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ORIGINAL ARTICLE

Measurement, Profiles, Prevalence, and Psychological Risk Factors of Problematic Gaming Among the Turkish Community: A Large-scale National Study

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Abstract
The present study investigated the prevalence, the potential different profiles, and the associated psychological factors of disordered gaming using data from a large-scale epidemiological study (TURBAHAR [Turkey's Addiction and Mental Health Risk Profile Map Project]) carried out in Turkey in 2018 with 24,494 participants aged 18–81 years. Participants completed a comprehensive survey comprising a demographic questionnaire, Gaming Addiction Risk Questionnaire, Brief Symptom Inventory, Personal Well-Being Index Adult Form, Positive and Negative Affect Schedule, Toronto Alexithymia Scale, and Experiences in Close Relationships-Revised Scale. Latent class analysis showed the existence of eight different game profiles, which differed in relation to the intensity and specific features of the behavior. Results showed that 1.6% of the participants were problematic gamers. Being male, being younger, lower education level, being single, using alcohol and cigarettes, psychiatric distress, positive and negative affect, and anxious adult attachment were positively associated with problematic gaming.

Keywords Problem gaming · Gaming addiction · Gaming disorder · Psychiatric symptoms · Affect · Attachment

Research into problematic gaming has increased substantially over the past 30 years (Griffiths et al. 2012). This increased research led to Internet Gaming Disorder (IGD) being included by the American Psychiatric Association (APA) as a tentative disorder in the latest (fifth) edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association 2013). In addition, gaming disorder has been officially included as a formal diagnostic entity in the 11th revision of the International Classification of Diseases (ICD; World Health Organization 2018). The DSM-5 proposes nine criteria for gaming disorder, while the World Health Organization has advocated three criteria to diagnose the same

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pathological behavior (although there is still great debate about these and the wording of them, as well as the assessment and diagnosis of gaming disorder more generally; Griffiths et al. 2016; King et al. 2013). The nine criteria for IGD include the following: (i) preoccupation; (ii) withdrawal; (iii) tolerance; (iv) relapse; (v) loss of interest in previous hobbies because of gaming; (vi) continuing to game despite problems; (vii) deceiving family members or others about the amount of time spent on gaming; (viii) using gaming for positive mood modification; and (ix) risking, jeopardizing, or losing a job or relationship due to gaming (APA, 2013).

These diagnostic nomenclatures from formal and broadly accepted institutions has had a major positive impact in the field, by promoting public health awareness considering the behavior, while concurrently pushing for relevant prevention and intervention policies and legislation (Kim and Seo 2015; King et al. 2018; Petry et al. 2018). Nevertheless, the introduction of two different, although to some extent similar (Scerri et al. 2019), diagnostic conceptualizations has also precipitated the introduction of different measurement scales (with varying psychometric properties; Pontes et al. 2017; Stavropoulos et al. 2018a, b) and therefore has undermined comparability of empirical evidence (Montag et al. 2019; Pontes et al. 2019b; Stavropoulos et al. 2019c). Furthermore, one could argue that both these diagnostic criteria, in spite of incorporating similar components, also deviate from the six criteria in the component model of addiction (Griffiths 2005), therefore, potentially hindering cross-addiction comparisons (Robbins and Clark 2015). To address these issues, the present work adopted a measurement scale that accurately reflects the six addiction criteria of the components model.

Disordered Gaming Profiles

Many scholars from the various fields involved with the study of excessive behaviors appear to support the definition of addictions based on the component model of behavioral addiction, which despite results showing different diagnostic weightings for each of the criteria (Gomez et al. 2019), have informed the basis for the ongoing dialogue in the broader field (Chen et al. 2020; Gearhardt et al. 2016; Guedes et al. 2016; Lehenbauer-Baum and Fohringer 2015). This may be viewed as significant in terms of a distinct conceptual definition of behavioral addictions (including excessive gaming as the point of interest of the present study), which is in contrast with the contested simplistic reformulation of behavioral addictions criteria based on substance abuse and/or gambling addiction disorders (Bean et al. 2017). Similarly, the present study reinforces consistency and (inter-behavioral addiction) comparability in the field, and views disordered gaming in the light of arguably the most widely accepted six addiction criteria in the behavioral addiction field. This appears important for two compelling reasons: (i) formal diagnostic definitions of gaming disorder have inspired different instruments for the same behavior (which inevitably compromise comparability of findings in relation to disordered gaming behaviors (Hu et al. 2019; Pontes et al. 2019a, b; Stavropoulos et al. 2019b), and (ii) topic-exclusive definitions/assessments of disordered gaming may not enable its examination in relation to other similarly presenting forms of behavioral addictions (Granero et al. 2016; Robbins and Clark 2015).

Similar to the prevalence of disordered gaming, persistent interest and questions have been raised concerning potentially different gamer profiles. More specifically, studies have assumed various disordered gaming typologies (Pontes et al. 2014; Carras and Kardefelt-Winther 2018). Indicatively, Pontes et al. (2014) concluded five relevant gaming profiles named as “casual,” “regular,” “low risk,” “high risk,” and “disordered”. Similarly, Carras and Kardefelt-Winther (2018) additionally favored five different disordered gaming profiles. These differed to those

of Pontes et al. (2014) and comprised the "normative," the "(I)GD," the "concerned," the "at risk," and the "engaged" profiles (Carras and Kardefelt-Winther, 2018). At this point, it should be highlighted that the different typologies/classes advocated by Pontes et al. (2014) and Carras and Kardefelt-Winther (2018) also differed to the three profiles implied by the relevant DSM-5 IGD specifiers (i.e., mild, moderate, and severe; American Psychiatric Association 2013), as well as a recent study by Stavropoulos et al. (2019a, b, c) that also advocated three different gaming profiles based on the user and game character bond. These inconsistencies are also important because such knowledge tends to underpin prevention and intervention policies and the allocation of relevant resources (Stavropoulos et al. 2019a, b, c). Given the additional lack of knowledge of disordered gaming profiles considering the Turkish population in particular, the present study uses the indicated latent class methodology to identify the following: (i) the optimum number of groups/types that best define disordered gaming presentations in this population; (ii) the proportion/size that these profiles occupy; (iii) whether the differences of these profiles are quantitative (e.g., differing intensity of the disordered gaming symptoms presented), qualitative (e.g., some present predominantly preoccupation while others predominantly withdrawal), and/or mixed (e.g., intensity and quality of symptom differences present concurrently across profiles).

Disordered Gaming Prevalence

The various definitions and instruments adopted have been to a certain extent implicated with the disparities considering disordered gaming presentations reported worldwide (Anderson et al. 2017). More specifically, the prevalence of disordered gaming internationally is reported to range between 2 and 15% in recent studies (Milani et al. 2018; Wu et al. 2018), although those using nationally representative samples tend to have much lower prevalence rates of approximately 1 to 5% (Griffiths et al. 2016). Such prevalence rate inconsistencies is not restricted to international populations in general but may also embrace the same national population, with scholars insisting on the reporting of prevalence rates in every related study (Fam 2018). Considering Turkey in particular (where the sample of the present country comes from), an online survey study with 1250 Turkish individuals indicated that approximately 1% were identified as problem gamers, and problematic gaming was positively correlated to average daily time spent playing video games and internet addiction (Evren et al. 2018). Nevertheless, a less recent cross-sectional study with 726 Turkish gamers reported that 11% of the participants were addicted to gaming and that problem gaming was moderately correlated with internet addiction, and weakly with weekly internet use duration, sustained game duration, and gaming frequency on mobile phone (Baysak et al. 2016). Interestingly, both of these studies did not employ population specific cut-off points. This is important for the reliability of the findings given: (i) the different meaning (severity) of the same scale numbers/scores across different populations previously demonstrated (Pontes et al. 2017), and (ii) the significant influence of cultural factors regarding the way gaming disorder behaviors are experienced and reported (O'Farrell et al. 2020; Stavropoulos et al. 2020a, b). The aforementioned inconsistencies highlight the necessity of large and representative (as well as methodologically robust) studies to appropriately address prevalence and incidence (i.e., changes of the behavior percentages over a certain period of time). The present study aims to address this gap by examining a large and representative sample of Turkish adults, while at the same time adopting an item response theory (IRT) methodology to define the appropriate cut-off, based on which disordered gaming prevalence will be estimated (Cai et al. 2011). At this point, it should be noted that the test characteristic curve (TCC) provided in IRT

analysis enables the matching of raw-scale and trait scores. Therefore, the TCC may determine cut-off points, without the use of a gold standard, guided by the raw score that corresponds with a level of two standard deviations above the mean of the latent factor (Embretson and Reise 2013).

Disordered Gaming Associated Factors

In order to understand disordered gaming, theoretical models that attempt to explain the origin of specific forms of internet addiction could be used. One of these models is the Interaction of Person-Affect-Cognition-Execution (I-PACE) model (Brand et al. 2016). According to the I-PACE model, individuals' disordered use of specific online activities is related to the interaction of general predisposing variables including genetics, early childhood experiences, psychopathology, temperamental features, and general coping styles (Brand et al. 2016). Much empirical evidence supports the theoretical implications of the I-PACE model by associating disordered gaming with psychological determinants including low life satisfaction, depression, high anxiety (Mentzoni et al. 2011), poor subjective wellbeing (Yang et al. 2019), increased hostile emotions (Carnagey and Anderson 2005), somatization (González-Bueso et al. 2018), poor family cohesion (Adams et al. 2019), and avoidant and anxious adult attachment (Monacis et al. 2017; Stavropoulos et al. 2018b; Throuvala et al. 2019). A cross-sectional study with 987 university students from Turkey who played videogames reported that attention deficit/hyperactivity disorder, aggression, and depression were positively related to problem gaming (Evren et al. 2019).

Mehroof and Griffiths (2010) investigated problematic gaming in relation to the temporary condition of state anxiety and long-standing quality of trait anxiety. They found that both were related to problematic gaming. Furthermore, Gentile et al. (2011) asserted that pathologically anxious gamers suffer more due to social avoidance behavior. Research has also shown that gamers play excessively when they feel worried, tense, or restless (Ramos-Diaz et al. 2018), and use gaming as a coping mechanism to alleviate negative self-perceptions. This corresponds with longitudinal findings considering excessive internet use in general (Stavropoulos et al. 2017). Individuals with negative self-perceptions can interact within virtual environments to enhance their self-worth (Odacı and Çelik 2013), and several studies have shown that negative self-perception is strongly related to various types of psychopathology including depression and anxiety (Glass et al. 1982; Hofmann 2000).

Several studies (e.g., Burleigh et al. 2018; Dong et al. 2011; Gentile et al. 2011; Kühn et al. 2018) have demonstrated that disordered gamers are more vulnerable to depression. Andreassen et al. (2016) investigated problematic gaming and comorbid psychiatric disorders among adults in a large-scale cross-sectional survey, and found positive and significant correlations. Moreover, the effects of unhealthy psychological mental states on psychological wellbeing may cause increased depressive symptoms and anxiety disorders (Smith and Book 2008). Diener et al. (1985) have referred life satisfaction as a general cognitive assessment of subjective wellbeing. Lower life satisfaction has been found to be related to problematic gaming in some studies (Ko et al. 2005; Shapira et al. 2000).

In addition, low levels of modifying and expressing emotions have been considered to be factors that increase risky behaviors among young people including disordered gaming and other internet-related disorders (Mullin and Hinshaw 2007). Consequently, impoverished emotional states might be considered as the components of alexithymia, a personality construct which has been defined as having difficulties in both defining and expressing feelings and is considered an externally oriented thinking style (Ünübol et al. 2018). Parker et al. (2005) have

reported that alexithymia is associated with addiction disorders. One possible explanation for this relationship is that alexithymic individuals may try to regulate their emotional states using addictive behaviors.

Extant literature suggests that socio-demographic variables should be taken into consideration when investigating disordered gaming. Müller and Montag (2017) reported that the relationship between internet addiction and alcohol consumption was influenced by the number of cigarettes smoked among male online video gamers. Van Rooij et al. (2014) found that boys who used nicotine, alcohol, and cannabis were almost twice more likely to report high problematic video gaming than non-users. Most of the studies in gaming literature in a number of different countries have reported that gender is a significant demographic predictor and males have more problems with gaming when compared with females (e.g., Arıcak et al. 2019; Brunborg et al. 2013; Ferguson et al. 2011; Mentzoni et al. 2011). A recent study found that young adult males were more engaged in gaming than females and reported more adverse consequences (Canale et al. 2019). However, some scholars claim that easy access to the internet has appeared to eliminate gender differences in some studies in the literature (Jang et al. 2008; Odacı 2011; Morcos et al. 2019; Stavropoulos et al. 2020b).

Age is another strong predictor of disordered gaming. Younger age groups are more likely to experience gaming addiction (Bartholow et al. 2005; Mentzoni et al. 2011). Since addictive gaming behavior is associated with young age (Arcelu et al. 2017), scholars tend to conduct research among adolescents and young adults but it has been speculated that "as the younger video gaming generation grows up, gaming will probably be more uniformly distributed across age groups" (Wittek et al. 2016, p. 682). Significant proportions of educated individuals aged 18–30 years engage in gaming (Evren et al. 2019). Although young people with upper secondary education constitute an important part of the gamer profile, some studies suggest that disordered gaming may increase among individuals with undergraduate and graduate degrees (Wittek et al. 2016). Furthermore, in relation to marital status, single individuals are more likely to be disordered gamers because those in relationships are likely to have other life responsibilities and obligations (Wenzel et al. 2009). Consequently, being single was positively associated with excessive video game use (Wittek et al. 2016).

The Present Study

On the basis of the international literature reviewed, the present study design was informed by the following points: (i) the inconclusive results considering the prevalence rates of disordered gaming both internationally, as well as within Turkey (where the population of interest of the current study comes from); (ii) the past use of measurement instruments that do not exclusively reflect the six commonly agreed behavioral addiction criteria (thus, enabling cross-addiction comparability in the relatively frequent cases of addiction comorbidities; Burleigh et al. 2019); (iii) the dearth of large-scale, and representative studies, as well as the prevalence disparities between such studies and studies with non-representative samples (Costa and Kuss 2019); (iv) the moderating role of the country of origin in the intensity between associated psychopathological factors and disordered gaming behaviors recently identified (Stavropoulos et al. 2019a, b, c), which could to some extent indicate country-specific results; and (v) inconsistencies considering the number as well as the nature of the gaming profiles proposed (Carras and Kardefelt-Winther, 2018; Pontes et al. 2014). Consequently, the present study examines

a large-scale representative sample utilizing an instrument reflecting the six commonly accepted behavioral addiction criteria to assess disordered gaming. More specifically, it psychometrically defines with the employment of IRT, a cut-off point for the population of interest, to accurately assess disordered gaming prevalence. Furthermore, it employs LCA analysis to define the optimum number of disordered gaming profiles, as well as the nature of their differences for that specific population. Finally, it describes the intensity of the associations between disordered gaming and psychological phenomenologies (previously identified in the literature). Consequently, the present study hypothesized that psychiatric distress, diminished subjective wellbeing, negative affect, alexithymia, and attachment styles would all be positively associated with disordered gaming.

Method

Participants and Procedure

The study sample comprised 24,380 Turkish participants (12,249 men and 12,131 women; $M_{age} = 31.79$ years, $SD_{age} = 10.86$; range = 18 to 81 years). The sample was planned based on the NUTS (nomenclature of territorial units for statistics) classification. NUTS is a hierarchical system for dividing up the economic territory of the European Union. The individuals residing in 26 NUTS3 regions of Turkey participated in the study (Table 1). At least 200 and at most 2000 individuals were included in each region. Inclusion criteria for participants were being over 18 years of age, and not having a mental illness that prevented the individual from completing questionnaires. Informed consent was taken from the participants and participation in the study was voluntary and anonymous. Ethical approval for the study was received from the university's ethics committee, and complied with the Declaration of Helsinki.

Measures

Participants first answered a demographic questionnaire that included items regarding their gender, age, education level, marital status, alcohol use, and cigarette use. Next, participants completed psychometric scales assessing problematic gaming, psychiatric distress, personal wellbeing, affect, alexithymia, and adult attachment styles.

Gaming Addiction Risk Questionnaire

The Gaming Addiction Risk Questionnaire (GARQ) was developed to assess problematic gaming (see Appendix). The scale comprises six items that assess six core components of addiction (salience, withdrawal, mood modification, conflict, tolerance, relapse; Griffiths 2005). Items (0 = never, 10 = always) were averaged to create an index of problematic gaming. The scale had excellent internal consistency in the present study (Cronbach's $\alpha = .93$).

Table 1 Demographic characteristics of the study group

Variable	Number	Percent
Gender		
Men	12,249	50.2
Women	12,131	49.8
Age group		
18–23 years	6327	26
24–29 years	6523	26.8
30–38 years	5459	22.4
39 years and older	6016	24.7
Education		
Primary school	1510	6.2
Secondary school	1433	5.9
High school	6355	26.1
Bachelor	13,333	54.7
Post-graduate	1735	7.1
Marital status		
Married	10,533	43.2
Single	13,828	56.8
Cigarette smoking		
Yes	10,640	43.7
No	13,718	56.3
Alcohol use		
Yes	8249	33.8
No	16,130	66.2

Brief Symptom Inventory

The Turkish form (Sahin and Durak 1994) of the 53-item Brief Symptom Inventory (BSI) (Derogatis and Spencer 1993) was used to assess anxiety (e.g., "Suddenly scared for no reason"), depression (e.g., "Feeling hopeless about the future"), negative self-concept (e.g., "Feelings of worthlessness"), somatization (e.g., "Numbness or tingling in parts of your body"), and hostility (e.g., "Having urges to break or smash things"). Items (1 = almost never, 5 = almost always) were averaged to create an index of general psychiatric distress ($\alpha = .95$).

Personal Well-Being Index Adult Form

The Turkish form (Meral 2014) of the eight-item Personal Well-Being Index Adult Form (PWBI-AF) (International Wellbeing Group 2013) was used to assess personal wellbeing (e.g., "How satisfied are you with your standard of living?", "How satisfied are you with your personal relationships?"). Items (0 = no satisfaction at all, 10 = completely satisfied) were averaged to create an index of personal wellbeing ($\alpha = .87$).

Positive and Negative Affect Schedule

The Turkish form (Gençöz 2000) of the 20-item Positive and Negative Affect Schedule (PANAS) (Watson, Clark, & Tellegen, 1988) was used to assess positive affect (e.g.,

"interested," "distressed") and negative affect (e.g., "irritable," "alert") at a given point in time. Items (1 = very slightly, 5 = extremely) were averaged to create indices of positive affect ($\alpha = .85$) and negative affect ($\alpha = .83$).

Toronto Alexithymia Scale

The Turkish form (Güleç et al. 2009) of the 20-item Toronto Alexithymia Scale (TAS-20) (Bagby et al. 1994) was used to assess difficulty identifying feelings (e.g., "I am often confused about what emotion I am feeling"), difficulty describing feelings (e.g., "It is difficult for me to find the right words for my feelings"), and externally oriented thinking (e.g., "Being in touch with emotions is essential"). Items (1 = strongly disagree, 5 = strongly agree) were averaged to create an index of alexithymia ($\alpha = .83$).

Experiences in Close Relationships-Revised

The Turkish form (Selçuk et al. 2005) of the 36-item Experiences in Close Relationships-Revised (ECR-R) (Fraley et al. 2000) was used to assess anxious attachment (e.g., "I'm afraid that I will lose my partner's love") and avoidant attachment (e.g., "I prefer not to be too close to romantic partners"). Items (1 = strongly disagree, 7 = strongly agree) were averaged to create indices of anxious ($\alpha = .83$) and avoidant attachment ($\alpha = .85$).

Statistical Analysis

The statistical analyses comprised following stages: (i) validation of the GARQ, (ii) identification of the optimum number of problematic gaming profiles and the nature of their differences, (iii) IRT psychometric examination of the GARQ cut off-point, (iv) estimation of the prevalence of problematic gaming, and (v) investigation of socio-demographic and psychological risk factors for problematic gaming. First, psychometric properties of GARQ were evaluated using classical test theory (CTT), exploratory factor analysis (EFA), and confirmatory factor analysis (CFA). Root mean square residuals (RMSEA), standardized root mean square residuals (SRMR), comparative fit index (CFI), and goodness of fit index (GFI) were checked to determine goodness of fit in CFA. RMSEA and SRMR lower than 0.05 suggest good fit, and RMSEA and SRMR lower than 0.08 indicate adequate fit; CFI and GFI higher than 0.95 is good, and CFI and GFI higher than 0.90 is acceptable (Hu and Bentler 1999).

Next, Mplus (Muthén and Muthén 2012) software was used to utilize latent class analysis (LCA). The Bayesian information criterion (BIC), the Akaike information criterion (AIC), the Lo-Mendell-Rubin test (LMRT) statistic, and the bootstrapped likelihood ratio test (LRT) were used to compare successive LCA models (Lubke and Neale 2006). Lower values in BIC and AIC suggest better fit. LMRT and BIC have been reported to identify the correct model (Witkiewitz et al. 2018). Additionally, higher entropy was used to determine classification accuracy. A unidimensional graded 3-PL IRT analysis (Embretson and Reise 2013) was applied to assess the cut-off point of the scale. The

IRT software (IRTPRO; Cai et al. 2011) produces the TCC which enables the matching of raw-scale and trait scores. The TCC may determine cut-off points, without the use of a gold standard, guided by the raw score that corresponds with a level of two standard deviations above the mean of the latent factor (Embretson and Reise 2013). In the final step, Pearson's correlation and hierarchical regression analyses were used to examine correlations between study variables and to predict problematic gaming based on socio-demographical and psychological variables.

Results

Scale Development

EFA indicated a unidimensional structure for GARQ with optimal Kaiser-Meyer-Olkin measure and Barlett's test of sphericity (0.90, $p < .001$) values, respectively (Kline 2011). A one-factor solution was extracted, which explained 74.49% of the variance. Communalities obtained in the EFA were between 0.69 and 0.81 from lowest to highest, respectively. Next, unidimensional structure of the scale was tested running CFA. Goodness of fit indices illustrated mostly good fit to the data ($\chi^2 = 2137.60$, df = 6, $p < .001$, RMSEA = 0.12 CI 90% [0.12, 0.12], SRMR = 0.02, CFI = 0.98, GFI = 0.97), and standardized regression weights ranging from 0.77 to 0.91 implied that all items had non-negligible role in the structure.

Problematic Gaming Profiles

Table 2 shows the AIC, the BIC, the entropy, and the LMRT values for all the LCA models tested in the present study. For the LCA, the fit of a nine-class model was not significantly better than that of an eight-class model. Similarly, the AIC and the BIC values decreased progressively from the two-class to the eight-class model and slightly changed on the nine-class model, thus confirming that the eight-class model had the optimum fit. For the eight-class model, the overall classification accuracy (i.e., entropy) was also high (0.955). Examination of the problematic gaming symptom profiles of the classes in this model indicated that the different profiles varied in terms of symptom intensity and different symptom elevations (Fig. 1). Based on these findings, the classes identified were defined as "Low Endorsement" class (1), "Adaptive Gamers" class (2), "Low Average Endorsement" class (3), "High Average Endorsement" class (4), "High Endorsement" class (5), "Moderately High Endorsement-Adaptive" class (6), "Moderately High Endorsement-Maladaptive" class (7), and "Average Endorsement-High Conflict" class (8).

IRT Definition of the Cut-off Point

A graded IRT 3 PLM model (i.e., discrimination, difficulty, and pseudo-guessing) was calculated to provide the TCC which would enable the definition of the raw score that reflected the point of two standard deviations above the mean of the latent factor - in this case problematic gaming (because the scale was shown to be unidimensional). Because the IRT

Table 2 Results of the latent class analysis

LCA	Classes	Percent	Posterior probability	VLMR-LRT (*p* value)	LMR-aLRT (*p* value)
Class = 1	1		1		
BIC = 417,243.809					
AIC = 417,146.536					
Class = 2	2	Class 1 = 78	Class 1 = 0.77686	< .001	< .001
BIC = 322,135.637		Class 2 = 22	Class 2 = 0.22314		
AIC = 321,981.621					
Entropy = 0.964					
Class = 3	3	Class 1 = 67	Class 1 = 0.67322	< .001	< .001
BIC = 293,628.126		Class 2 = 23	Class 2 = 0.22856		
AIC = 293,417.367		Class 3 = 10	Class 3 = 0.09822		
Entropy = 0.953					
Class = 4	4	Class 1 = 65	Class 1 = 0.64864	< .001	< .001
BIC = 280,705.779		Class 2 = 15	Class 2 = 0.15303		
AIC = 280,438.278		Class 3 = 12	Class 3 = 0.12060		
Entropy = 0.954		Class 4 = 8	Class 4 = 0.07773		
Class = 5	5	Class 1 = 60	Class 1 = 0.60279	< .001	< .001
BIC =271,704.152		Class 2 = 16	Class 2 = 0.15910		
AIC = 271,379.908		Class 3 = 13	Class 3 = 0.12710		
Entropy = 0.943		Class 4 = 7	Class 4 = 0.07053		
		Class 5 = 4	Class 5 = 0.04048		
Class = 6	6	Class 1 = 60	Class 1 = 0.59852	< .001	< .001
BIC = 264,465.002		Class 2 = 4	Class 2 = 0.03818		
AIC = 264,233.380		Class 3 = 12	Class 3 = 0.12053		
Entropy = 0.947		Class 4 = 9	Class 4 = 0.09305		
		Class 5 = 10	Class 5 = 0.09566		
		Class 6 = 5	Class 6 = 0.05406		
Class = 7	7	Class 1 = 59	Class 1 = 0.59281	< .001	< .001
BIC= 260,669.324		Class 2 = 3	Class 2 = 0.02691		
AIC = 260,231.595		Class 3 = 2	Class 3 = 0.02474		
Entropy = 0.946		Class 4 = 9	Class 4 = 0.09134		
		Class 5 = 12	Class 5 = 0.11632		
		Class 6 = 10	Class 6 = 0.09652		
		Class 7 = 5	Class 7 = 0.05136		
Class = 8	8	Class 1 = 59	Class 1 = 0.58727	< .001	< .001
BIC = 255,128.124					
AIC = 254,633.652		Class 2 = 11	Class 2 = 0.11156		
Entropy = 0.955		Class 3 = 9	Class 3 = 0.09498		
		Class 4 = 9	Class 4 = 0.08674		
		Class 5 = 5	Class 5 = 0.05114		
		Class 6 = 3	Class 6 = 0.02548		
		Class 7 = 2	Class 7 = 0.02229		
		Class 8 = 2	Class 8 = 0.01959		
Class = 9	9	Class 1 = 0	Class 1 = 0.00023	.97	.97
BIC = 254,457.401		Class 2 = 2	Class 2 = 0.02446		
AIC = 253,906.186		Class 3 = 2	Class 3 = 0.02229		
Entropy = 0.957		Class 4 = 2	Class 4 = 0.01907		
		Class 5 = 10	Class 5 = 0.10393		
		Class 6 = 60	Class 6 = 0.58868		
		Class 7 = 5	Class 7 = 0.05136		
		Class 8 = 9	Class 8 = 0.08680		
		Class 9 = 10	Class 9 = 0.09840		

AIC = Akaike information criterion, *BIC* = Bayesian information criterion, *VLMR-LRT* = Vuong-Lo-Mendell-Rubin likelihood ratio test, *LMR-LRT* = Lo-Mendell-Rubin likelihood ratio test

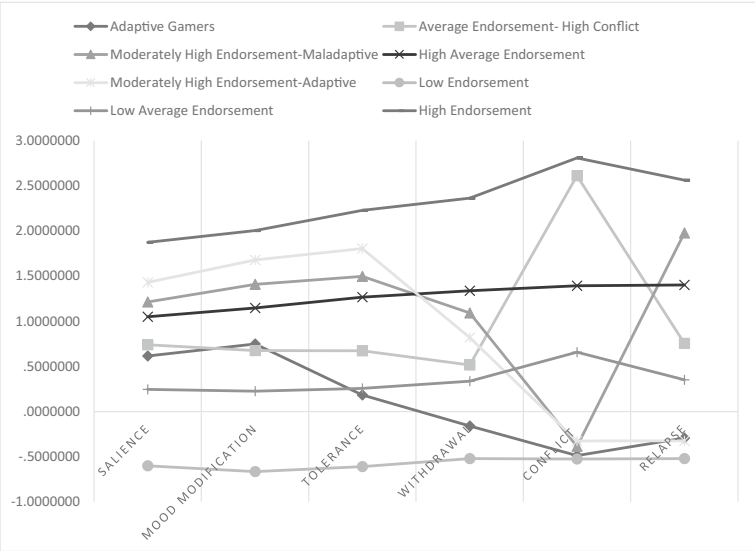

Fig. 1 Standardized performance of the classes across the six problematic gaming criteria

examination of the psychometric properties of the scale was not the aim of the present study, these are not provided here. The TCC (see Fig. 2) indicated that the scale provided a sufficient psychometric measure for assessing individuals with high and low levels of problematic gaming behaviors. The problematic gaming behavior at a level of two SDs above the mean trait level corresponds with a raw score of 56, and based on this, is suggested as a conditional (before clinical assessment confirmation) diagnostic cut-off point. Therefore, this score informed the calculation of the prevalence rate. Accordingly, 1.6% of the participants were at very high risk for being addicted to gaming.

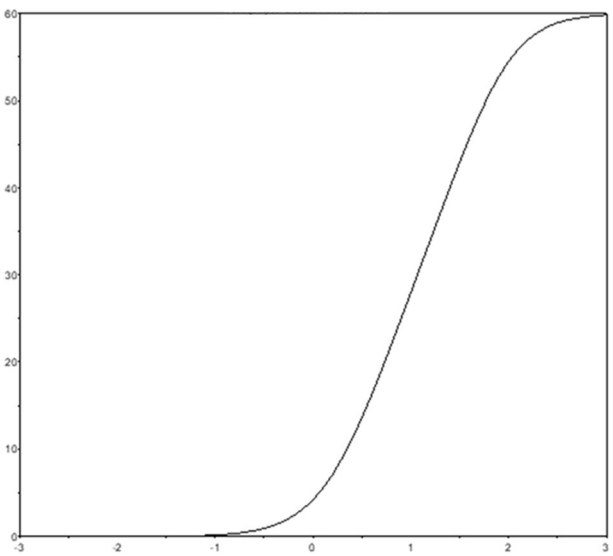

Fig. 2 Test characteristic curve for cut-off point determination

Table 3 Mean scores, standard deviations, and Pearson's correlations coefficients of the study variables

	1	2	3	4	5	6	7	8
1. Problematic gaming	-							
2. Psychiatric distress	.20*	-						
3. Personal wellbeing	− .09*	− .44*	-					
4. Positive affect	.06*	− .15*	.38*	-				
5. Negative affect	.17*	.58*	− .35*	− .10*	-			
6. Alexithymia	.09*	.51*	− .14*	.05*	.32*	-		
7. Avoidant attachment	.05*	.24*	− .29*	− .28*	.23*	0.01	-	
8. Anxious attachment	.13*	.44*	− .20*	− .10*	.37*	.30*	.21*	-
M	11.79	98.20	51.45	30.42	19.46	50.20	60.27	60.21
SD	14.83	29.04	15.95	7.97	6.83	10.80	19.23	18.36

*$p < .001$

Risk Factors for Problematic Gaming

Table 3 demonstrates mean scores, standard deviations, and correlation coefficients of the study variables. Problematic gaming was positively correlated with psychiatric distress ($r = .20$, $p < .001$), positive affect ($r = .06$, $p < .001$), negative affect ($r = .17$, $p < .001$), alexithymia ($r = .09$, $p < .001$), avoidant attachment ($r = .05$, $p < .001$), and anxious attachment ($r = .13$, $p < .001$), and negatively with personal wellbeing ($r = -.09$, $p < .001$).

Table 4 contains the results of hierarchical regression analysis. Being male ($\beta = 0.06$, $p < .01$), being single ($\beta = 0.05$, $p < .01$), alcohol use ($\beta = 0.14$, $p < .001$), cigarette use

Table 4 Hierarchical regression analysis for predictors of problem gaming

Model	B	SE	β	*t*	ΔR^2
Block 1 ($F_{(6,24,168)} = 596.76$; $p < .001$)					.13
Gender[a]	− 7.48	0.18	− .25	− 40.84***	
Age	− .27	0.01	− .20	− 25.83***	
Education[b]	− .77	0.10	− .05	− 7.80***	
Marital status[c]	1.60	0.23	.05	7.13***	
Alcohol use[d]	− .92	0.20	− 0.03	− 4.52***	
Cigarette use[d]	− 2.20	0.19	− 0.07	− 11.48***	
Block 2 ($F_{(13,24,161)} = 357.95$; $p < .001$)					.03
Gender[a]	− 7.77	0.18	− 0.26	− 42.71***	
Age	− 0.23	0.01	− 0.17	− 21.98***	
Education[b]	− 0.46	0.10	− 0.03	− 4.63***	
Marital status[c]	1.02	0.23	0.03	4.52***	
Alcohol use[d]	− 0.65	0.20	− 0.02	− 3.22**	
Cigarette use[d]	− 1.63	0.19	− 0.05	− 8.63***	
Psychiatric distress	0.07	0.01	0.13	14.69***	
Personal wellbeing	− 0.01	0.01	− 0.01	− 1.38	
Positive affect	0.14	0.01	0.08	11.54***	
Negative affect	0.09	0.02	0.04	5.30***	
Alexithymia	− 0.01	0.01	− 0.01	− 1.03	
Avoidant attachment	0.01	0.09	0.00	0.11	
Anxious attachment	0.71	0.10	0.05	7.28***	

B, unstandardized regression coefficient; *SE*, standard error; *β*, standardized regression coefficient

[a] Men = 1, Women = 2; [b] Primary school = 1, Graduate school = 5; [c] Married = 1, Single = 2; [d] Yes = 1, No = 2;
* $p < .05$, ** $p < .01$, *** $p < .001$

($\beta = 0.08$, $p < .001$), psychiatric distress ($\beta = 0.07$, $p < .001$), positive affect ($\beta = 0.10$, $p < .001$), negative affect ($\beta = 0.04$, $p < .01$), and anxious attachment ($\beta = 0.07$, $p < .001$) were all positively related with higher problematic gaming, whereas age ($\beta = -0.05$, $p < .01$) and having higher education level ($\beta = -0.04$, $p < .01$) were negatively associated with it. Together, they accounted for 16% of the variance in problematic gaming ($F_{13,24,161} = 357.95$, $p < .001$).

Discussion

The present study tested the psychometric properties of a newly developed short-scale assessing problematic gaming after combining CTT and IRT methods, and examined the prevalence and psychological predictors of problematic gaming while adjusting for socio-demographic factors using a large-scale Turkish sample ($N = 24{,}380$). Being male, being younger, having lower education level, being single, alcohol use, cigarette use, psychiatric distress, positive affect, negative affect, and anxious attachment were positively associated with problematic gaming.

Disordered Gaming Profiles

Considering the applicable profiles, LCA resulted in eight distinct disordered gaming groups, differing in a mixed quantitative and qualitative manner across the six criteria/items investigated. These groups were defined as the "Low Endorsement" profile (59%), the "Adaptive Gamers" profile (11%), the "Low Average Endorsement" profile (9%), the "High Average Endorsement" profile (9%), the "High Endorsement" profile (5%), the "Moderately High Endorsement-Adaptive" profile (3%), the "Moderately High Endorsement-Maladaptive" profile (2%), and the "Average Endorsement-High Conflict" profile (2%). The results partially confirm previous typologies to the extent that a low, a moderate, and a high endorsement profile are supported. Furthermore, the findings support that the vast majority of gamers present with adaptive and non-clinically significant manifestations. Interestingly, Class 8, the "Average Endorsement-High Conflict" group might also indicate the existence of a population that despite not reporting significant symptoms may be experiencing technophobic behaviors due to aversive predisposition of their context towards gaming. Nevertheless, the number of classes found here is higher than past studies. This difference could be attributable to three major factors; (i) the size of the sample that statistically enabled the detection and meaningful examination of less popular gaming types; (ii) the cultural specificity and the technological diversity of the Turkish population that might present with a different profile distribution; and (iii) the use of a specific assessment instrument (GARQ), which being exclusively based on the six behavioral addiction criteria, differed to the instruments used in past gaming disorder profiling (Pontes et al. 2014; Carras and Kardefelt-Winther 2018).

Cut-off and Prevalence

Test characteristic curves analysis in the context of item response theory showed that the scale provided a sufficient psychometric measure for assessing individuals with high and low levels of problematic gaming behaviors, and that the cut-off score of the scale was 56. Accordingly,

the estimated prevalence of problematic gaming in the present sample was 1.6% based on this cut-off. This is similar to some prevalence rates reported in previous studies that were conducted with large nationally representative samples, while much lower than some others with smaller and more heterogeneous samples (Griffiths et al. 2016; Milani et al. 2018; Wu et al. 2018). The different results are mostly related to characteristics of the samples used. It should be noted that the present study's sample was much bigger than previous studies and also comprised non-gamers (therefore, it reflects the prevalence of the presentation in the general population and not just in the population of gamers).

Associated Factors

In line with the theoretical assumptions of the I-PACE model which assert that psychopathology and general coping style are among an individual's core characteristic that could promote disordered use of specific internet-related activities (Brand et al. 2016), psychiatric symptoms and affect were positively associated with problem gaming. Similar to the findings here, it appears reasonable to assume that participants with high-level psychiatric symptoms may use gaming as a coping strategy to deal with emotional distress. Consequently, it is possible that individuals experiencing negative emotions may have immature defense styles, making them susceptible to have a higher vulnerability toward problematic technology use (including gaming). Online gamers had high expressive hostility both online and in the real world, and that the internet has a "buffering effect" that helps reduce hostility (Yen et al. 2011). Evren et al. (2019) reported that hostility and negative affect were associated with severity of gaming disorder symptoms. Similar to their results, it is assumed that gamers in the present study regulated their negative emotions via online games based on the results found here. Somewhat unexpectedly, positive affect was a positive predictor of problem gaming. This contradicts with the notion that positive mood has a buffering effect on addictive behaviors, although, it is in line with a finding that the impact of affective triggers may vary in terms of different behaviors (Evers et al. 2018).

Subjective wellbeing was one of the variables examined in the present study. Despite the significant correlation between subjective wellbeing and problematic gaming in correlation analysis, there was no relationship between the former and latter. Diener et al. (1985) argue that the levels of subjective wellbeing increase when social needs are met and individuals achieve goals. Contradicting the present study, subjective wellbeing was found to decrease as the level of problematic internet use increased among university students in a previous study (Odacı and Çıkrıkçı 2014). It may be that there were other variables in the regression model tested in the present study that had stronger effects on problematic gaming than poor subjective wellbeing.

The present study found that anxious attachment was positively associated with problematic gaming. This is in line with a study of by Eichenberg et al. (2017) which found that insecure (i.e., avoidant and anxious) attachment styles were associated with pathological internet use which may be related to the fact that anonymity is more significant for insecurely attached individuals. Individuals with anxious attachments are generally in need of social belonging, and they specifically consider how they are perceived on social platforms (Lin 2015), which might lead them to excessive use. Securely attached individuals do not tend to be at risk of problematic online behaviors because they already have greater social networks and more social ties than less attached individuals (Jenkins-Guarnieri et al. 2012). Similar to these studies, the findings of the present study supported the notion that anxiously attached participants have a higher risk of developing online gaming problems because attachment anxiety has been associated with lower

ability for presenting affective responses to stimuli and can lead to diminished self-control (Han et al. 2017).

In terms of socio-demographic variables, being male, being younger, being single, being an alcohol user, being a cigarette user, and having a lower education level were all positively associated with problem gaming. Kuss and Griffiths (2012) reported that males have an elevated risk for developing an addiction to playing online games, which is in line with the findings reported here. In line with the empirical literature (see Kuss and Griffiths (2012) for a review), the model presented here suggests that problematic gaming behaviors decrease as age increases and that younger gamers are more likely to develop problematic online behaviors. Assuming that individuals with higher education have more demanding occupations compared with others, various life responsibilities may not provide the opportunity to invest excessive time in online computer games as a pastime (Griffiths et al. 2004). The present finding regarding the marital status and gaming is consistent with the existing literature suggesting that being single is associated with elevated problem gaming (Wittek et al. 2016). Finally, in line with the present results, some empirical studies (Lee, Hana, Kim, & Renshaw, 2013; Padilla-Walker et al. 2010; Van Rooij et al. 2014; Wenzel et al. 2009) have found an association of excessive gaming with cigarette smoking and alcohol consumption.

Limitations and Conclusion

Despite the large sample size, the present study has some limitations. Further longitudinal studies should be conducted because the present study was cross-sectional. Longitudinal studies would enable researchers to understand changes in psychiatric symptoms relating to IGD over time. Additionally, use of self-report questionnaires used in the study may have led to social desirability and recall biases. Finally, some of the participants may have been excluded from the study due to their severe symptoms preventing them from completing the survey. Despite these limitations, the present study is the first that empirically investigates the psychological predictors of problem gaming with a very large sample in Turkey. The data presented here cannot be generalized to those outside of Turkey but results suggest that symptoms of psychiatric distress are correlated with problem gaming as has been found in other countries (Andreassen et al. 2016).

Considering previous literature and the present findings, in order to further delineate the difference between non-pathological high engagement and problematic behavior (Griffiths et al. 2004), it would be useful to take various factors including psychiatric symptoms, psychosocial struggles, and emotional characteristics into account in developing new perspectives. In this rapidly developing field, more robust data and insights from large-scale representative samples are required, and affective prevention and intervention strategies should be developed to diagnose and treat problem gaming. Finally, based on the findings of the present study, socio-demographic differences should also be taken into account for problem gaming in such strategies.

Compliance with Ethical Standards

Ethical approval for the study was received from the university's ethics committee, and complied with the Declaration of Helsinki.

Conflict of Interest The authors declare no conflict of interest.

Appendix. Gaming Addiction Risk Questionnaire

Please rate the below items considering your gaming behavior.

1. This behavior has become the centre of my life, often comes to my mind, and I often engage in it. Even if I'm not doing it, I'm thinking about when I can. I get some relief when I plan to engage in the behavior. Sometimes there is an urge that is so powerful, I find a way to engage in the behaviour, and I cannot prevent it. (Salience)
2. Sometimes, when I'm bored, sometimes when I'm happy, I think of this behavior and I do it. Many times when my problems increase, my urge to engage in the behaviour increases. If I'm unable to do it, my mind does not relax. It's like I'm alive. (Mood modification)
3. Even if I engage in the behaviour at the same rate, sometimes it's not enough for me, I have to engage in it more. I have to increase the time and amount I engage in the behaviour or I will not relax. (Tolerance)
4. When I'm in a place where it's impossible for me to engage in the behaviour, or when I try to stop myself, or when someone sees my problem and tries to interfere, I feel symptoms of tension psychologically or physically. (Withdrawal)
5. Engaging in the behavior causes me to have problems in my environment, my social life is badly affected, it can disrupt my work, and I often get criticized about it. (Conflict)
6. If I do stop engaging in the behaviour, it can be triggered again and I when it does it's like it never stopped in the first place. (Relapse)

References

Adams, B. L., Stavropoulos, V., Burleigh, T. L., Liew, L. W., Beard, C. L., & Griffiths, M. D. (2019). Internet gaming disorder behaviors in emergent adulthood: A pilot study examining the interplay between anxiety and family cohesion. *International Journal of Mental Health and Addiction, 17*, 828–844.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5)* (5th ed.). Arlington: American Psychiatric Publishing.

Anderson, E. L., Steen, E., & Stavropoulos, V. (2017). Internet use and problematic internet use: A systematic review of longitudinal research trends in adolescence and emergent adulthood. *International Journal of Adolescence and Youth, 22*, 430–454.

Andreassen, C. S., Billieux, J., Griffiths, M. D., Kuss, D. J., Demetrovics, Z., Mazzoni, E., & Pallesen, S. (2016). The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: A large-scale cross-sectional study. *Psychology of Addictive Behaviors, 30*, 252–262.

Arcelus, J., Bouman, W., Jones, B., Richards, C., Jimenez-Murcia, S., & Griffiths, M. (2017). Video gaming and gaming addiction in transgender people: An exploratory study. *Journal of Behavioral Addictions, 6*, 1–9.

Arıcak, O. T., Dinç, M., Yay, M., & Griffiths, M. D. (2019). Adapting the short form of the internet gaming disorder scale into Turkish: Validity and reliability. *Addicta: The Turkish Journal on Addictions, 6*, 15–22.

Bagby, R. M., Taylor, G. J., & Parker, J. D. (1994). The twenty-item Toronto Alexithymia Scale—II. Convergent, discriminant, and concurrent validity.. *Journal of Psychosomatic Research, 38*, 33–40.

Bartholow, B. D., Sestir, M. A., & Davis, E. B. (2005). Correlates and consequences of exposure to video game violence: Hostile personality, empathy, and aggressive behavior. *Personality and Social Psychology Bulletin, 31*, 1573–1586.

Baysak, E., Kaya, F. D., Dalgar, I., & Candansayar, S. (2016). Online game addiction in a sample from Turkey: Development and validation of the Turkish version of Game Addiction Scale. *Klinik Psikofarmakoloji Bülteni-Bulletin of Clinical Psychopharmacology, 26*, 21–31.

Bean, A. M., Nielsen, R. K. L., Van Rooij, A. J., & Ferguson, C. J. (2017). Video game addiction: The push to pathologize video games. *Professional Psychology: Research and Practice, 48*, 378–389.

Brand, M., Young, K. S., Laier, C., Wölfling, K., & Potenza, M. N. (2016). Integrating psychological and neurobiological considerations regarding the development and maintenance of specific Internet-use disorders: an Interaction of Person-Affect-Cognition-Execution (I-PACE) model. *Neuroscience & Biobehavioral Reviews, 71*, 252–266.

Brunborg, G. S., Mentzoni, R. A., Melkevik, O. R., Torsheim, T., Samdal, O., Hetland, J., & Pallesen, S. (2013). Gaming addiction, gaming engagement, and psychological health complaints among Norwegian adolescents. *Media Psychology, 16*, 115–128.

Burleigh, T. L., Stavropoulos, V., Liew, L. W., Adams, B. L., & Griffiths, M. D. (2018). Depression, internet gaming disorder, and the moderating effect of the gamer-avatar relationship: An exploratory longitudinal study. *International Journal of Mental Health and Addiction, 16*(1), 102–124.

Burleigh, T. L., Griffiths, M. D., Sumich, A., Stavropoulos, V., & Kuss, D. J. (2019). A systematic review of the co-occurrence of gaming disorder and other potentially addictive behaviors. *Current Addiction Reports, 6*, 383–401.

Cai, L., Du Toit, S. H. C., & Thissen, D. (2011). *IRTPRO: flexible, multidimensional, multiple categorical IRT modeling [computer software]*. Chicago: Scientific Software International.

Canale, N., Marino, C., Griffiths, M. D., Scacchi, L., Monaci, M. G., & Vieno, A. (2019). The association between problematic online gaming and perceived stress: The moderating effect of psychological resilience. *Journal of Behavioral Addictions, 8*, 174–180.

Carnagey, N. L., & Anderson, C. A. (2005). The effects of reward and punishment in violent video games on aggressive affect, cognition, and behavior. *Psychological Science, 16*, 882–889.

Carras, M. C., & Kardefelt-Winther, D. (2018). When addiction symptoms and life problems diverge: A latent class analysis of problematic gaming in a representative multinational sample of European adolescents. *European Child & Adolescent Psychiatry, 27*, 513–525.

Chen, I. H., Strong, C., Lin, Y. C., Tsai, M. C., Leung, H., Lin, C. Y., et al. (2020). Time invariance of three ultra-brief internet-related instruments: Smartphone Application-Based Addiction Scale (SABAS), Bergen Social Media Addiction Scale (BSMAS), and the nine-item Internet Gaming Disorder Scale-Short Form (IGDS-SF9) (Study part B). *Addictive Behaviors, 101*, 105960.

Costa, S., & Kuss, D. (2019). Clinical practices for gaming disorders: A systematic review. *Frontiers in Psychology, 10*, e578.

Derogatis, L. R., & Spencer, P. M. (1993). *Brief symptom inventory: BSI*. Upper Saddle River: Pearson.

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment, 49*, 71–75.

Dong, G., Lu, Q., Zhou, H., & Zhao, X. (2011). Precursor or sequela: Pathological disorders in people with internet addiction disorder. *PLoS One, 6*, e14703.

Eichenberg, C., Schott, M., Decker, O., & Sindelar, B. (2017). Attachment style and internet addiction: An online survey. *Journal of Medical Internet Research, 19*, e170.

Embretson, S. E., & Reise, S. P. (2013). *Item response theory for psychologists*. Mahwah: Lawrence Erlbaum.

Evers, C., Dingemans, A., Junghans, A. F., & Boevé, A. (2018). Feeling bad or feeling good, does emotion affect your consumption of food? A meta-analysis of the experimental evidence. *Neuroscience & Biobehavioral Reviews, 92*, 195–208.

Evren, C., Dalbudak, E., Topcu, M., Kutlu, N., Evren, B., & Pontes, H. M. (2018). Psychometric validation of the Turkish nine-item Internet Gaming Disorder Scale–Short Form (IGDS9-SF). *Psychiatry Research, 265*, 349–354.

Evren, C., Evren, B., Dalbudak, E., Topcu, M., & Kutlu, N. (2019). Relationships of internet addiction and internet gaming disorder symptom severities with probable attention deficit/hyperactivity disorder, aggression and negative affect among university students. *ADHD Attention Deficit and Hyperactivity Disorders, 11*, 413–421.

Fam, J. Y. (2018). Prevalence of internet gaming disorder in adolescents: A meta-analysis across three decades. *Scandinavian Journal of Psychology, 59*, 524–531.

Ferguson, C. J., Coulson, M., & Barnett, J. (2011). A meta-analysis of pathological gaming prevalence and comorbidity with mental health, academic and social problems. *Journal of Psychiatric Research, 45*, 1573–1578.

Fraley, R. C., Waller, N. G., & Brennan, K. A. (2000). An item response theory analysis of self-report measures of adult attachment. *Journal of Personality and Social Psychology, 78*, 350–364.

Gearhardt, A. N., Corbin, W. R., & Brownell, K. D. (2016). Development of the Yale Food Addiction Scale Version 2.0. *Psychology of Addictive Behaviors, 30*, 113–121.

Gençöz, T. (2000). Positive and negative affect schedule: A study of validity and reliability. *Turkish Journal of Psychology, 15*, 19–26.

Gentile, D. A., Choo, H., Liau, A., Sim, T., Li, D., Fung, D., & Khoo, A. (2011). Pathological video game use among youths: A two-year longitudinal study. *Pediatrics, 127*, 319–329.

Glass, C. R., Merluzzi, T. V., Biever, J. L., & Larsen, K. H. (1982). Cognitive assessment of social anxiety: Development and validation of a self-statement questionnaire. *Cognitive Therapy and Research, 6*, 37–55.

Gomez, R., Stavropoulos, V., Beard, C., & Pontes, H. M. (2019). Item response theory analysis of the recoded Internet Gaming Disorder Scale-Short-Form (IGDS9-SF). *International Journal of Mental Health and Addiction, 17*, 859–879.

González-Bueso, V., Santamaría, J., Fernández, D., Merino, L., Montero, E., & Ribas, J. (2018). Association between internet gaming disorder or pathological video-game use and comorbid psychopathology: A comprehensive review. *International Journal of Environmental Research and Public Health, 15*, e668.

Granero, R., Fernández-Aranda, F., Mestre-Bach, G., Steward, T., Baño, M., del Pino-Gutiérrez, A., et al. (2016). Compulsive buying behavior: clinical comparison with other behavioral addictions. *Frontiers in Psychology, 7*, e914.

Griffiths, M. D. (2005). A "components" model of addiction within a biopsychosocial framework. *Journal of Substance Use, 10*, 191–197.

Griffiths, M. D., Davies, M. N. O., & Chappell, D. (2004). Online computer gaming: A comparison of adolescent and adult gamers. *Journal of Adolescence, 27*, 87–96.

Griffiths, M. D., Kuss, D. J., & King, D. L. (2012). Video game addiction: past, present and future. *Current Psychiatry Reviews, 8*, 308–318.

Griffiths, M. D., Van Rooij, A., Kardefelt-Winther, D., Starcevic, V., Király, O., et al. (2016). Working towards an international consensus on criteria for assessing internet gaming disorder: A critical commentary on Petry et al (2014). *Addiction, 111*, 167–175.

Guedes, E., Sancassiani, F., Carta, M. G., Campos, C., Machado, S., King, A. L. S., & Nardi, A. E. (2016). Internet addiction and excessive social networks use: What about Facebook? *Clinical Practice and Epidemiology in Mental Health, 12*, 43–48.

Güleç, H., Köse, S., Güleç, M. Y., Çitak, S., Evren, C., Borckardt, J., & Sayar, K. (2009). Reliability and factorial validity of the Turkish version of the 20-item Toronto Alexithymia Scale (TAS-20). *Klinik Psikofarmakoloji Bulteni, 19*, 214–220.

Han, L., Geng, J., Jou, M., Gao, F., & Yang, H. (2017). Relationship between shyness and mobile phone addiction in Chinese young adults: Mediating roles of self-control and attachment anxiety. *Computers in Human Behavior, 76*, 363–371.

Hofmann, S. G. (2000). Self-focused attention before and after treatment of social phobia. *Behaviour Research and Therapy, 38*, 717–725.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structural analysis: Conventional criteria versus new alternatives. *Structural Equation Modelling, 6*, 1–55.

Hu, E., Stavropoulos, V., Anderson, A., Clarke, M., Beard, C., Papapetrou, S., & Gomez, R. (2019). Assessing online flow across cultures: A two-fold measurement invariance study. *Frontiers in Psychology, 10*, e407.

International Wellbeing Group (2013). Personal Well-being Index-Adult. Melbourne: Australian Centre on Quality of Life, Deakin University. Retrieved November 26, 2018, from http://www.acqol.com.au/uploads/pwi-a/pwi-a-english.pdf.

Jang, K. S., Hwang, S. Y., & Choi, J. Y. (2008). Internet addiction and psychiatric symptoms among Korean adolescents. *Journal of School Health, 78*, 165–171.

Jenkins-Guarnieri, M. A., Wright, S. L., & Hudiburgh, L. M. (2012). The relationships among attachment style, personality traits, interpersonal competency, and Facebook use. *Journal of Applied Developmental Psychology, 33*, 294–301.

Kim, J. H., & Seo, J. S. (2015). Brain and addiction: From neuroscientific evidence to Korean legislation. *Japanese Journal of General Hospital Psychiatry, 27*, 227–232.

King, D. L., Haagsma, M. C., Delfabbro, P. H., Gradisar, M., & Griffiths, M. D. (2013). Toward a consensus definition of pathological video-gaming: A systematic review of psychometric assessment tools. *Clinical Psychology Review, 33*, 331–342.

King, D. L., Delfabbro, P. H., Doh, Y. Y., Wu, A. M., Kuss, D. J., Pallesen, S., et al. (2018). Policy and prevention approaches for disordered and hazardous gaming and internet use: An international perspective. *Prevention Science, 19*, 233–249.

Kline, R. B. (2011). *Principles and practices of structural equation modeling* (2nd ed.). New York: Guilford Press.

Ko, C., Yen, J., Chen, C., Chen, S., & Yen, C. (2005). Gender differences and related factors affecting online gaming addiction among Taiwanese adolescents. *Journal of Nervous and Mental Disease, 193*, 273–277.

Kühn, S., Berna, F., Lüdtke, T., Gallinat, J., & Moritz, S. (2018). Fighting depression: Action video game play may reduce rumination and increase subjective and objective cognition in depressed patients. *Frontiers in Psychology, 9*, e129.

Kuss, D. J., & Griffiths, M. D. (2012). Internet gaming addiction: A systematic review of empirical research. *International Journal of Mental Health and Addiction, 10*, 278–296.

Lee, Y. S., Hana, D. H., Kim, S. M., & Renshaw, P. F. (2013). Substance abuse precedes internet addiction. *Addictive Behaviors, 38*, 2022–2025.

Lehenbauer-Baum, M., & Fohringer, M. (2015). Towards classification criteria for internet gaming disorder: Debunking differences between addiction and high engagement in a German sample of World of Warcraft players. *Computers in Human Behavior, 45*, 345–351.

Lin, J. H. (2015). The role of attachment style in Facebook use and social capital: Evidence from university students and a national sample. *Cyberpsychology, Behavior and Social Networking, 18*, 173–180.

Lubke, G., & Neale, M. C. (2006). Distinguishing between latent classes and continuous factors: Resolution by maximum likelihood? *Multivariate Behavioral Research, 41*, 499–532.

Mehroof, M., & Griffiths, M. D. (2010). Online gaming addiction: The role of sensation seeking, self-control, neuroticism, aggression, state anxiety, and trait anxiety. *Cyberpsychology, Behavior and Social Networking, 13*, 313–316.

Mentzoni, R. A., Brunborg, G. S., Molde, H., Myrseth, H., Skouverøe, K. J. M., Hetland, J., & Pallesen, S. (2011). Problematic video game use: Estimated prevalence and associations with mental and physical health. *Cyberpsychology, Behavior and Social Networking, 14*, 591–596.

Meral, B. F. (2014). Psychometric properties of Turkish form of the Personal Well-being Index-Adult. *Journal of Happiness and Well-Being, 2*, 119–131.

Milani, L., La Torre, G., Fiore, M., Grumi, S., Gentile, D. A., Ferrante, M., et al. (2018). Internet gaming addiction in adolescence: Risk factors and maladjustment correlates. *International Journal of Mental Health and Addiction, 16*, 888–904.

Monacis, L., de Palo, V., Griffiths, M. D., & Sinatra, M. (2017). Exploring individual differences in online addictions: The role of identity and attachment. *International Journal of Mental Health and Addiction, 15*, 853–868.

Montag, C., Schivinski, B., Sariyska, R., Kannen, C., Demetrovics, Z., & Pontes, H. M. (2019). Psychopathological symptoms and gaming motives in disordered gaming—a psychometric comparison between the WHO and APA diagnostic frameworks. *Journal of Clinical Medicine, 8*, e1691.

Morcos, M., Stavropoulos, V., Rennie, J. J., Clark, M., & Pontes, H. M. (2019). Internet gaming disorder: compensating as a Draenei in World of Warcraft. *International Journal of Mental Health and Addiction*, 1–17.

Müller, M., & Montag, C. (2017). The relationship between internet addiction and alcohol consumption is ınfluenced by the smoking status in male online video gamers. *Clinical Neuropsychiatry, 14*, 34–43.

Mullin, B. C., & Hinshaw, S. P. (2007). Emotion regulation and externalizing disorders in children and adolescents. In J. J. Gross (Ed.), *Handbook of emotion regulation* (pp. 523–541). New York: Guilford Press.

Muthén, L. K., & Muthén, B. O. (2012). *Mplus statistical modeling software: Release 7.0*. Los Angeles: Muthén & Muthén.

O'Farrell, D. L., Baynes, K. L., Pontes, H. M., Griffiths, M. D., & Stavropoulos, V. (2020). Depression and disordered gaming: Does culture matter? *International Journal of Mental Health and Addiction*, 1–19.

Odacı, H. (2011). Academic self-efficacy and academic procrastination as predictors of problematic internet use in university students. *Computers & Education, 57*, 1109–1113.

Odacı, H., & Çelik, Ç. B. (2013). Who are problematic internet users? An investigation of the correlations between problematic internet use and shyness, loneliness, narcissism, aggression and self-perception. *Computers in Human Behavior, 29*, 2382–2387.

Odacı, H., & Çıkrıkçı, Ö. (2014). Problematic internet use in terms of gender, attachment styles and subjective well-being in university students. *Computers in Human Behavior, 32*, 61–66.

Padilla-Walker, L. M., Nelson, L. J., Carroll, J. S., & Jensen, A. C. (2010). More than a just a game: Video game and internet use during emerging adulthood. *Journal of Youth and Adolescence, 39*, 103–113.

Parker, J. D. A., Wood, L. M., Bond, B. J., & Shaughnessy, P. (2005). Alexithymia in young adulthood: A risk factor for pathological gambling. *Psychotherapy and Psychosomatics, 74*, 51–55.

Petry, N. M., Zajac, K., Ginley, M., Lemmens, J., Rumpf, H. J., Ko, C. H., & Rehbein, F. (2018). Policy and prevention efforts for gaming should consider a broad perspective: commentary on: policy responses to problematic video game use: A systematic review of current measures and future possibilities (Király et al., 2018). *Journal of Behavioral Addictions, 7*, 543–547.

Pontes, H. M., Kiraly, O., Demetrovics, Z., & Griffiths, M. D. (2014). The conceptualisation and measurement of DSM-5 Internet Gaming Disorder: the development of the IGD-20 Test. *PloS One, 9*, e110137.

Pontes, H. M., Stavropoulos, V., & Griffiths, M. D. (2017). Measurement invariance of the Internet Gaming Disorder Scale–Short-Form (IGDS9-SF) between the United States of America, India and the United Kingdom. *Psychiatry Research, 257*, 472–478.

Pontes, H. M., Schivinski, B., Brzozowska-Woś, M., & Stavropoulos, V. (2019a). Laxer clinical criteria for gaming disorder may hinder future efforts to devise an efficient diagnostic approach: A tree-based model study. *Journal of Clinical Medicine, 8*(10), e1730.

Pontes, H. M., Stavropoulos, V., & Griffiths, M. D. (2019b). Emerging insights on internet gaming disorder: Conceptual and measurement issues. *Addictive Behaviors Reports*. https://doi.org/10.1016/j.abrep.2019.100242.

Ramos-Diaz, J., Guevara-Cordero, C., Király, O., Demetrovics, Z., & Griffiths, M. D. (2018, August). Excessive gaming and internet use: Preliminary results with anxiety and depression among highly engaged Peruvian gamers. In *2018 IEEE XXV International Conference on Electronics, Electrical Engineering and Computing (INTERCON)* (pp. 1-4). IEEE.

Robbins, T. W., & Clark, L. (2015). Behavioral addictions. *Current Opinion in Neurobiology, 30*, 66–72.

Sahin, N. H., & Durak, A. (1994). Brief Symptom Inventory-BSI: A study of the brief symptom inventory in Turkish youth. *Turkish Journal of Psychology, 9*, 44–56.

Scerri, M., Anderson, A., Stavropoulos, V., & Hu, E. (2019). Need fulfilment and internet gaming disorder: A preliminary integrative model. *Addictive Behaviors Reports, 9*, e100144.

Selçuk, E., Günaydın, G., Sümer, N., & Uysal, A. (2005). A new scale developed to measure adult attachment dimensions: Experiences in Close Relationships-Revised (ECR-R) – Psychometric evaluation in a Turkish sample. *Türk Psikoloji Yazıları, 8*, 1–11.

Shapira, N. A., Goldsmith, T. D., Keck Jr., P. E., Khosla, U. M., & McElroy, S. L. (2000). Psychiatric features of individuals with problematic internet use. *Journal of Affective Disorders, 57*, 267–272.

Smith, J. P., & Book, S. W. (2008). Anxiety and substance use disorders: A review. *Psychiatry Times, 25*, 19–23.

Stavropoulos, V., Gomez, R., Steen, E., Beard, C., Liew, L., & Griffiths, M. D. (2017). The longitudinal association between anxiety and internet addiction in adolescence: The moderating effect of classroom extraversion. *Journal of Behavioral Addictions, 6*(2), 237–247.

Stavropoulos, V., Beard, C., Griffiths, M. D., Buleigh, T., Gomez, R., & Pontes, H. M. (2018a). Measurement invariance of the Internet Gaming Disorder Scale–Short-Form (IGDS9-SF) between Australia, the USA, and the UK. *International Journal of Mental Health and Addiction, 16*, 377–392.

Stavropoulos, V., Mastrotheodoros, S., Burleigh, T. L., Papadopoulos, N., & Gomez, R. (2018b). Avoidant romantic attachment in adolescence: Gender, excessive internet use and romantic relationship engagement effects. *PLoS One, 13*(7), e0201176.

Stavropoulos, V., Adams, B. L., Beard, C. L., Dumble, E., Trawley, S., Gomez, R., & Pontes, H. M. (2019a). Associations between attention deficit hyperactivity and internet gaming disorder symptoms: Is there consistency across types of symptoms, gender and countries? *Addictive Behaviors Reports, 9*, e100158.

Stavropoulos, V., Bamford, L., Beard, C., Gomez, R., & Griffiths, M. D. (2019b). Test-retest measurement invariance of the nine-item Internet Gaming Disorder Scale in two countries: A preliminary longitudinal study. *International Journal of Mental Health and Addiction*, 1-18. Epub ahead of print. https://doi.org/10.1007/s11469-019-00099-w.

Stavropoulos, V., Gomez, R., & Motti, F. (2019c). Introduction to the special topic:"Internet gaming disorder: A pathway towards assessment consensus". *Frontiers in Psychology, 10*, e1822.

Stavropoulos, V., Baynes, K. L., O'Farrel, D. L., Gomez, R., Mueller, A., Yucel, M., & Griffiths, M. (2020a). Inattention and disordered gaming: Does culture matter? *Psychiatric Quarterly*, 1–16. https://doi.org/10.1007/s11126-019-09702-8.

Stavropoulos, V., Rennie, J., Morcos, M., Gomez, R., & Griffiths, M. (2020b). Understanding the relationship between the Proteus effect, immersion, and gender among *World of Warcraft* players: An empirical survey study. *Behavior & Information Technology*. https://doi.org/10.1080/0144929X.2020.1729240.

Throuvala, M. A., Janikian, M., Griffiths, M. D., Rennoldson, M., & Kuss, D. J. (2019). The role of family and personality traits in internet gaming disorder: A mediation model combining cognitive and attachment perspectives. *Journal of Behavioral Addictions, 8*, 48–62.

Ünübol, H., Sayar, F. G. H., & Kanpolat, S. (2018). Investigation of the relationship between alexithymia and eating attitude, self-esteem and anger in women who applied to psychological counseling center. *The European Respiratory Journal, 4*, 280–288.

Van Rooij, A. J., Kuss, D. J., Griffiths, M. D., Shorter, G. W., Schoenmakers, T. M., & van de Mheen, D. (2014). The (co-)occurrence of problematic video gaming, substance use, and psychosocial problems in adolescents. *Journal of Behavioral Addictions, 3*, 157–165.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*, 1063–1070.

Wenzel, H. G., Bakken, I. J., Johansson, A., Götestam, K. G., & Oren, A. (2009). Excessive computer game playing among Norwegian adults: Self-reported consequences of playing and association with mental health problems. *Psychological Reports, 105*, 1237–1247.

Witkiewitz, K., Roos, C. R., Tofighi, D., & Van Horn, M. L. (2018). Broad coping repertoire mediates the effect of the combined behavioral intervention on alcohol outcomes in the COMBINE study: An application of latent class mediation. *Journal of Studies on Alcohol and Drugs, 79*, 199–207.

Wittek, C. T., Finserås, T. R., Pallesen, S., Mentzoni, R. A., Hanss, D., Griffiths, M. D., & Molde, H. (2016). Prevalence and predictors of video game addiction: A study based on a national representative sample of gamers. *International Journal of Mental Health and Addiction, 14*, 672–686.

World Health Organization. (2018). *International classification of diseases, 11th Revision (ICD-11)*. Retrieved September 7, 2019, from www.who.int/classifications/icd/. Accessed 06 Mar 2020.

Wu, A. M., Chen, J. H., Tong, K. K., Yu, S., & Lau, J. T. (2018). Prevalence and associated factors of internet gaming disorder among community dwelling adults in Macao, China. *Journal of Behavioral Addictions, 7*, 62–69.

Yang, Z., Asbury, K., & Griffiths, M. D. (2019). An exploration of problematic smartphone use among Chinese university students: Associations with academic anxiety, academic procrastination, self-regulation and subjective wellbeing. *International Journal of Mental Health and Addiction, 17*, 596–614.

Yen, J. Y., Yen, C. F., Wu, H. Y., Huang, C. J., & Ko, C. H. (2011). Hostility in the real world and online: The effect of internet addiction, depression, and online activity. *Cyberpsychology, Behavior and Social Networking, 14*, 649–655.

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