



# The Development of the Turkish Craving for Internet Gaming Scale (CIGS): A Validation Study

Mustafa Savci<sup>1</sup> · Mark D. Griffiths<sup>2</sup> 

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## Abstract

As the use of digital technology has increased, abuse and addiction to technology have been identified among a minority of users. In the mid-1990s, the concept of internet addiction was first used. Today, almost every digital technology use has been claimed to have a minority of disordered users. One key aspect of addictive substance behaviors is craving. Craving is also an important component of behavioral addictions including digital technology disorders such as Internet Gaming Disorder. The aim of the present study was to develop the Turkish version of the Craving for Internet Gaming Scale (CIGS) via an adaptation of the Penn Alcohol Craving Scale (PACS). The present study comprised 368 adolescents from four different samples. The measures used included the Craving for Internet Gaming Scale, Digital Game Addiction Scale, and Brief Self-Control Scale. The structural validity of CIGS was investigated with Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and criterion validity. The reliability of CIGS was evaluated using Cronbach  $\alpha$  internal consistency reliability coefficient and corrected item total correlation coefficients. As a result of EFA, it was found that the five-item CIGS had a single-factor structure. The unidimensional CIGS obtained as a result of EFA was tested with CFA. As a result of CFA, the unidimensional structure of CIGS was confirmed in two different samples. Criterion validity of CIGS was assessed via digital gaming addiction, self-discipline, impulsiveness, daily internet gaming duration, and internet gaming history. As a result of criterion analysis, CIGS was associated with these variables in the expected direction. Finally, according to reliability analysis, the CIGS was found to be a reliable scale. When validity and reliability analysis of the CIGS are considered as a whole, it is concluded that the CIGS is a valid and reliable scale that assesses craving for internet gaming.

**Keywords** Online gaming · Internet gaming disorder · Craving · Internet gaming craving · Online gaming addiction

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✉ Mark D. Griffiths  
mark.griffiths@ntu.ac.uk

Extended author information available on the last page of the article

The latest (fifth) edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) describes craving as “a strong desire/urge” to use a substance (American Psychiatric Association [APA] 2013). Similarly, the tenth edition of the International Classification of Diseases (ICD-10) defines craving as “a strong desire or sense of compulsion” to use a particular substance (WHO 1993). The concept of craving has traditionally been conceptualized for alcohol and substance addiction as described in both the DSM-5 and ICD-10 (APA 2013; WHO 1993). Craving is intensely felt by individuals in the process of giving up a substance (Kavanagh et al. 2013). However, in recent years, the concept of craving has been used in the evaluation of behavioral addictions (Grant et al. 2010; Holden 2001; Sauvaget et al. 2015). Indeed, behavioral addictions and substance addictions have been shown to be similar in many respects (Griffiths 2005). In behavioral addictions, an urge or craving can occur before addictive behavior develops (Grant et al. 2010). In addition, craving can be implicated in the development, continuity, and relapse of addictive behavior, and can lead to loss of control over that behavior or substance within an individual’s behavior (Sauvaget et al. 2015). According to scholars (e.g., Grant et al. 2010; Griffiths 1996a), behavioral addictions can be similar to substance addictions in many ways including natural history, phenomenology, tolerance, comorbidity, overlapping genetic contribution, neurobiological mechanisms, and response to treatment. In the DSM-5, behavioral addictions refer to behavioral disorders that share some features related to substance abuse but are not associated with any substance (APA 2013).

In the literature, addictions to gambling, sex, pornography, exercise, shopping, food, and gaming have been conceptualized as behavioral addictions (Andreassen et al. 2015; APA 2013; Freeman 2008; Gearhardt et al. 2009; Griffiths 2005; Moreyra et al. 2002; Terry et al. 2004; Voros 2009). In recent years, increased Internet use has led to a minority of individuals experiencing problems such as internet gaming addiction and social media addiction (Kuss et al. 2014; Kuss and Griffiths 2017). In the DSM-5, Internet Gaming Disorder (IGD) is conceptualized as a tentative disorder that requires further research. In the DSM-5, IGD is diagnosed if five or more of the symptoms below are endorsed over a 12-month period (APA 2013).

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Preoccupation	1. Preoccupation with internet games. (The individual thinks about previous gaming activity or anticipates playing the next game; internet gaming becomes the dominant activity in daily life). Note: This disorder is distinct from internet gambling disorder, which is included under gambling disorder.
Withdrawal	2. Withdrawal symptoms when internet gaming is taken away. (These symptoms are typically described as irritability, anxiety, or sadness, but there are no physical signs of pharmacological withdrawal.)
Tolerance	3. Tolerance involving the need to spend increasing amounts of time engaged in internet games.
Persistence	4. Unsuccessful attempts to control the participation in internet games.
Displacement	5. Loss of interests in previous hobbies and entertainment as a result of, and with the exception of, internet games.
Awareness	6. Continued excessive use of internet games despite knowledge of psychosocial problems.
Deception	7. Has deceived family members, therapists, or others regarding the amount of internet gaming.
Escape	8. Use of internet games to escape or relieve a negative mood (e.g., feelings of helplessness, guilt, and anxiety).
Missed opportunities	9. Has jeopardized or lost a significant relationship, job, or educational or career opportunity because of participation in internet games.

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Unlike the DSM-5, in ICD-11, internet gaming disorder is considered a disorder (under gaming disorder). According to the World Health Organization (WHO 2016), gaming disorder is characterized by a pattern of persistent or recurrent gaming behavior (“digital gaming” or

“video-gaming”), which may be online (i.e., over the Internet) or offline, manifested by:

- |                 |   |
|-----------------|---|
| Loss of control | 1. Impaired control over gaming   |
| Displacement    | 2. Increasing priority is given to gaming to the extent that gaming takes precedence over other life interests and daily activities |
| Escape          | 3. Continuation or escalation of gaming despite the occurrence of negative consequences   |

These symptoms in many areas impede the functioning of the individual (personal, family, social, educational, occupational, or other important areas). The pattern of gaming behavior may be continuous or episodic and recurrent (WHO 2016). Research has shown that IGD is related to specific personality traits such as neuroticism (Gervasi et al. 2017; González-Bueso et al. 2018), psychopathology (Bargeron and Hormes 2017; González-Bueso et al. 2018; King and Delfabbro 2016), poor psychological wellbeing (Bargeron and Hormes 2017; Cheng et al. 2018; Sarda et al. 2016), lower academic performance (Hawi et al. 2018; Sahin et al. 2014), lower social connectedness (Sarda et al. 2016; Savci and Aysan 2017), impulsivity (Bargeron and Hormes 2017; Kim et al. 2017; Ryu et al. 2018), poor sleep quality (Hawi et al. 2018; Lam 2014), and poor interpersonal relationships (APA 2013; Ryu et al. 2018). Given these findings, it can be said that IGD has a broad etiological spectrum. In addition, it is predicted that IGD will become a significant health problem for a minority of individuals in the coming years. Research has also demonstrated that adolescents and emerging adults are a risk group for developing IGD, particularly among males (King and Delfabbro 2016; Kuss and Griffiths 2012). According to King and Delfabbro (2014), adolescents with IGD have four main characteristics that make adolescents vulnerable to internet gaming disorder: (i) beliefs about game reward value and tangibility, (ii) maladaptive and inflexible rules about gaming behavior, (iii) over-reliance on gaming to meet self-esteem needs, and (iv) gaming as a method of gaining social acceptance.

Numerous studies have been carried out on the prevalence of IGD. However, the use of different measuring tools comprising differing criteria has resulted in different results even in the same countries and cultures. The DSM-5 emphasizes that IGD is more common in Asian countries and among male adolescents (aged 12–20 years). Feng et al. (2017) examined 27 studies on normal population between 1998 and 2016 and found the mean average prevalence rate to be 4.7%. In a different study, the prevalence of IGD was found to be between 10 and 15% in the Far East countries, 1–10% in Western countries, and 1–9% in South American and African countries (Saunders et al. 2017). There are a limited number of studies concerning IGD in Turkey (the country of the present study). In a study by Turkish Green Crescent (2017), the prevalence of problematic digital gaming play among 6116 Turkish adolescents (aged 12–19 years) was reported as being 8.5% (Aricak et al. 2018). Some scholars claim that the prevalence of IGD is increasing worldwide among both school-aged students and among representative samples of the general population (Feng et al. 2017).

IGD appears to be a problem threatening adolescent health in many countries worldwide (Feng et al. 2017). This makes it necessary to recognize and assess such a problem with well-validated measurement tools for IGD. Indeed, there are no well-researched subtypes of IGD. Gaming disorder often involves specific online games such as role-playing games and battle arena games, but can also involve offline games as demonstrated by all the studies published in the 1980s and 1990s (Griffiths et al. 2012). It is likely that preferred games will vary over time as new games are developed and popularized. Further research on the subtypes of IGD is needed (APA 2013). While gaming addiction is similar to substance addiction in many respects, the concept of craving is arguably noteworthy. In recent years, research into craving for online gaming has been carried out. Such research has reported that game addicts

experienced craving for online gaming (Dong et al. 2017; King et al. 2016; Kim et al. 2018; Shin et al. 2018; Zhang et al. 2016). These studies also show that craving occurs in IGD as it does in substance addiction. When the DSM-5 definition of craving is taken into consideration, craving for online gaming is also defined as a strong desire/urge to engage in gaming online (APA 2013). When the ICD-10 definition of craving is taken into consideration, it is defined as a strong desire or sense of compulsion to engage in gaming online (WHO 1993).

Although there are many scales that assess IGD (King et al. 2013; Pontes 2016), no scale exists that assesses craving for internet gaming. However, different measurement methods have been used to assess craving for online gaming. The most commonly used methods are qualitative self-report techniques, multimodal biosignals, functional magnetic resonance imaging (fMRI), visual analogue scales, and plasma levels of leptin (Dong et al. 2017; King et al. 2016; Kim et al. 2018; Shin et al. 2018; Zhang et al. 2016). The creation of a self-rating scale for gaming craving may help to stimulate studies in the area. There is also a need for valid and reliable scales to facilitate cross-cultural studies. Consequently, the present study adapted a widely used craving scale rather than develop a completely new scale from scratch (i.e., the Penn Alcohol Craving Scale) which has been adapted in many cultures (e.g., Chodkiewicz et al. 2018; Evren et al. 2008; Kim et al. 2008; Pérez Gálvez et al. 2016). Therefore, the primary aim of the study was to adapt and validate a Turkish version of the PACS to assess craving among gamers.

## Methods

### Participants

The present study comprised 368 adolescents (172 females and 196 males) from four different samples including a pilot study comprising 30 students (18 girls and 12 boys). The structural reliability and validity were performed on a convenience sample of 338 students from three different samples. Structural validity was performed using exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and criterion validity. EFA was performed on 102 adolescents, CFA was performed on 103 adolescents, and criterion validity on 133 adolescents. Demographic information of the four study groups is presented in Table 1.

**Table 1** Demographic information of the study groups

		EFA Sample		CFA Sample		Criterion validity sample		Pilot study sample	
		<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Sex	Girl	49	48	35	34	70	52.6	18	60
	Boy	53	52	68	66	63	47.4	12	40
Daily internet gaming duration		.16–10 h, $\bar{X}$ = 2.58 h		.16–12 h, $\bar{X}$ = 2.33		.25–11 h $\bar{X}$ = 1.99			
Internet gaming history		1–12 years, $\bar{X}$ = 4.6 years		1–15 years, $\bar{X}$ = 4.73		1–12 years, $\bar{X}$ = 4.49			
Age		14–20 years, $\bar{X}$ = 16.59 ± .88		14–18 years, $\bar{X}$ = 15.94 ± .96		14–18 years, $\bar{X}$ = 16.53 ± 1.33		14–18	
Total		102		103		133		30	

## Materials

**Craving for Internet Gaming Scale** In the present study, the PACS developed by Flannery et al. (1999) was adapted to develop the Craving for Internet Gaming Scale (CIGS). The five-item PACS is a self-report measure that asks individuals to rate the intensity, frequency, and duration of their craving, and ability to resist acting on their craving for a stated period of time. The PACS also asks individuals to average their craving for the preceding week. The PACS is a unidimensional scale comprising five items and produces a score ranging from 0 to 6. High scores on the scale indicate high levels of alcohol craving. The Cronbach's alpha internal consistency reliability coefficient for PACS was previously calculated to be .92. The criterion validity of the original PACS was assessed using the Obsessive-Compulsive Drinking Scale (Modell et al. 1992), Alcohol Urge Questionnaire (Bohn et al. 1995), Addiction Severity Index (McLellan et al. 1980), and Drinker's Inventory of Consequences (Miller et al. 1995). The predictive validity of the original scale was based on relapse. Consequently, the PACS is a valid and reliable scale to assess alcohol craving. The PACS has also been translated into Turkish by Evren et al. (2008) for alcohol-addicted men. In the present study, PACS was adapted to Turkish as CIGS by replacing the word "alcohol" with the words "internet gaming." Further details of the adaptation, validity, and reliability process of the CIGS is given in the following sections.

**Digital Game Addiction Scale** The Digital Game Addiction Scale (DGAS-7) was developed by Lemmens et al. (2009) and adapted into Turkish by Yalcin-Irmak and Erdogan (2015). It utilizes a Likert-type scale comprising seven items and a single dimension. EFA has demonstrated that the DGAS-7 had a unidimensional structure explaining 56.96% of the total variance. This unidimensional structure was then tested with CFA. As a result of the CFA, the DGAS model had acceptable compliance index values ( $\chi^2 = 14.22$ ,  $p = .37$ ,  $df = 14$ ,  $RMSEA = .012$ ,  $AGFI = .92$ ,  $CFI = .99$ ,  $GFI = .96$ , and  $SRMR = .06$ ). Factor loading values of the DGAS-7 in the present study ranged from .77 to .52 (all acronyms are described in Table 2). In a previous study, the Cronbach's alpha internal consistency coefficient of DGAS-7 was found to be .72 and the test-retest correlation was found to be .80. There are no items rated in reverse and the high scores indicate that the risk of digital gaming addiction increases (Yalcin-Irmak and Erdogan 2015). In the present study, Cronbach's alpha coefficient was .86.

**Brief Self-Control Scale** The Brief Self-Control Scale (BSCS) was developed by Tangney et al. (2004) and adapted into Turkish by Nebioglu et al. (2012). It comprises nine items across two dimensions (impulsiveness and self-discipline) and utilizes a 5-point Likert-type scale. As a result of the CFA, the BSCS was found to have perfect fit indices ( $\chi^2/df = 1.98$ ,  $CFI = .98$ ,  $GFI = .99$ , and  $RMSEA = .043$ ). The criterion validity of the BSCS was assessed by social intelligence, emotion management skills, and impulsivity. Cronbach's  $\alpha$  internal consistency reliability coefficients of the BSCS ranged between .81 and .87 in a previous study (Nebioglu et al. 2012). In the present study, the Cronbach's alpha coefficient was .67.

## Procedure

The adaptation of the PACS to the Turkish CIGS started with the approval of the Ethics Committee and with permission to collect data. Following this, the adapted PACS was

**Table 2** Goodness of fit indices and acceptable limits

Indices	Acceptable limits
$\chi^2/df$	$\leq 5$ acceptable fit, $\leq 3$ perfect fit
RMSEA	$\leq 0.10$ weak fit, $\leq 0.08$ good fit, $\leq 0.05$ perfect fit
GFI	.85–.89 acceptable fit, $\geq .90$ good fit
AGFI	.85–.89 acceptable fit, $\geq .90$ good fit
CFI	$\geq .90$ acceptable fit, $\geq .95$ good fit, $\geq .97$ perfect fit
IFI	$\geq .90$ acceptable fit, $\geq .95$ good fit, $\geq .97$ perfect fit
TLI (NNFI)	$\geq .90$ acceptable fit, $\geq .95$ good fit

(Brown 2006; Cokluk et al. 2012; Hu and Bentler 1999; Kelloway 2015; Kline 2011; Raykov and Marcoulides 2008; Meydan and Şeşen 2011; Schumacker and Lomax 2004; Schermelleh-Engel et al. 2003; Sümer 2000; Şimşek 2007; Tabachnick and Fidell 2013; Thompson 2004) (As cited in Savci 2017)

$\chi^2$ , chi-Square; *df*, degrees of freedom; *RMSEA*, the root mean square error of approximation; *GFI*, Goodness of Fit Index; *AGFI*, Adjusted Goodness of Fit Index; *CFI*, Confirmatory Fit Index; *IFI*, Incremental Fit Index; *TLI (NNFI)*, Tucker Lewis Index (Non-Normed Fit Index)

translated into the Turkish CIGS. Two groups of four faculty members who spoke English at a good level carried out the translation process of PACS. The first group translated the items of PACS into Turkish. The second group then translated the Turkish version back into English. At this stage, the consistency between two translations was examined. The discrepancies in translations were forwarded to the translation groups leading to a consensus on the translation. Following, the Turkish PACS was drafted. At this stage, the draft form was revised as the CIGS. In the CIGS, the words “internet gaming” were used instead of the word “drinking” (e.g., “How often have you thought about *internet gaming*” or “How good would *internet gaming* make you feel?”). Four researchers conducting research into addiction examined the adapted form. The corrections proposed by the researchers were carried out. In the final stage, the CIGS was evaluated by 30 adolescents. At this stage, it was found that adolescents evaluated the scale items as “clear” and understandable.

The structural validity of CIGS was examined using both EFA and CFA. Before starting the EFA, the suitability of the data for factor analysis was examined by the Kaiser-Meyer-Olkin (KMO) coefficient and Bartlett’s Sphericity Test. As a result of the analyses, it was found that the data were suitable for factor analysis. Principal Component Analysis was used in EFA. The structure obtained as a result of EFA was tested with CFA. Before starting CFA, the data were examined for sample size, multiple linearity, multicollinearity, and multiple normality. Given that the data set met the assumptions of CFA, the model was tested with the covariance matrix using the Maximum Likelihood method. The model fit was examined with  $\chi^2/df$ , RMSEA, GFI, CFI, IFI, and TLI (NNFI) fit indices. Commonly accepted fit indices and acceptable limits for model fit are presented in Table 2 along with a description of each acronym. Criterion validity of the CIGS was assessed with scales and questions examining digital gaming addiction, self-discipline, impulsiveness, daily internet gaming duration, and internet gaming history. The reliability of CIGS was evaluated with Cronbach  $\alpha$  internal consistency reliability coefficient and corrected item total correlation coefficients. The Cronbach  $\alpha$  internal consistency coefficient and corrected item total correlation coefficients were calculated in the EFA, CFA, and criterion validity samples. SPSS and AMOS programs were used to analyze the data.

## Results

### Pilot Study

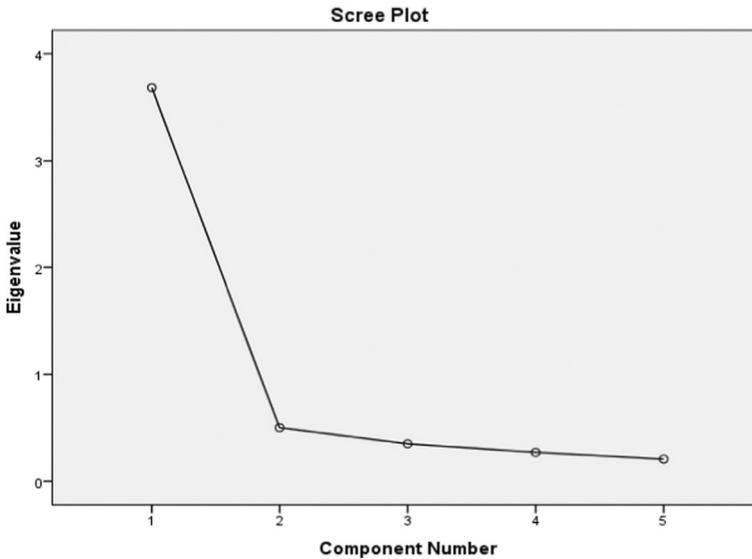
A pilot study was carried out on 30 adolescents (15 females and 15 males) in order to evaluate whether the CIGS was understood by adolescents. In the pilot study, the problems that adolescents may encounter while reading the scale items and instructions were evaluated. During the study, one adolescent did not understand the word craving. It was understood that the adolescent did not read the instruction. After reading the instruction, the problem was solved because the concept of craving was defined in the instruction. As a result of the pilot study, the instructions, scale items, and response options were understood by the adolescents.

### Scale Validity

**Exploratory Factor Analysis** The structural validity of the CIGS was investigated using Exploratory Factor Analysis (EFA). An EFA was performed on the data collected from 102 adolescents (49 females and 53 males). The suitability of the data with EFA was evaluated with the Kaiser-Meyer-Olkin (KMO) coefficient and Barlett's Sphericity Test. As a result of the analysis, KMO coefficient = .88 and Barlett's Sphericity Test =  $\chi^2 = 331.101$ ,  $p < .001$  were found. These findings indicate that the data was suitable for EFA. In the second stage, EFA was performed on the five items of the CIGS using Principal Component Analysis. As a result of the analysis, it was found that the CIGS had a single-factor structure with an Eigenvalue of 3.683. The single-factor structure of CIGS accounted for 73.7% of the total variance. Finally, a scree plot was analyzed. When the line graph presented in Fig. 1 is examined, it can be seen that the graph continues in a horizontal plane after the first break. Factor loading values of the CIGS were ranged between .77 and .90. The scree plot of the CIGS is presented in Fig. 1, and the EFA results are shown in Table 3.

**Confirmatory Factor Analysis** The unidimensional CIGS model obtained as a result of EFA was then tested with Confirmatory Factor Analysis (CFA). CFA was performed on 103 adolescents (35 females and 68 males). The model was tested with the first-level CFA. As a result of the CFA, it was found that the model had acceptable fit values [ $\chi^2 = 9.115$ ,  $df = 5$ ,  $\chi^2/df = 1.823$ , RMSEA = .090, GFI = .97, AGFI = .90, CFI = .99, IFI = .99, and TLI (NNFI) = .97]. The factor loadings of the CIGS in this sample were ranged between .64 and .90. The path diagram of the CIGS in this sample is presented in Fig. 2. The CIGS model was also tested in the criterion validity sample. As a result of the first level of CFA performed on this sample, it was found that the model had acceptable fit values (except for RMSEA) [ $\chi^2 = 21.628$ ,  $df = 5$ ,  $\chi^2/df = 4.326$ , RMSEA = .159, GFI = .95, AGFI = .85, CFI = .97, IFI = .97, and TLI (NNFI) = .93]. The factor loading values of the CIGS in this sample ranged between .67 and .93. The path diagram of CIGS in this sample is presented in Fig. 3. As a result, it was found that the five-item unidimensional structure of the CIGS was confirmed in two different samples. The CFA results are shown in Table 4.

**Criteria Validation** Criterion validity of the CIGS was assessed using measures of digital gaming addiction, self-discipline, impulsiveness, daily Internet gaming duration, and Internet gaming history. The CIGS, DGAS-7, BSCS, and a Personal Information Form were administered to adolescents. The criterion validity of the CIGS was carried out on a sample of 133



**Fig. 1** The scree plot of the CIGS

adolescents (70 females and 60 males). The relationship between CIGS and digital gaming addiction, self-discipline, impulsiveness, daily internet gaming duration, and internet gaming history was analyzed using Pearson's Moments Multiplication Correlation Analysis. The analysis demonstrated that the CIGS was significantly associated with daily internet gaming duration ( $r = .65, p < .01$ ), internet gaming history ( $r = .51, p < .01$ ), impulsiveness ( $r = .40, p < .01$ ), self-discipline ( $r = -.29, p < .01$ ), and digital game addiction ( $r = .73, p < .01$ ).

### Scale Reliability

The reliability of the CIGS was evaluated with Cronbach  $\alpha$  internal consistency reliability coefficient and corrected item total correlation coefficients. The Cronbach  $\alpha$  internal consistency reliability coefficient and corrected item total correlation coefficients were calculated across the three samples (EFA, CFA, and criterion validity). Cronbach  $\alpha$  internal consistency coefficients of the CIGS were calculated as .91, .88, and .91, respectively. Correlated item total correlation coefficients of the CIGS were between .66 and .83 in the EFA sample, .61 and .83 in the CFA sample, and .68 to .86 in the criterion validity sample. These findings demonstrate that CIGS provides reliable results across different samples.

**Table 3** The EFA results of CIGS

	Items	Factor loading	% of variance	Eigenvalue
CIGS	1	.87	73.66	3.36
	2	.89		
	3	.77		
	4	.86		
	5	.90		

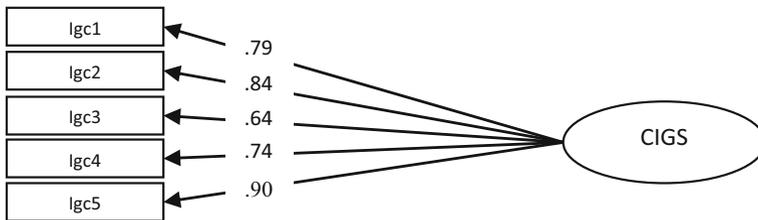


Fig. 2 Model of CIGS in the first sample

## Discussion

The aim of the present study was to develop the Craving for Internet Gaming Scale (CIGS) by adapting the Penn Alcohol Craving Scale. The structural validity of CIGS was evaluated using both EFA and CFA. Furthermore, the criterion validity of the CIGS was evaluated with DGAS-7, BSCS, daily internet gaming duration, and internet gaming history. The reliability of CIGS was evaluated with Cronbach  $\alpha$  internal consistency reliability coefficient and corrected item total correlation coefficients. Results of the EFA and CFA demonstrated that the CIGS has a unidimensional structure. In fact, the unidimensional structure of CIGS explained 73% of the total variance and is more than sufficient for unidimensional scales given that 30% variance in unidimensional scales is considered sufficient (Buyukozturk 2010; Cokluk et al. 2012). When the factor loadings of the items were examined, it was shown that they were sufficient across all three samples (EFA, CFA, and criterion validity). Factor loading values are accepted as  $> .30$  (Kline 1994) or  $> .32$  (Tabachnick and Fidell 2013). The single-factor structure obtained as a result of the EFA was tested with CFA in two separate samples. As a result of CFA, the single-factor CIGS model had good fit values in both samples. Additionally, the fit index values in Table 2 also demonstrate acceptable values.

The criterion validity of the CIGS was assessed by examining digital gaming addiction, self-discipline, impulsiveness, daily internet gaming duration, and internet gaming history. Analysis, again demonstrated that the CIGS was associated with all these variables in the expected direction (i.e., craving was correlated with gaming addiction, impulsivity, poor self-discipline, and high daily internet use). The reliability of the CIGS was evaluated with Cronbach  $\alpha$  internal consistency reliability coefficient. In the social sciences, an internal consistency reliability coefficient of  $.70$  and above is considered sufficient for such scales (Cokluk et al. 2012). Again, in the present study, the CIGS coefficients were more than sufficient. More specifically, internal consistency coefficients and corrected item total correlation coefficients of the CIGS across all three samples were in the range of acceptable values

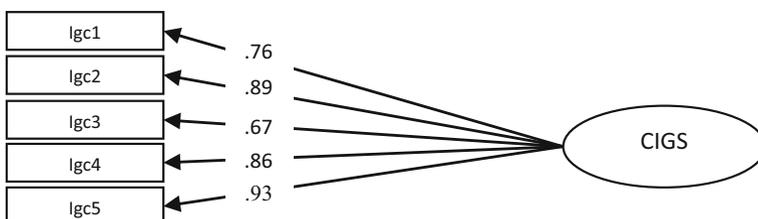


Fig. 3 Model of CIGS in the second sample

**Table 4** The CFA results of CIGS

	CFA sample			Criterion validity sample		
	$\lambda$	$R^2$	$t$	$\lambda$	$R^2$	$t$
CIGS → Igc1	.79	.62	9.928	.76	.58	11.579
CIGS → Igc2	.84	.70	10.975	.89	.78	16.085
CIGS → Igc3	.64	.41	7.280	.67	.45	9.428
CIGS → Igc4	.74	.55	9.090	.86	.73	14.848
CIGS → Igc5	.90	.81		.93	.87	

found in the literature. The findings of the present study indicate that CIGS is a valid and reliable scale for assessing craving among gamers.

Digital technologies are now used extensively worldwide (Kemp 2018). As the use of digital technologies increases, an increasing minority of individuals have been shown to display problematic behavior related to such technologies (Kuss et al. 2014). Indeed, it appears that every new digital technology and platform produces a small minority of individuals that experience problems relating to the technology that some scholars describe as addictions (e.g., Kuss and Griffiths 2017; Savci and Aysan 2018). The first paper published on internet addiction was by Griffiths (1996b) who, like Young (1998), used it to describe individuals who spent hours a day online to the neglect of everything else in their lives.

However, over two decades later, the term is an umbrella term used primarily to describe addictions on the Internet rather than to the Internet. Words like “addictive,” “compulsive,” “pathological,” and “problematic” are now used alongside Internet and smartphone use generally (e.g., Kwon et al. 2013; Lei and Yang 2007; Meerkerk et al. 2009; Panda and Jain 2018; Saidon et al. 2016; Shapira et al. 2003; Takao et al. 2009; Young 1998), as well as specific online activities such as social media use (e.g., Aladwani and Almarzouq 2016; Griffiths and Szabo 2014; Kuss and Griffiths 2017; Lee and Cheung 2014; Savci et al. 2018), online gambling (APA 2013; WHO 2016), online shopping (Rose and Dhandayudham 2014), online pornography (Owens et al. 2012), online sex (Griffiths 2001), phubbing (Karadağ et al. 2016), cyberbullying (Campbell 2005), fear of missing out (Elhai et al. 2016), phantom ringing, phantom vibration, and phantom texts/notifications (Chen et al. 2014; Drouin et al. 2012; Kruger and Djerf 2016; Lin et al. 2013). Subdivisions of these potentially addictive and/or problematic behaviors and other new potentially problematic online behaviors appear to be growing annually. At present, only IGD is officially recognized in some form (APA 2013; WHO 2016). However, the number of disorders diagnosed in the future may increase as the number of people who use the Internet and smartphones increases. The concept of craving presented here relating to gaming use could also be applied for other online problematic disorders related to digital technology use. Therefore, craving is very important for these disorders.

The validity and reliability of the CIGS were performed on adolescent samples. Given that adolescents appear to be more vulnerable to IGD (Kuss and Griffiths 2012), the sample is arguably appropriate. Furthermore, all the analyses regarding the validity and reliability of the CIGS increased its measurement power. The newly developed CIGS may facilitate increased research into craving among gamers for intercultural use. The PACS is already used in many cultures and it is hoped the CIGS can do the same. There are of course limitations to the present study. The CIGS is a self-report scale and self-report is

open to well-known biases such as memory recall and social desirability biases (although this cannot be overcome when using psychometric testing as all data are self-report). The reliability and validity of CIGS were also carried out using non-clinical samples because the scale was validated using a convenience sample of students. Therefore, future studies will need to test the scale's utility using clinical samples (as well as comparing clinical and non-clinical samples). Furthermore, the validity and reliability of the CIGS were carried out on adolescents studying at high schools which may have meant some types of adolescents were not included in the analysis (e.g., non-traditional students in special needs schools and students who regularly truant). The present study also used convenience sampling method with a modest sample size based on Turkish adolescents. This limits the representation of the sample. Therefore, future research should use bigger and more representative (and random) samples from other countries and cultures. Furthermore, the present study did not include test-retest reliability. Despite these limitations, the validity and reliability of the CIGS was psychometrically robust. The CIGS's criterion validity should also be evaluated with scales based on objective assessment tools. Future CIGS studies should also examine different adolescent groups as well as emerging and older adults.

### Compliance with Ethical Standards

**Ethics Committee Approval** Ethics committee approval was obtained for this study. The authors report that the study was conducted in accordance with the Helsinki Declaration.

**Informed Consent** The Informed Consent Form was read by the researcher in the classroom environment.

**Conflict of Interest** The authors declare that they have no conflict of interest.

### Appendix 1. İnternette Oyun Oynama Aşerme Ölçeği (İOOAÖ) (Turkish)

Bu araştırma internette oyun oynama isteğinizi değerlendirmek amacıyla gerçekleştirilmektedir. Lütfen her maddeyi dikkatlice okuyun ve son bir haftayı dikkate alarak, internette oyun aşermenizi (internette oyun oynama isteğinizi) en iyi tanımlayan seçeneği işaretleyin.

1. Son bir haftayı dikkate aldığınızda, internette oyun oynamak ile ilgili ya da internette oyun oynamanın sizi ne kadar iyi hissettireceği ile ilgili ne sıklıkta düşündünüz?
  - ① Hiç (geçtiğimiz hafta içinde 0 defa)
  - ① Nadiren (geçtiğimiz hafta içinde 1-2 defa)
  - ② Ara sıra (geçtiğimiz hafta içinde 3-4 defa)
  - ③ Bazen (geçtiğimiz hafta içinde 5 ila 10 defa veya günde 1-2 defa)
  - ④ Sıklıkla (geçtiğimiz hafta içinde 11-20 defa veya günde 2-3 defa)
  - ⑤ Çoğu zaman (geçtiğimiz hafta içinde 20-40 defa veya günde 3-6 defa)
  - ⑥ Neredeyse her zaman (geçtiğimiz hafta içinde 40 defadan fazla veya günde 6 defadan fazla)
2. Son bir haftayı dikkate aldığınızda, en şiddetli noktasında, internette oyun oynama aşermeniz ne kadar güçlüydü?
  - ① Hiç istek yoktu
  - ① Önemsenmeyecek düzeyde, yani çok hafif istek
  - ② Hafif istek
  - ③ Orta düzeyde istek
  - ④ Güçlü istek, fakat kolaylıkla kontrol edildi
  - ⑤ Güçlü istek ve kontrol edilmesi zor

- ⑥ Güçlü istek ve kontrol edilemez
3. Son bir haftayı dikkate aldığınızda, internette oyun oynamak ile ilgili ya da internette oyun oynamanın sizi ne kadar iyi hissettireceği ile ilgili düşünmeye ne kadar zaman harcadınız?
- ① Hiç
- ② 20 dakikadan az
- ③ 21-45 dakika
- ④ 46-90 dakika
- ⑤ 90 dakika -3 saat
- ⑥ 3-6 saat arası
- ⑦ 6 saatten daha fazla
4. Son bir haftayı dikkate aldığımızda, eğer internette oyun oynama imkânınız olduğunu bilseydiniz internette oyun oynamaya direnmek ne kadar zor olurdu?
- ① Hiç zor olmazdı
- ② Çok hafif zor
- ③ Hafif zor
- ④ Orta zorlukta
- ⑤ Çok zor
- ⑥ Aşırı zor
- ⑦ Karşı koyamazdım
5. Önceki sorulara verdiğiniz cevapları aklınızda tutarak, lütfen son bir hafta için ortalama internette oyun oynama aşermenizi değerlendirin.
- ① Hiç oynama düşüncem olmadı ve hiç oynama isteğim olmadı.
- ② Nadiren oynamayla ilgili düşündüm ve nadiren oynama isteğim oldu.
- ③ Ara sıra oynamayla ilgili düşündüm ve ara sıra oynama isteğim oldu.
- ④ Bazen oynamayla ilgili düşündüm ve bazen oynama isteğim oldu.
- ⑤ Sıklıkla oynamayla ilgili düşündüm ve sıklıkla oynama isteğim oldu.
- ⑥ Çoğu zaman oynamayla ilgili düşündüm ve çoğu zaman oynama isteğim oldu.
- ⑦ Neredeyse her zaman oynamayla ilgili düşündüm ve neredeyse her zaman oynama isteğim oldu.

## Appendix 2. Craving for Internet Gaming Scale (CIGS)

This research is carried out to evaluate your craving for internet gaming (desire for internet gaming). Please read the following questions and choose the option that suits you. Please consider the option for each question that best describes your craving for Internet gaming over the past week

1. In the past week, how often have you thought about internet gaming or about how good internet gaming would make you feel?
- ① Never, that is, 0 times during this period of time.
- ② Rarely, that is, 1 to 2 times during this period of time.
- ③ Occasionally, that is, 3 to 4 during this period of time.
- ④ Sometimes, that is, 5 to 10 times during this period or 1 to 2 times a day.
- ⑤ Often, that is, 11 to 20 times during this period or 2 to three times a day.
- ⑥ Most of the time, that is, 20 to 40 during this period or 3 to 6 times a day.
- ⑦ Nearly all of the time, that is, more than 40 times during this period or more than 6 times a day.
2. In the past week at its most severe point, how strong was your craving for internet gaming?
- ① None at all.
- ② Slight, that is a very mild urge.
- ③ Mild urge.
- ④ Moderate urge.
- ⑤ Strong urge, but easily controlled.
- ⑥ Strong urge and difficult to control.
- ⑦ Strong urge and uncontrollable.
3. In the past week, how much time have you spent thinking about internet gaming or about how good internet gaming would make you feel?
- ① None at all.

- 
- ① Less than 20 minutes.  
 ② 21–45 minutes.  
 ③ 46–90 minutes.  
 ④ 90 minutes–3 hours.  
 ⑤ Between 3 to 6 hours.  
 ⑥ More than 6 hours.
4. In the past week, how difficult would it have been to resist internet gaming if you knew you had the opportunity to engage in internet gaming?
- ① Not difficult at all.  
 ② Very mildly difficult.  
 ③ Mildly difficult.  
 ④ Moderately difficult.  
 ⑤ Very difficult.  
 ⑥ Extremely difficult.
5. Keeping in mind your responses to the previous questions, please rate your overall average craving for internet gaming during the past week.
- ① Never thought about internet gaming and never had the urge to internet gaming.  
 ② Rarely thought about internet gaming and rarely had the urge to internet gaming.  
 ③ Occasionally thought about internet gaming and occasionally had the urge to internet gaming.  
 ④ Sometimes thought about internet gaming and sometimes had the urge to internet gaming.  
 ⑤ Often thought about internet gaming and often had the urge to internet gaming.  
 ⑥ Thought about internet gaming most of the time and had the urge to internet gaming most of the time.  
 ⑦ Thought about internet gaming nearly all of the time and had the urge to internet gaming nearly all of the time.
- 

### Appendix 3. Penn Alcohol Craving Scale (PACS)

Circle the most appropriate number for each item. If this is the first time you are filling out this form, the questions apply to the last week that you drank any alcohol. If you received Serax or another medication for detoxification, exclude that time period. If you are currently participating in the medication trial, these questions cover the time period from the day of your last visit to the day before your current visit

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1. How often have you thought about drinking or about how good a drink would make you feel during this period?
- ① Never, that is, 0 times during this period of time.  
 ② Rarely, that is, 1 to 2 times during this period of time.  
 ③ Occasionally, that is, 3 to 4 during this period of time.  
 ④ Sometimes, that is, 5 to 10 times during this period or 1 to 2 times a day.  
 ⑤ Often, that is, 11 to 20 times during this period or 2 to three times a day.  
 ⑥ Most of the time, that is, 20 to 40 during this period or 3 to 6 times a day.  
 ⑦ Nearly all of the time, that is, more than 40 times during this period or more than 6 times a day.
2. At its most severe point, how strong was your craving during this period?
- ① None at all.  
 ② Slight, that is a very mild urge.  
 ③ Mild urge.  
 ④ Moderate urge.  
 ⑤ Strong urge, but easily controlled.  
 ⑥ Strong urge and difficult to control.  
 ⑦ Strong urge and would have drunk alcohol if it were available.
3. How much time have you spent thinking about drinking or about how good a drink would make you feel during this period?
- ① None at all.  
 ② Less than 20 minutes.  
 ③ 21–45 minutes.  
 ④ 46–90 minutes.

- ④ 90 minutes-3 hours.  
 ⑤ Between 3 to 6 hours.  
 ⑥ More than 6 hours.
4. How difficult would it have been to resist taking a drink during this period of time if you had known a bottle were in your house?
- ① Not difficult at all.  
 ② Very mildly difficult.  
 ③ Mildly difficult.  
 ④ Moderately difficult.  
 ⑤ Very difficult.  
 ⑥ Extremely difficult.  
 ⑦ Would not be able to resist.
5. Keeping in mind your responses to the previous questions, please rate your overall average alcohol craving for the stated period of time.
- ① Never thought about drinking and never had the urge to drink.  
 ② Rarely thought about drinking and rarely had the urge to drink.  
 ③ Occasionally thought about drinking and occasionally had the urge to drink.  
 ④ Sometimes thought about drinking and sometimes had the urge to drink.  
 ⑤ Often thought about drinking and often had the urge to drink.  
 ⑥ Thought about drinking most of the time and had the urge to drink most of the time.  
 ⑦ Thought about drinking nearly all of the time and had the urge to drink nearly all of the time.

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## Affiliations

Mustafa Savci<sup>1</sup> • Mark D. Griffiths<sup>2</sup>

Mustafa Savci  
msavci@firat.edu.tr

<sup>1</sup> Department of Guidance and Psychological Counseling, Firat University, Elazig, Turkey

<sup>2</sup> International Gaming Research Unit, Psychology Department, Nottingham Trent University, Burton Street, Nottingham NG1 4BU, UK