# Determining the correlation between tobacco dependence severity and internet gaming disorder

Serkan KÖKSOY[a], Belkıs CAN[b]

*a Burdur Mehmet Akif Ersoy University, Health Science Faculty, Burdur, Turkey*

*bSuleyman Demirel University, Medicine Faculty Hospital Application and Research Center, Isparta, Turkey*

## ARTICLE INFO

## ABSTRACT

**Introduction and Objective:** Internet gaming disorder and tobacco dependence are important and current public health problems. The objective of our research is to indicate the correlation between internet gaming disorder and tobacco dependence.

**Participant and Method:** This study was designed as a descriptive-cross sectional study. The data of the study were collected in Burdur province between April-August 2021. The sociodemographic questions of the research were formed by the authors by compiling the current literature.

**Results:** Of the total 361 people participating in the study. The mean age of the participants was $29.1 \pm 8.98$ years, and 190 (52.6%) participants were male. Fagerström Test for Nicotine Dependence mean was $3.72 \pm 2.73$ points, the mean of heaviness of smoking index was $2.16 \pm 1.77$ points, and internet gaming disorder short form nine items mean was $16.73 \pm 89$ points. The correlation between Fagerström Test for Nicotine Dependence, heaviness of smoking index and internet gaming disorder short form nine items was found to be positive and weak (0.10 and 0.09, respectively).

**Conclusion:** Both internet gaming disorder and tobacco dependence are important public health problems. It is important to indicate which epidemiological parameters these problems correlate with. This study was conducted for this purpose and the correlation between internet gaming disorder and Fagerström Test for Nicotine Dependence as well as heaviness of smoking index was found to be positive and weak. Other descriptive parameters were found to be compatible with the literature. In order to explain the findings of this study more precisely, we believe that it will be beneficial to work particularly on homogeneous samples.

**Key Words:** Internet Gaming Disorder, Internet Addiction Disorder, Nicotine, Smoking, Students .

## INTRODUCTION

Internet gaming disorder (IGD) has been identified by the American Psychiatric Association (APA) as "the disorder that needs to be researched most." APA has considered IGD as a threat to public health (1). There are various scales used to detect IGD. One of the most useful of these scales is Internet Gaming Disorder Short Form 9 (IGDSF-9), which consists of nine items. This form has high internal consistency (cronbach alpha coefficient: 0.87), it is one-dimensional, and it gives information about the person's status in the last one year. 36 points (p) were determined as the cut-off point of the scale (2). It is very suitable for descriptive and cross-sectional studies as it is easy to answer (3,4).

Tobacco dependence is an important public health problem. It is considered as a global health-threatening epidemic (5). There are various scales to understand tobacco dependence clinically. Some of these scales have been referred to nicotine, which is considered the main component in tobacco content. Nicotine is one of the most important addictive materials in tobacco dependence (6). The Fagerström Test for Nicotine Dependence (FTND) is a scale developed to understand the severity of tobacco dependence. This scale consists of 6 questions, and is a measurement tool that can be scored from 0 to 10 p. As a result of scoring, a minimum of 0 p and a maximum of 10 p are taken. A score of <5p on this scale is considered "low dependence", 5p = "moderate dependence" and 5p> "high dependence" (7). The heaviness of smoking index

(HSI) was created by using the first and fourth questions of the FTND. This scale constitutes 6 points of FTND. The sensitivity of the scale was found to be 79.5% and the specificity of it was found to be 96.5% (8). The scale is recommended for the studies with high participation. It has also been indicated that the scale can be used safely in daily smokers (9).

The number of studies that establish a correlation between IGD and tobacco dependence is very limited. One study indicated that IGD is correlated with the prevalence of tobacco use (10). In addition, some studies have indicated that digital games may be associated with various negative effects such as tobacco use (11,12). The objective of our study is to indicate the correlation between IGD and FTND as well as HSI, and to guide new scientific researches to be made.

## PARTICIPANT AND METHOD

### Participant

The study was composed of individuals residing in Burdur province. The criteria for being a participant are "being a smoker at least for the last one year" and "using one of the devices of computer, smart phone or tablet at least for the last one year".

Study Design: This study was designed as descriptive -cross sectional research. The data of the study were collected between April-August 2021. Due to the epidemic, some of this data was collected by google form and the rest was collected face to face.

### Sample Size

G*power program was used to calculate the sample group of the study (13). In the calculation of the sample group, effect size=0.25, **α=0.05,** power=0.95 and the number of subgroups were taken as 3. Thus, it was calculated that the sample group consisted of at least 252 people.

### Data Collection Form of the Study

The form in which the sociodemographic data of the study was collected was created by the authors by compiling the current literature. In the study, also the questions about FTND, HSI and IGD were asked.

***IGDSF9:*** The scale used in the study for internet gaming disorder is the IGDSF9 scale (2). The scale measures the behavior of the individual regarding internet gaming in the last one year. In this scale, which was created in a Likert form, scoring is as follows: Never=1p, Rarely=2p, Sometimes=3p, Often=4p and Very often=5p. As a result of the scale scoring, a minimum of 9p and a maximum of 45p are taken. The cut-off score of IGDSF9 was calculated as 36. The Turkish adaptation of the IGDSF9 scale, which is in a foreign language, was carried out with two separate scientific researches. In one of these researches, the calculation was made as Cronbach's alpha coefficient 0.89 (14), and in the other scientific study it was calculated as 0.82 (15).

***FTND:*** The scale used in the study to understand the severity of smoking dependence is the scale of FTND (7). This scale consists of 6 questions. As a result of scale scoring, a minimum of 0p and a maximum of 10p are taken. A score of <5p on this scale is considered "low dependence", 5p = "moderate dependence" and 5p> "high dependence". The Turkish validity of the scale was made and Cronbach's alpha coefficient 0.56 was found (16).

***HSI:*** It is a scale which was created by using the first and fourth questions of the FTND. The scale is recommended for the studies with high participation. This scale constitutes 6 points of FTND. The sensitivity of the scale was found to be 79.5% and the specificity of it was found to be 96.5% (8).

### Ethical Permission and Participant Consent

Ethical permission of this study was obtained from Burdur Mehmet Akif Ersoy University Non-Intervention Clinical Research Ethics Committee (2021 -108). In addition, permission was obtained from the authors who made the Turkish adaptations of the scales. The information about "being a participant" were presented to the participants in the data form. The participant's marking of the entire form was interpreted as giving consent.

### Statistical Analysis

SPSS (V.24) package program was used in the analysis of the data. Data are given as n, %, mean and standard deviation (Mean ± SD). In between group comparison, student t test and analysis of variance

(Posthoc Tukey) were performed. For Skewness and Curtosis values in normal distribution, (n> 300) absolute value ranges recommended in a study were accepted (17). Statistical significance was determined as p<0.05.

## RESULTS

Of the total 361 people participating in the study. The age mean of the participants was 29.1±8.98 years. Out of which 190 (52.6%) participants were male. The mean scale points of the participants were 3.72±2.73 points in FTND, as 2.16±1.77 points in HSI, and as 16.73±89 points in IGD. The Cronbach's alpha coefficient of the IGD and FTND scales were 0.89 and 0.71 (Respectively). The mean smoking duration of the participants was 6.56±3.46 years. In addition, it was determined that they played games on smart phones, computers and tablets for a mean of 8.06±3.92 years. It was calculated that a mean of 2.62±1.77 games were installed on the technological devices of the sample group, and that a mean of 4.29±3.11 hours per week were spent on these games. The data of the analysis of independent variables are summarized in Table 1. The data of the dependent variables are summarized in table 3.

**Table 1.** Descriptive findings of sociodemographic variables

| Variable | | | n | % | Mean ± St Dev | Test | p |
|---|---|---|---|---|---|---|---|
| **Gender** | **IGD** | Female | 171 | 47.37 | 15.84±6.12 | t=-2.3 | **0.02** |
| | | Male | 190 | 52.63 | 17.54±7.44 | | |
| | **FTND** | Female | 171 | 47.37 | 3.42±2.57 | t=-2 | 0.05 |
| | | Male | 190 | 52.63 | 3.99±2.84 | | |
| | **HSI** | Female | 171 | 47.37 | 1.84±1.54 | t=-3.2 | **<0.01** |
| | | Male | 190 | 52.63 | 2.44±1.91 | | |
| **Marital Status** | **IGD** | Married | 141 | 39.06 | 16.19±7.29 | t=-1.2 | 0.23 |
| | | Single | 220 | 60.94 | 17.08±6.61 | | |
| | **FTND** | Married | 141 | 39.06 | 3.76±2.79 | t=0.2 | 0.84 |
| | | Single | 220 | 60.94 | 3.70±2.69 | | |
| | **HSI** | Married | 141 | 39.06 | 2.11±1.71 | t=-0.4 | 0.72 |
| | | Single | 220 | 60.94 | 2.18±1.81 | | |
| **Income** | **FTND** | Income expense balanced | 201 | 55.68 | 3.49±2.70[a] | f=3.3 | **0.039** |
| | | Less income than expense | 96 | 26.59 | 3.71±2.76[a] | | |
| | | More income than expense | 64 | 17.73 | 4.48±2.67[b] | | |
| | **HSI** | Income expense balanced | 201 | 55.68 | 2.09±1.78 | f=1.7 | 0.19 |
| | | Less income than expense | 96 | 26.59 | 2.04±1.81 | | |
| | | More income than expense | 64 | 17.73 | 2.52±1.65 | | |
| | **IGD** | Income expense balanced | 201 | 55.68 | 16.39±7.34 | f=1.6 | 0.21 |
| | | Less income than expense | 96 | 26.59 | 16.53±6.26 | | |
| | | More income than expense | 64 | 17.73 | 18.11±6.20 | | |
| **Education** | **FTND** | Primary Education | 23 | 6.37 | 3.48±2.64 | f=0.9 | 0.401 |
| | | Secondary Education | 59 | 16.34 | 4.15±2.48 | | |
| | | Higher Education | 279 | 77.29 | 3.65±2.79 | | |
| | **HSI** | Primary Education | 23 | 6.37 | 2.17±1.80 | f=0.9 | 0.392 |
| | | Secondary Education | 59 | 16.34 | 2.44±1.51 | | |
| | | Higher Education | 279 | 77.29 | 2.09±1.82 | | |
| | **IGD** | Primary Education | 23 | 6.37 | 16.43±8.07 | f=0.1 | 0.95 |
| | | Secondary Education | 59 | 16.34 | 16.56±7.01 | | |
| | | Higher Education | 279 | 77.29 | 16.80±6.78 | | |

FTND=Fagerström Test for Nicotine Dependence, HSI= Heaviness of Smoking Index, IGD=Internet Gaming Disorder, t=student t test, f=ANOVA, a,b : Different letters display statistically significant differences between groups.

**FTND, HSI and IGD correlation**

The correlation between FTND, HSI and IGD was found to be positive and weak (0.10 and 0.09, respectively), however the statistical difference was detected (p=0.049) (Table 2)

**Table 2.** Correlation Table

| Variable | | FTND | HSI | IGD |
|---|---|---|---|---|
| **FTND** | **r** | - | 0.924 | 0.103 |
| | **p** | - | **<0.001** | **0.049** |
| | **n** | 361 | 361 | 361 |
| **HSI** | **r** | 0.924 | - | 0.09 |
| | **p** | <0.001 | - | 0.09 |
| | **n** | 361 | 361 | 361 |
| **IGD** | **r** | 0.10 | 0.09 | - |
| | **p** | 0.049 | 0.09 | - |
| | **n** | 361 | 361 | 361 |

N=361, r=Pearson correlation. FTND: Fagerström Test for Nicotine Dependence, HSI: Heaviness of Smoking Index, IGD: Internet Gaming Disorder.

**Table 3.** Descriptive parameters of FTND and IGD

| Variable | n | % | Mean ± St. Dev* | f | p | 95% CI for Mean Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|---|
| FTND <5 | 216 | 59.8 | 16.17±6.44 | | | 15.30 | 17.03 |
| FTND =5 | 49 | 13.6 | 17.18±6.98 | 1.956 | 0.143 | 15.18 | 19.19 |
| FTND >5 | 96 | 26.6 | 17.78±7.72 | | | 16.22 | 19.34 |
| Total | 361 | 100 | 16.73±6.89 | | | 16.02 | 17.45 |

Mean of IGD, f: ANOVA, FTND: Fagerström Test for Nicotine Dependence, FTND <5: low smoking dependence, FTND =5: Moderate smoking dependence, FTND >5: high smoking dependence.

**IGD prevalence**

According to Pontes and Griffith's (2015) scale criteria, the number of people who scored equal to or above 36 points of cut-off point was 3 (0.83%). According to the DSM-5 diagnostic criteria of APA (2013), the number of people who scored 5 or above out of 9 was found to be 18 (4.99%).

**DISCUSSON**

APA indicated IGD as "the disorder that needs to be researched most" (1). There are various scales used to define this disorder. The scale of IGDSF-9 is one of those scales which are used to define this situation (2). Tobacco dependence is an important public health problem. It is considered as a global health-threatening epidemic (5). FTND scale is one of the scales used to understand the severity of tobacco dependence clinically, and HSI is also calculated with this scale (7,8). The number of studies that establish a correlation between IGD and Tobacco dependence is very limited. The objective of our study is to indicate the correlation between IGD and FTND as well as HSI, and to guide new scientific researches to be made.

When we evaluate the findings of our research; the IGD mean were found to be close to each other in the sample of Australia, England and America, but higher than the IGD mean in our study (18). In other studies, the IGD mean was found to be lower than the mean we calculated (19,20). We believe that these findings in the IGD mean are related to the sociodemographic variables of the countries. In the studies on the internal consistency of IGDSF9,

the Cronbach's alpha coefficient values were close to the values in our study. (2,21). In studies on the prevalence of IGD, it was found to vary depending on the effects such as person, place, time, income, etc. (22,23).

Although the prevalence of IGD in our study was affected by these variables, it was found to be close to previous studies carried out. FTND scale is suitable for both cigarette and smokeless cigarette (24). This scale which is used to determine the severity of smoking dependence has been used in various scientific studies (25,26). Statistical differences were detected in various epidemiological parameters of scientific studies by using FTND, HSI and IGD scales. The most notable part of these findings is related to the gender variable. In the studies carried out, FTND and IGD means in men were found to be higher than in women and statistical difference was measured (26-28).

The number of studies establishing relation between IGD and FTND is extremely limited. In a IGD research, the prevalence of tobacco use was measured (%22.2) (10). In addition, some studies have indicated that digital games may be associated with various negative effects such as tobacco use (11,12). Statistically significant correlations were found between substance use and gaming disorders in a study that included many countries and whose main purpose was the analysis of gaming and substance use (tobacco, cannabis and alcohol). However, this relation between game and substance use was found to be inconsistent. It was emphasized that attention should be paid to epidemiological characteristics (country level, personality traits, etc.) in order to eliminate this inconsistency (29). In our study, the statistical difference in the correlation between FTND and IGD was found to be borderline (p=0.049). We think that this may be related to the participants and the sociodemographic characteristics of the country.

## CONCLUSION

Both internet gaming disorder and tobacco dependence are important public health problems. It is important to indicate which epidemiological parameters these problems correlate with. This study was conducted for this purpose and the correlation between IGD and FTND as well as HSI was found to be positive and weak. Other descriptive parameters were found to be compatible with the literature. In order to explain the findings of this study more precisely, we believe that it will be beneficial to work particularly on homogeneous samples.

## REFERENCES

1. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, Fifth ed. VA, Arlington. 2013.

2. Pontes HM, & Griffiths MD. Measuring DSM-5 Internet gaming disorder: Development and validation of a short psychometric scale. Comput Human Behav. 2015 (45):137–143.

3. Maldonado-Murciano L, M Pontes H, Griffiths MD, Barrios M, Gómez-Benito J, Guilera G. The Spanish Version of the Internet Gaming Disorder Scale-Short Form (IGDS9-SF): Further Examination Using Item Response Theory. Int J Environ Res Public Health. 2020;17(19):7111. Published 2020 Sep 28. doi:10.3390/ijerph17197111

4. Monacis L, Palo V, Griffiths MD, Sinatra M. Validation of the Internet Gaming Disorder Scale - Short-Form (IGDS9-SF) in an Italian-speaking sample. J Behav Addict. 2016;5(4):683-690. doi:10.1556/2006.5.2016.083

5. Global Adult Tobacco Survey (GATS), Turkey Report, Ministry of Health, Publ. No 803. https://www.who.int/tobacco/surveillance/en_tfi_gats_turkey_2009.pdf Published Date:2010. Accessed Date: 01 Oct 2021.

6. Michalak E, Halko-Gąsior A, Chomyszyn-Gajewska M. Przegl Lek. 2016;73(7):516-519.

7. Heatherton TF, Kozlowski LT, Frecker RC, Fagerström KO. The Fagerström Test for Nicotine Dependence: a revision of the Fagerström Tolerance Questionnaire. Br J Addict. 1991;86 (9):1119-1127. doi:10.1111/j.1360-0443.1991.tb01879.x

8. Sağlam L. Nikotin Bağımlılığının Klinik Değerlendirilmesi. Güncel Göğüs Hastalıkları Serisi. 2017;4(1):78-89.

9. Lim KH, Idzwan MF, Sumarni MG, et al. Heaviness of smoking index, number of cigarettes smoked and the Fagerstrom test for nicotine dependence among adult male Malaysians. Asian Pac J Cancer Prev. 2012;13(1):343-346. doi:10.7314/apjcp.2012.13.1.343

10. Mallorquí -Bagué N, Fernández-Aranda F, Lozano-Madrid M, et al. Internet gaming disorder and online gambling disorder: Clinical and personality correlates [published correction appears in J Behav Addict. 2018 Jan 18;7(2):205]. J Behav Addict. 2017;6(4):669-677. doi:10.1556/2006.6.2017.078

11. Faust KA, Prochaska JJ. Internet gaming disorder: A sign of the times, or time for our attention?. Addict Behav. 2018;77:272-274. doi:10.1016/j.addbeh.2017.07.009

12. Anderson CA, Shibuya A, Ihori N, et al. Violent video game effects on aggression, empathy, and prosocial behavior in eastern and western countries: a meta-analytic review. Psychol Bull. 2010;136(2):151-173. doi:10.1037/a0018251

13. Faul F, Erdfelder E, Lang AG, Buchner A. G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behav Res Methods. 2007;39(2):175-191. doi:10.3758/bf03193146

14. Arıcak OT, Dinç M, Yay M, Griffiths MD. Adapting the short form of the Internet Gaming Disorder Scale into Turkish: Validity and reliability. Addicta: The Turkish Journal on Addictions. 2018;5(4) 615–636

15. Evren C, Dalbudak E, Topcu M, Kutlu N, Evren B, Pontes HM. Psychometric validation of the Turkish nine-item Internet Gaming Disorder Scale-Short Form (IGDS9-SF). Psychiatry Res. 2018;265:349-354. doi:10.1016/j.psychres.2018.05.002

16. Uysal MA, Kadakal F, Karşidağ C, Bayram NG, Uysal O, Yilmaz V. Fagerstrom test for nicotine dependence: reliability in a Turkish sample and factor analysis. Tuberk Toraks. 2004;52(2):115-121.

17. Kim HY. Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. Restor Dent Endod. 2013;38(1):52-54. doi:10.5395/rde.2013.38.1.52

18. Stavropoulos V, Beard C, Griffiths MD, Buleigh T, Gomez R, Pontes HM. Measurement Invariance of the Internet Gaming Disorder Scale-Short-Form (IGDS9-SF) Between Australia, the USA, and the UK. Int J Ment Health Addict. 2018;16(2):377-392. doi:10.1007/s11469-017-9786-3

19. De Pasquale C, Sciacca F, Martinelli V, Chiappedi M, Dinaro C, Hichy Z. Relationship of Internet Gaming Disorder with Psychopathology and Social Adaptation in Italian Young Adults. Int J Environ Res Public Health. 2020;17(21):8201. Published 2020 Nov 6. doi:10.3390/ijerph17218201

20. Qin L, Cheng L, Hu M, et al. Clarification of the Cut-off Score for Nine-Item Internet Gaming Disorder Scale-Short Form (IGDS9-SF) in a Chinese Context. Front Psychiatry. 2020;11:470. Published 2020 May 25. doi:10.3389/fpsyt.2020.00470

21. Severo RB, Barbosa APPN, Fouchy DRC, et al. Development and psychometric validation of Internet Gaming Disorder Scale-Short-Form (IGDS9-SF) in a Brazilian sample. Addict Behav. 2020;103:106191. doi:10.1016/j.addbeh.2019.106191

22. Feng W, Ramo DE, Chan SR, Bourgeois JA. Internet gaming disorder: Trends in prevalence 1998-2016. Addict Behav. 2017;75:17-24. doi:10.1016/j.addbeh.2017.06.010

23. Salam Z, Sadiq Z, Tajamul U, Sethi MR, Irfan M. Internet Gaming Disorder In Students Of Peshawar: A Cross Sectional Survey. J Ayub Med Coll Abbottabad. 2019;31(4):548-552.

24. Mushtaq N, Beebe LA. Psychometric Properties of Fagerström Test for Nicotine Dependence for Smokeless Tobacco Users (FTND-ST). Nicotine Tob Res. 2017;19(9):1095-1101. doi:10.1093/ntr/ntx076

25. Salhi L, Seidel L, Albert A, Lambert F. Fagerström test for nicotine dependence as an indicator in tobacco-related studies in periodontology. J Periodontol. 2021;92(2):298-305. doi:10.1002/JPER.20-0019

26. Köksoy S, & Kara F. The effect of long-term awareness on active and passive tobacco Smokers. World Journal of Advanced Research and Reviews. 2021;12(01), 439–446. doi:10.30574/wjarr.2021.12.1.0525

27. Mihara S, Higuchi S. Cross-sectional and longitudinal epidemiological studies of Internet gaming disorder: A systematic review of the literature. Psychiatry Clin Neurosci. 2017;71(7):425-444. doi:10.1111/pcn.12532

28. Wichstrøm L, Stenseng F, Belsky J, von Soest T, Hygen BW. Symptoms of Internet Gaming Disorder in Youth: Predictors and Comorbidity. J Abnorm Child Psychol. 2019;47(1):71-83. doi:10.1007/s10802-018-0422-x

29. Strizek J, Atzendorf J, Kraus L, Monshouwer K, Puhm A, Uhl A. Perceived problems with adolescent online gaming: National differences and correlations with substance use. J Behav Addict. 2020;9(3):629-641. Published 2020 Oct 6. doi:10.1556/2006.2020.00061.