 scores. IGDS9 scores showed a gradual and significant increase with increased playing time (none, <1 hour, 1–7 hours and >8 hours). The DASS-21 scores measuring depression, anxiety and stress levels, were also found to be worse among those spending more time playing games. The percentage of students with anxiety scores conclusive for 'severe' or 'extremely severe' anxiety was of particular interest, as more than a third (37%) of those playing games in excess of 8 hours a day were found to have severe or extremely severe anxiety levels, while the

corresponding values of the none, <1 hour and 1–7 hour groups were 12.5%, 21.6% and 21.4%.

(1) Is game playing time associated with students' characteristics and levels of gaming addiction and stress?

Time spent playing games was associated with gender, IGDS9 score and DASS-21 scores. Boys were found to have longer game play times, while IGDS9 and DASS-21 scores indicated that students with longer gaming duration per day had higher levels of gaming addiction, and worse scores for depression, anxiety and stress.

In a recent meta-analysis, it was reported that depression and depressive behavior were rather common findings among those with IGD. Even so, studies that have reported a lack of relationship between IGD and depression do exist (King, Delfabbro, Zwaans, & Kaptsis, 2013; Stetina, Kothgassner, Lehenbauer, & Kryspin-Exner, 2011). Although data is limited regarding the assessment of causes leading to problematic gaming levels and associations with depression, a study by Gentile et al. showed that depressive symptoms had become an issue only after problematic levels of gaming started, and only progressed with worsening of gaming behavior (D. A. Gentile et al., 2011). This finding seems to support the suggestion that problematic levels of gaming may lead to depression, rather than the presence of a bi-directional relationship. However, a very detailed longitudinal study on this topic which assessed patients with IGD in a 4-year period, suggested that IGD and depression were influential on each other, possibly leading to a vicious cycle of comorbidity (Liu et al., 2018). Our data does not enable the determination of causal relationships between depression and gaming addiction, as is the case with the majority of studies on this field due to their cross-sectional nature; thus, it is evident that further studies on this field that perform psychological assessments and determine the underlying causes for depression in patients with IGD are required.

The relationship between IGD and anxiety appears to be a more direct one, as the literature on this topic is seemingly unanimous in terms of demonstrating increased anxiety levels (both trait and state anxiety) in those with IGD (Kim et al., 2016; King & Delfabbro, 2016; Männikkö, Billieux, & Kääriäinen, 2015; Vadlin, Åslund, Hellström, & Nilsson, 2016). Our findings were no different, as 37% of students with a game playing duration of 8 hours or more (per day) had severe or extremely severe levels of anxiety, which was almost double the percentage of any other group. However, it is also important to state that anxiety scores were increased throughout our sample. For instance, while there were no students with extremely severe depression and only a few with extremely severe stress levels in all groups, 9.1% of students that did not play any games were found to have extremely severe anxiety levels. Therefore, we believe that the relationship between anxiety and IGD should be evaluated with care as this age group appears to have increased levels of anxiety at baseline when measured with DASS-21. Further studies may also benefit from the use of a better anxiety scale in terms of reflecting adolescents' anxiety levels.

In regard to stress, our findings indicate that increased time spent with gaming was associated with higher levels of stress, as measured by the DASS-21. Several studies on this topic also reported that young persons with IGD had increased stress (Kim, Namkoong, Ku, & Kim, 2008; Paulus, Ohmann, Von Gontard, & Popow, 2018; Subramaniam et al., 2016).

(2) Are there any differences between academically successful and unsuccessful students in terms of gaming addiction scores?

In the current study, students reporting that they felt themselves to be unsuccessful had significantly worse gaming addiction as shown by higher IGDS9 scores. The literature on this topic can be considered to be mostly one-sided, patients with IGD have been reported to have little regard for their health, academic success and social relationships, leading to significantly reduced academic success and social isolation (Griffiths, Kuss, & King, 2012; Sublette & Mullan, 2012; Toker & Baturay, 2016). However, there are also studies indicating that, although academic success and gaming addiction scores were negatively correlated, further analyses demonstrated the lack of any significant effect size (Sahin, Gümüş, & Tofur, 2014). Further, in a study performed in college students, although game playing time was not found to influence GPA, those who stated they played games were found to have lower GPA than their peers who did not play games (Wright, 2011). Therefore, although the great majority of published data indicates that academic performance is negatively affected by problematic gaming, it is apparent that further studies are needed to determine the underlying effects and results.

(3) Is there any association between game type and gaming addiction score?

Gaming addiction scores were found to be positively correlated with all game types played/preferred by the students, suggesting that preferred game type was not effective on addiction development. However, multiple regression analysis revealed that the parameters independently associated with increased IGDS9 scores were: time spent gaming and the preference of action, simulation and social media games. Interestingly, preferring to play games on smartphones was associated with lower gaming addiction score. However, gender, preference of other

game types and preferred gaming platform(s) were not associated with gaming addiction.

It is believed that the characteristics of game types are influential on addictive behavior. Specific game characteristics or 'elements', such as presence of violence, multiplayer games, reward systems, social interactions within games, promotion of an 'involvement' feeling, and the chance for unlimited progression, have all been associated to addictive behavior development and IGD in various studies (Eichenbaum, Kattner, Bradford, Gentile, & Green, 2015; Haagsma, Caplan, Peters, & Pieterse, 2013; Hartmann, Jung, & Vorderer, 2012; King, Delfabbro, Griffiths, & Gradisar, 2011). However, the fact that many of these elements are present in various games and genres –regardless of the actual game type– make it very difficult to pinpoint an exact association between one particular characteristic and the propensity for addictive behavior towards gaming.

Despite these difficulties, addiction to massively multiplayer online role-playing games (MMORPGs) was found to be associated with several factors, including curiosity towards the game, role-playing elements, obligation to continue pursuing 'rewards', the rewards themselves, and a sense of belonging. Interestingly, in contrast to our findings, playing time was found to be unassociated with MMORPG addiction (Hsu, Wen, & Wu, 2009). In other studies, factors that increased the possibility of gaming addiction were found to be: possessing a gaming console, handheld gaming device and high quality internet connection (Frölich et al., 2016; Karaoğlan-Yılmaz, Yılmaz, Teker, & Keser, 2014). Although we did not assess the quality of internet access, our results with gaming platforms were in contrast with these suggestions. Moreover, we found that gaming on a smartphone was associated with lower IGDS9 score, which is a remarkable result on its own merit; however, a direct comparison may be erroneous, as smartphone gaming cannot be considered the same as the possession of a handheld gaming device. Furthermore, the majority of our participants were girls, and several studies have shown fundamental physiological differences between males and females in terms of gaming behavior and the use of electronic devices and devices designed for gaming (Hoeft, Watson, Kesler, Bettinger, & Reiss, 2008; Kuss & Griffiths, 2012). The reduction of IGDS9 scores in those that game on their smartphones may be crucial in terms of providing treatment options to individuals with IGD. Although it is early to arrive on conclusions regarding this matter, further studies must be performed to determine whether patients with IGD can be 'weaned' off from gaming via the recommendation of smartphone gaming as a short-term measure. To conclude, we believe that further studies are required to assess the role of gaming platforms (or devices) on the development and progression of addictive behavior and IGD, particularly due to our results indicating that smartphone gaming was not influential on gaming addiction score.

5. Limitations

The limitations of this study include (1) the low number of male students in which IGD is more likely to develop (Hyun et al., 2015) , (2) the fact that game groups did not include separate types for MOBA and MMORPG games, which are very popular game types that may have required separation for better assessment of results, (3) not performing diagnostic studies for IGD according to DSM criteria, and (4) the lack of psychological assessments which may have been useful in identifying whether gaming and play times were a result of other problems that also influence characteristics such as depression, anxiety and stress. However, in one study, no relationship between problematic gaming and any psychiatric disorders were found (Frölich et al., 2016).

6. Conclusion

The relationships between gaming duration and parameters such as depression, anxiety, stress and gaming addiction scores appear to be rather significant in our group of high school students. Considering that time spent gaming, and preference of action, simulation and social media games were found to be independently associated with higher IGDS9 scores which were also found to be higher in those that reported being unsuccessful, we believe that gaming duration and game types played by high school students should be closely controlled. Finally, the fact that smartphone gaming was found to reduce IGDS9 scores is an extremely interesting finding which requires further studies for confirmation and assessment of its role in gaming behavior.

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