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An Investigation of Internet Gaming Disorder: A Study with MMO Gamers

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Abstract: Online digital games, which have started to become an ordinary element of individuals' daily life, have many positive outputs such as increasing communication skills, strengthening social ties, and providing motivation. In addition to all these, increasing gaming time and the number of players bring concepts such as problematic gaming behavior and game addiction to the agenda. One of these negative situations is internet gaming disorder (IGD). The main objectives of this study are to conduct the validity and reliability studies of the nine-item short form of the IGD scale and to examine IGD according to various variables. To this end, the Confirmatory Factor Analysis (CFA) results of the data obtained from 405 gamers playing in Massively Multiplayer Online (MMO) environments show that the measurement validity is provided. Furthermore, the internal consistency coefficient and composite reliability values are also satisfactory. The analysis results determined that the participants showed a low level of IGD. It was concluded that, by controlling the age variable with ANCOVA, the singular effects of gender and daily gaming time were significant on IGD, but their joint effects were not significant.

Keywords: Internet gaming disorder, validity, reliability, MMO gamers.

1. Introduction

Virtual worlds have started to attract great attention in contemporary social research under the effect of the internet offering new and multicultural content that includes different virtual experiences that users can interact with and users' spending a lot of time in virtual worlds. In this context, one of the most prominent examples is online games. Especially in recent years, under the effect of a significant change and development in the game industry, there has been a significant increase in the number of individuals playing online games from many different age groups worldwide. When the growth in the game industry and the number of players is examined, it is estimated that the game market revenue in 2020 will reach 159 billion dollars and the number of players worldwide will reach 2.7 billion (Newzoo, 2020). At this point, it is possible to say that playing games in digital environments has become an integral part of daily life.

There are many studies revealing the positive outcomes of online games that have started to become a part of people's routines (Huvila et al., 2010; Reinecke, 2009; Trepte and Reinecke, 2011). It is stated that playing online games motivates gamers socially and can expand the existing relationships of gamers (Frostling-Henningsson, 2009; Jansz and Tanis, 2007). It is also emphasized that online games increase social interaction, strengthen in-game and out-of-game social ties (Ko et al., 2005; Trepte, Reineke and Juechems, 2012; Yee, 2006), and increase the formation of social ties through which individuals can learn and inspire each other (Steinkuehler and Williams, 2006; Williams et al., 2006). Furthermore, it is stated that online games act as a source of intrinsic motivation, improve focusing and cognitive effort, and increase the effort required to reach goals (Adachi and Willoughby, 2013). Although the positive effects of a desirable and healthy gaming behavior have been revealed widely in the studies conducted (Connoly et al., 2012), for some gamers, if the activity of playing games moves away from being functional, it is also emphasized that it turns into a pathological state that can harm the social, professional, family, educational, and psychological functioning (Gentile et al., 2011).

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In today's cyber age, the fact that playing online games in excessive and irregular ways harms the mental health of individuals in many different ways is addressed as a pathological concept expressed as gaming disorder. Internet gaming disorder (IGD) is expressed as frequent and continuous gaming that harms the individual's activities in daily, professional, and educational areas (Schivinski et al., 2018). Furthermore, the APA (American Psychiatric Association) (2013) in general refers to IGD in DSM-V (Diagnostic and Statistical Manual of Mental Disorders) as a type of behavior of getting involved in computer games in a continuous and repetitive way and addresses it as a mental state that is recommended to be studied more in the literature. Again, nine symptoms used in the diagnosis of IGD are included in DSM-5. These criteria are listed below:

- Being preoccupied with internet games,
- Withdrawal symptoms that occur when games are not played on the Internet,
- The development of tolerance to playing games for longer periods of time on the Internet,
- Unsuccessful attempts to control the internet gaming action,
- Loss of interest in activities and hobbies previously enjoyed,
- Continuing to play excessively on the internet despite negative psycho-social consequences,
- Deceiving family members, therapists, and others about the amount of internet gaming,
- Using internet games to escape or relieve negative moods,
- Jeopardizing or losing an important relationship, job, education, or career opportunity due to participation in internet games.

In addition to these nine negative symptoms used in the diagnosis of IGD, withdrawal (Orleans and Laney, 2000), game addiction (Gruesser, Thalemann and Griffiths, 2007), and deterioration in life relationships can be given as examples of the negative effects of uncontrolled gaming (Kraut et al., 1998). In the studies, many antecedents, indicators, and predictor variables were examined and their effects were revealed in the context of IGD, addiction, and problematic use. In the studies conducted, it has been addressed in connection with many dimensions such as age, gender, gaming time, academic performance, curiosity, excitement, entertainment, challenge, reward, well-being, efficacy, loneliness, self-control, obligation, self-esteem, self-confidence, isolation, abandon, escape, fear, stress, and aggression (Hsu et al., 2009; Hussain and Griffiths, 2009; Beranuy et al., 2013; Toker and Baturay, 2016; King et al., 2011; Caplan, Williams and Yee, 2009; Lemmens, Valkenburg and Peter, 2011; Kuss and Griffiths, 2012; Khang, Kim and Kim, 2013). The mentioned findings, the acceleration of the increase in gaming times and the number of players every year increase the importance of IGD, especially for young players, even more.

Although many studies on IGD have been carried out, the study results differ in terms of participant characteristics, culture, and time. There is a need for current and culture-specific studies to obtain effective and consistent results. In parallel, it is important to verify the measurement tools for online gaming to be used in the studies in the culture in which they are planned to be used. At this point, the use of measurement tools that show good psychometric properties, have a short and concise structure, and are widely accepted by being verified in many different cultures provides significant advantages. Considering the features mentioned above, especially the Internet Gaming Disorder Scale Short Form (IGDS9-SF) stands out. The adaptation studies of the IGDS, developed by Pontes and Griffiths (2015), were performed in many countries such as England (Pontes, Stavropoulos and Griffiths, 2015), Slovenia (Pontes, Macur and Griffiths, 2016), Portugal (Pontes and Griffiths, 2016), Italy (Monacis, Palo and Griffiths, 2016), China (Sigerson et al., 2017), and Iran (Wu et al., 2017). In parallel, the robust psychometric properties of the IGDS as a widely used measurement tool in various cultures and its simplicity and clarity in evaluating IGD are among the points highlighted in the literature (Monacis et al., 2016; Pontes and Griffiths, 2015; Pontes and Griffiths, 2016; Wu et al., 2017). Furthermore, it is stated that the IGDS, based on nine criteria (APA, 2013) proposed by DSM-5, serves as the starting point for more standardized research in the field (Stavropoulos et al., 2018).

When previous studies are examined, it is observed that IGD is associated with many problems such as substance use, behavioral addictions, and emotional disorders (Sigerson et al., 2017). The importance of protecting the physical and psychological health of gamers with IGD is increasing, especially when online gaming opportunities are considered (Wu et al., 2017). Accordingly, it can be said that especially massively multiplayer online (MMO) games and MMO gamers

constitute a significant risk group. Many studies have been carried out on IGD, and the study results differ in terms of participant characteristics. There is a need for up-to-date studies specific to the sample characteristics to obtain effective and consistent results. In parallel, it is also important to verify the measurement tools for online gaming to be used in the studies with the gamer population in which they are planned to be used. Accordingly, the purpose of this study is to verify the validity and reliability of the IGDS in an empirical study in which the participant group is Turkish MMO gamers and to examine the IGD levels of MMO gamers in the context of various variables. In line with this purpose, answers to the following research questions were sought:

1. Does the IGDS give valid and reliable results in a sample of MMO gamers?
2. What is the IGD level of MMO gamers?
3. Does the IGD level of MMO gamers vary according to gender and gaming time?

2. Method

In the study, single survey, correlational survey, and causal comparison designs were used to determine the distribution, relationships between the variables, and differences between the groups without any intervention to the variables (Fraenkel, Wallen and Hyun, 2012).

2.1. Participant Group

Participants were determined by the convenience sampling method and consist of 405 MMO gamers with the age varying between 15 and 50 years ($\bar{x}_{age}$=28.03). In the data of 537 participants collected online, extreme values and missing data were cleared. The characteristics of the data of the 405 participants remaining after this procedure are included in Table 1.

Table 1. Demographic characteristics of the participant group

		f	%
Gender	Female	143	35.3
	Male	262	64.7
Daily gaming time	Less than one hour	34	8.4
	One to three hours	271	66.9
	Three to five hours	70	17.3
	More than five hours	30	7.4
Total		**405**	**100.0**

According to Table 1, 35.3% of the gamers are female, and 64.7% are male. While participants playing games for one to three hours constitute the largest group according to the gaming time, those who play games for more than five hours constitute the smallest group.

2.2. Data Collection Tools and Process

In the study, the IGDS developed by Pontes and Griffiths (2015) was used. The scale has a single-factor structure consisting of nine items. The IGDS was created based on nine symptoms (APA, 2013) used in the diagnosis of internet gaming disorder in DSM-5. The lowest score that can be obtained from the scale created in the five-point Likert type (1: Never, 5: Very often) is nine, and the highest score is 45.

The IGDS was adapted to Turkish by Evren et al. (2018) and Arıcak et al. (2018). It is observed that both studies were conducted simultaneously with this research. While university students with the mean age of 21.84, involved in e-sports activities and reporting that they played online games from time to time constituted the participant group in the adaptation study performed by Evren et al. (2018), the participant group of Arıcak et al. (2018) consisted of students aged between 10-29 years. Both valuable studies reveal the validity and reliability of the IGDS in different sample groups. However, the fact that the participant group covers a wide age range and consists entirely of MMO gamers makes this study more compatible with the participant group of the original scale. Furthermore, MMO games provide an ideal context for examining IGD risks due to their avatar customization features and high addiction potential (Stavropoulos, 2017). The primary necessary permissions were obtained for this study (Doğan, Şahin and Şahin, 2018), the first findings of which regarding the adaptation were presented at the 12th International Computer and Instructional Technologies Symposium on May 2, 2018. The scale items translated into Turkish by the researchers were checked by a linguist and five domain experts who were proficient in English and were academicians in the Guidance and Psychological Counseling and Computer and Instructional Technology Education departments. The final form of the

translation, which was agreed upon by the experts, was applied to 10 participants who regularly played online games, and it was determined that the items were understandable. After this stage, the data required for confirmatory factor analysis (CFA) were collected online through an MMO game, the developer of which was one of the researchers.

2.3. Data Analysis

CFA was performed for the adaptation studies of the IGDS, and the item load values and fit values were examined. CFA is expressed as testing the properties of a newly developed scale or a scale that will be adapted such as construct validity and measurement invariance in terms of time or sampling (Harrington, 2009). It is also explained as a statistical technique that consists of latent variables and operates based on testing models that have been theoretically verified (Tabachnick and Fidell, 2012). With the realization of CFA, values for the fit of the measurement tool and data are obtained. In addition to this, the internal consistency coefficient (α), composite reliability (CR), and standard error of measurement (SEM) values were examined in reliability analyses. Descriptive statistics were used to determine the IGD level of the participants according to the data obtained from the scale, and the two-way analysis of covariance (ANCOVA) was used for the independent groups to examine the differentiation status according to gender and daily gaming frequency.

3. Findings

3.1. Findings Regarding the Validity and Reliability of the IGDS

At this stage, the reliability of the measurement tool was tested first. To evaluate reliability, α and CR values were calculated. These values are expected to be above 0.70 for CR and α. According to the analysis results, it was determined that α and CR values (α = .82, CR = .83) were within accepted ranges in the literature (Fornell and Larcker, 1981; Nunnally and Bernstein, 1994). The values obtained are presented in Table 2.

Table 2. Reliability and item load values for the IGDS

IGDS	α	CR	Items	Item loadings
			M1	.549
			M2	.678
			M3	.607
			M4	.697
IGDS	.82	.83	M5	.685
			M6	.565
			M7	.503
			M8	.526
			M9	.371

α= Cronbach's alpha, CR= Composite reliability

In the evaluation of reliability, when the load values of the items in the scale are examined in addition to α and CR, it is observed that the values are at appropriate intervals (>0.32) and statistically significant (Tabachnick and Fidell, 2012). Accordingly, it can be said that reliability was provided at the item level (Figure 1).

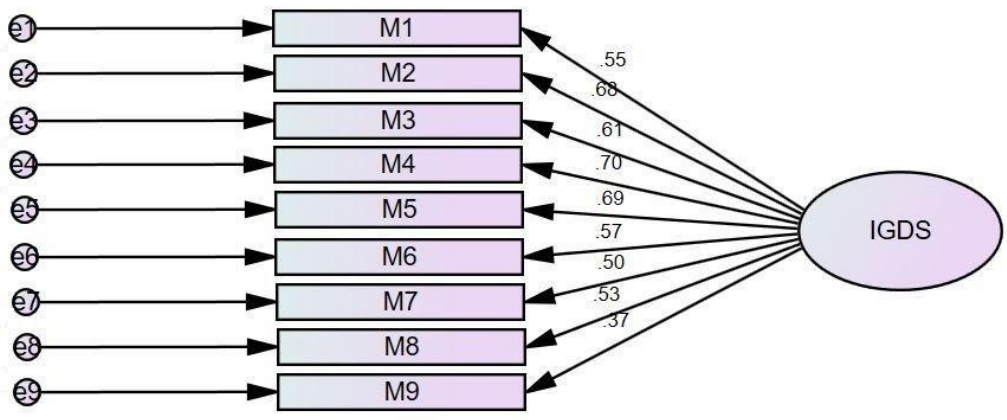

Figure 1. Confirmatory Factor Analysis

CFA was performed after the reliability studies, and it was examined whether the scale was verified with the obtained fit values. The analysis results demonstrated that the fit values (χ2/sd=2.96, NFI=.93, TLI=.92, CFI=.95, RMSEA=.07, SRMR=.04) were appropriate for the value ranges recommended in the literature. The obtained fit values are presented in Table 3.

Table 3. Confirmatory Factor Analysis Fit Values

Fit Index	Ideal Fit Value	Fit Value	Literature
χ^2/sd	0≤ χ^2/sd≤3	2.96	Kline (2005)
SRMR	0≤SRMR≤0.05	.04	Kline (2005)
RMSEA	0≤RMSEA≤.07	.07	Steiger (2007)
NFI	.90≤NFI≤1	.93	Bentler and Bonnet (1980)
TLI	.90≤TLI≤1	.92	Sümer (2000)
CFI	.95≤CFI≤1	.95	Hu and Bentler (1999)
χ^2= 70.963; sd=24			

In addition to these, the SEM value was calculated in the study. SEM reflects changes in the scores observed in the IGDS according to measurement errors (Morrow et al., 2015). The fact that the calculated SEM value is less than half of the obtained standard deviation is a finding indicating that reliability is provided. In this study, the SEM value calculated for the IGDS is 2.82, and the half of the standard deviation is 3.34. Therefore, since SEM<sd/2, it can be said that the IGDS is reliable (Table 4).

Table 4. SEM values calculated for the IGDS

	n=405
SEM	$(\sqrt{1-0.82} * 6.676 =2.80$
sd/2	6.676/2=3.34

When all the findings regarding the adaptation studies of the IGDS were examined, it was determined that the scale was also a valid and reliable measurement tool for Turkish MMO gamers.

3.2. Findings Regarding the Distribution of IGD Levels and Their Comparison by Gender and Gaming Time

The mean scores that can be obtained from the IGDS vary between one and five. Accordingly, the mean and standard deviation values of the scores obtained from the scale were examined (Table 5). Therefore, the mean IGD score of the participant group is 19.55. The IGD level of males ($\bar{x}_{male}$=18.54) is higher than that of females ($\bar{x}_{female}$=20.10).

Table 5. Investigation of the distribution of the IGD levels by groups (Unadjusted means)

Gender	Daily gaming time	$\bar{x}$	df	n
Female	Less than one hour	13.88	6.820	16
	One to three times	17.96	5.253	89
	Three to five hours	19.83	7.257	24
	More than five hours	25.36	9.111	14
	Total	**18.54**	**6.758**	**143**
Male	Less than one hour	12.28	5.758	18
	One to three times	19.13	5.231	182
	Three to five hours	23.96	6.706	46
	More than five hours	28.88	6.141	16
	Total	**20.10**	**6.578**	**262**
Total	Less than one hour	13.03	6.235	34
	One to three times	18.75	5.258	271
	Three to five hours	22.54	7.126	70
	More than five hours	27.23	7.740	30
	Total	**19.55**	**6.676**	**405**

It is known that the age variable plays an important role in IGD and problematic gaming behavior (Festl et al., 2013). Accordingly, it was determined that adolescents displayed these problematic behaviors more than adults (Festl, Scharkow and Quandt, 2013; Hawi, Samaha and Griffiths, 2018; Kircaburun et al., 2020). Therefore, age was determined

to be the control variable when examining how IGD changed according to gender and the frequency of playing games. As can be seen in Table 6, age has a significant effect (η^2=.443) on the IGD level (Cohen, 1988). In addition, when gender and daily gaming time are taken into consideration one by one, the level of IGD differentiates ($F_{gender}(1)=6.19$, $p<.05$; $F_{DGT}(3)=29.82$, $p<.05$). However, there is no significant difference in terms of IGD levels in subgroups where females and males are separated according to the gaming time ($F_{gender*DGT}(3)=.92$, $p>.05$). The effect size of gender on IGD is small (η^2_{gender}=.015), and that of daily gaming time is large (η^2_{DGT}=.184). Accordingly, it can be said that gender may not affect IGD in practice, but daily game playing time affects it.

Table 6. Investigation of IGD according to daily gaming time and gender

Source of variance	Sum of Squares	sd	Mean Square	F	p	Effect size
Age	5992.24	1	5992.24	315.13	.000	.443
Gender	117.70	1	117.70	6.19	.013	.015
DGT	1700.80	3	566.93	29.82	.000	.184
Gender*DGT	52.60	3	17.53	.92	.430	.007

When age is taken under control, the means of the IGD level in the subgroups is also recalculated. When Table 5 and Table 7 are examined together, the adjusted means of the females' and males' IGD level ($\bar{x}_{female}$=19.54, $\bar{x}_{male}$=21.10) is higher than the unadjusted means ($\bar{x}_{female}$=2.06, $\bar{x}_{male}$=2.17), and this occurs in the same way in the subgroups of gender formed according to gaming time. Furthermore, it can be calculated that the adjusted means of all participants are 20.47.

Table 7. Investigation of the distribution of the IGD levels by groups (Adjusted means)

Gender	Daily gaming time	$\bar{x}$	SE	n
Female	Less than one hour	16.20	1.098	16
	One to three hours	18.00	.462	89
	Three to five hours	20.05	.890	24
	More than five hours	23.91	1.168	14
	Total	**19.54**	**.471**	**143**
Male	Less than one hour	16.02	1.049	18
	One to three hours	19.21	.323	182
	Three to five hours	22.31	.650	46
	More than five hours	26.86	1.096	16
	Total	**21.10**	**.416**	**262**

Paired comparison tests were examined to determine between which subgroups there was a significant difference according to ANCOVA results (Table 8). Accordingly, it is observed that females have significantly lower IGD levels than males ($\Delta\bar{x}_{(female-male)}$= -.174; $p<.05$). When the IGD level is examined in terms of daily gaming time, it is revealed that each group is significantly different from the other, and those who play more time have higher IGD levels.

Table 8. *Paired comparison results of IGD according to gender and daily gaming time*

(I) Independent v.	(J) Independent v.	$\Delta\bar{x}_{(I-J)}$	SE	p
Female	Male	-.174*	.070	.013
Less than one hour	One to three hours	-.277*	.091	.015
	Three to five hours	-.563*	.106	.000
	More than five hours	-1.030*	.125	.000
One to three hours	Three to five hours	-.286*	.069	.000
	More than five hours	-.753*	.095	.000
Three to five hours	More than five hours	-.467*	.108	.000

To summarize all the findings obtained, it can be said that the IGDS is valid and reliable, the mean of IGD level has increased a little bit, although it is still low, when age is taken under control, the gender and gaming time alone affect IGD, but there is no significant difference in the subgroups formed by addressing both of them together.

4. Discussion, Conclusion, and Recommendations

Within the scope of the study, the IGDS was empirically verified. It can be said that the measurement validity was ensured since the fit values and factor loads examined with the performed CFA were within the appropriate intervals. Furthermore, α, CR, and SEM values were calculated for reliability studies. When these values are examined, it is observed that the IGDS yields reliable results. Accordingly, it can be said that the IGDS is a valid and reliable measurement tool within the scope of Turkish MMO gamers. The fact that the single-factor structure of the scale is also maintained in this study is consistent with the original study (Pontes and Griffiths, 2015) and adaptation studies conducted both in Turkey (Arıcak et al., 2018; Evren et al., 2018) and other cultures (Pontes & Griffiths, 2016; Pontes, Macur, and Griffiths, 2016; Wu et al., 2017; Yam et al., 2019). The sample group in these studies usually consists of adolescents or university students. Although Montag et al. (2019) and Stavropoulos et al. (2018) selected gamers as the participant group in their studies, the mean age of these gamers is around 13 in both studies. Therefore, the fact that this measurement tool also gives valid and reliable results with a group of adult gamers also includes adult MMO gamers in the IGD diagnostic framework determined by the APA.

When the distribution of the participants according to the IGD level was examined, it was observed that the IGD mean was 18.54 for females, 20.10 for males, and 19.55 for the general mean. Considering that the scale is in the five-point Likert type, it can be said that the participants scored less than 27, which is the average score that can be obtained, and therefore IGD was low. Pontes and Griffiths (2015) argue that 36 points can be used as a cut-off point to classify the distribution of participants as "There is IGD" and "There is no IGD." In this case, the gamers' IGD score is very low according to the specified cut-off point. However, Severo et al. (2020) statistically analyzed the evaluation of expert psychiatrists and the scores obtained from the IGDS and clinically determined that scores higher than 16 indicate groups at risk in terms of IGD. In this case, if the means are examined again, it can be said that both female and male gamers in this study are in the risky group in terms of IGD. It can be said that this is due to the fact that the participants consist of gamers who play games regularly.

The IGD levels of the participant group were examined according to gaming time and gender, and it was determined that the singular effects of both variables were significant and their joint effects were not significant. Here, age (Pontes et al., 2014), which is known to be highly correlated with IGD, was determined to be the control variable. As a result of ANCOVA, it is observed that the effect size of age on IGD is quite large. When the literature is reviewed, it is observed that the role of gender in IGD is controversial. Some studies determined that gender significantly differentiates IGD (Griffiths and Hunt, 1998; Hoeft et al., 2008; Kuss, Pontes and Griffiths, 2013), while others determined that it does not create a difference (Pontes et al., 2014; Scerri et al., 2019; Stavropoulos et al., 2018). However, in their meta-analysis study, Su et al. (2020) revealed that males had higher IGD levels than females. In the mentioned meta-analysis study, it is regarded as important to make a judgment about the gender variable by examining the effect sizes obtained in 53 studies. In other words, the findings obtained in this study regarding the role of gender on IGD are generally compatible with the literature. However, the fact that the effect size is quite small raises questions about whether the difference determined may not be valid in practice. The difference in question may be due to the fact that males play more online games than females (Chang, Hsied and Lin, 2018) or the competitive nature of the game is more attractive to male gamers (Warthberg, Kriston and Thomasius, 2020). Therefore, it will be useful to examine social, psychological, or biological variables together to eliminate this uncertainty regarding gender.

As a result of ANCOVA, in addition to gender, the effect of gaming time on IGD was also examined, and it was observed that the effect was quite large. The APA (2013) states that if the weekly gaming time is over 30 hours, individuals are in the risk group in terms of IGD. It is known that situations such as problematic gaming, game addiction, and IGD are directly related to gaming times (Fumero et al., 2020; Jeromin, Rief and Barke, 2016; Pontes and Griffiths, 2015). Therefore, the difference between the categories of daily gaming time in terms of IGD is a finding expected to be in favor of the groups playing more, and it also coincides with the literature. An important predictor of gaming time is the power to meet needs within the game (Johnson, Gardner and Sweetser, 2016). In addition to this, there are the gamer type, the number of friends in the game, and the game type (Cole and Griffiths, 2007, Johnson, Gardner and Sweetser,2016; Mills et al., 2018; Williams, Yee, and Caplan, 2008). Therefore, it can be said that these variables are also related to IGD, and examining them together with variables (such as age, gender, gaming time) the effects of which have been proven in future studies may be useful in explaining IGD better.

Finally, the statistical difference as a result of ANCOVA is not significant in subgroups in which females and males are separated according to the gaming time (for example, the difference between females who play less than an hour and males who play less than one hour, etc.). In other words, females and males do not differ significantly when compared to the same gaming time categories. Although the fact that the singular effects of these two independent variables are significant predicts that their joint effects will also be significant, it can be interpreted that the differences related to controlling the age variable become insignificant.

Although it is thought that the study contains results that will contribute to the literature, some limitations should also be mentioned. The fact that the participants were determined by the convenience sampling method reduces the generalizability of the study regarding the gamer population. Including random gamers in research for subsequent studies will yield more reliable results. Furthermore, in the study, analyses were conducted on the basis of gender, gaming time and age, which had been proven to be effective on IGD in many studies. In subsequent studies, the variables mentioned in the previous sections can also be examined. The cross-cultural validity of IGD has also been analyzed in many studies (Pontes, Stavropoulos and Griffiths, 2017; Stavropoulos et al., 2019). However, Turkish culture has not been addressed in the relevant studies. Therefore, cross-cultural validity studies in which the sample of Turkey will also be included can be designed. Moreover, the IGDS is used not to diagnose problematic behavior but to determine the distribution of the sample (Pontes and Griffiths, 2015). Therefore, it can be used as a diagnostic tool by analyzing the clinical validity of the scale. Finally, it is observed that the participant group is in the risky group in terms of IGD according to the cut-off point determined by Severo et al. (2020). Thus, some training can be planned to prevent the negative psycho-social effects of IGD.

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Conflict of Interest

Yazarlar tarafından çıkar çatışmasının olmadığı rapor edilmiştir. / No conflicts of interest to report.

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