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Towards comprehending internet gaming disorder: evaluating the psychometric properties of the Polish adaptation of the Craving for Internet Gaming Scale

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Abstract

Purpose: This study aims to adapt and verify the psychometric properties of the Craving for Internet Gaming Scale (CIGS) in a Polish sample. Craving, although observed as significantly associated with Internet Gaming Disorder, is not currently included in its diagnostic criteria. This research addresses the need for scales to measure craving in this particular context.

Methods: The research involved a sample of 575 participants. Psychometric analysis, including confirmatory factor analysis, was conducted to assess the CIGS' reliability and validity. Additional scales, such as the Game Transfer Phenomena Scale, Motives for Online Gaming Questionnaire, and the Depression Anxiety Stress Scales, were used for concurrent validity analysis.

Results: The study results demonstrate the excellent psychometric properties of the Polish adaptation of the CIGS. It showed high reliability in terms of internal consistency and provided evidence for construct validity. Furthermore, it exhibited a positive correlation with various scales associated with problematic video game use and gaming addiction, while also showing a moderate negative correlation with self-control.

Conclusions: Our findings suggest that the CIGS retains its psychometric properties in different cultures, making it a valuable instrument for comprehending craving within the context of Internet gaming disorder. Future research should focus on the adaptation of the CIGS to various cultural settings and the exploration of potential intergroup differences.

Key words: CIGS, Polish adaptation, Internet gaming disorder, craving for internet gaming, problematic video game use.

INTRODUCTION

Video gaming has emerged as one of the most prevalent forms of leisure worldwide. It is estimated that in 2023 the number of active gamers reached 3.38 billion, exhibiting a 6.3% year-on-year growth [1]. Among this population, a segment demonstrates problematic video game use [2-4] or video game addiction [5-7]. The 11th Revision of the International Classification of Diseases incorporates the concept of gaming disorder, encompassing both offline and online gaming [8]. However, specific studies indicate that internet gaming is more frequently associated with addiction than offline gaming [9].

In 2013, the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5) introduced Internet Gaming Disorder (IGD) as a concept requiring further investigation [10]. The proposed criteria for IGD have prompted extensive discourse among researchers, highlighting various concerns, including the absence of standardized measurement instruments and the necessity for criteria enhancement [6, 11-14].

One element not explicitly addressed in the DSM-5 criteria for IGD is 'craving'. This phenomenon has been identified as being clinically significant in various forms of addiction [15, 16]. In general, it can be defined as the conscious experience of a desire to take a substance [17]. Among other things, craving is associated with substance use disorder [15, 16, 18-21], food addiction [22, 23], gambling disorder [24, 25], compulsive pornography use [26, 27], compulsive online shopping [28, 29], problematic use of social networking sites [30, 31], and problematic mobile phone use [32]. Research findings suggest that

craving may play a clinically meaningful role in IGD as well [11, 33, 34]. The measurement and consideration of craving have also been proposed to be of significance in the assessment of clinical intervention outcomes and the treatment of IGD [35-39].

A challenging aspect in assessing the level of craving for internet gaming is the absence of a standardized, uniform measurement method. Various scales used in research are mere modifications of existing instruments [33, 38-41]. This situation hinders or even precludes the comparability of findings across different studies. Moreover, employing scales that lack comprehensive confirmation of their validity and reliability in a specific population carries the risk of obtaining biased results. Hence, it is vital to possess a scale dedicated to measuring IGD with well-established psychometric properties.

One of the candidates for addressing this deficiency is the Craving for Internet Gaming Scale (CIGS) [42]. It encompasses five statements related to the frequency and duration of thoughts about internet gaming, the perceived pleasure associated with it, the intensity of the craving, the challenges in resisting internet gaming, and the overall average craving experienced in the past week.

The scale was developed based on the Penn Alcohol Craving Scale (PACS), which measures the subjective, conscious need to use alcohol [15]. The PACS was used as a conceptual framework for assessing various phenomena related to craving, including problematic smartphone use [43], substance use disorder [44, 45], and compulsive online shopping [46]. The analysis of the psychometric properties of CIGS has confirmed its high reliability and validity. Originally validated on a Turkish sample, the scale has not yet been adapted for use in other cultures.

This study addresses this gap by adapting and validating the CIGS with a Polish sample. It responds to the call for undertaking research on gamers across diverse countries and cultural contexts in order to enhance our comprehension of IGD, refine its criteria, and improve the diagnostic process [6, 42].

METHODS

Participants and procedure

Participants were recruited through Ariadna, a nationwide Polish online research panel, open to individuals aged 15 and up, with rigorous verification procedures in place to prevent automated responses and the creation of multiple accounts. Platform users earned points for completing surveys, which could be redeemed for rewards such as books, games, cosmetics, and electronics.

The participants completed an online questionnaire consisting of seven scales, along with demographic questions and others related to their video gaming activities. The questionnaire also included a control question designed to verify participants' attentiveness. At the end of the study, participants were requested to indicate their level of engagement in percentage terms.

From the initial sample, one individual was excluded due to their declaring a low level of engagement in completing the questionnaire. Consequently, the analysis was carried out on a sample comprising 575 individuals, including 275 females. The mean age of the participants was $M = 29.45$ and a standard deviation of $SD = 4.25$, ranging from 18 to 35. The self-reported average duration of a single uninterrupted gaming session in the last month was $M = 2.75$ hours, $SD = 3.32$, with a range from 1 to 39.

To verify the psychometric properties of the CIGS, the sample was randomly divided into two subsamples. The first was used to evaluate structural validity and consisted of 288 individuals, including 135 females, with an average age of $M = 29.30$ and a standard deviation of $SD = 4.20$. The second subsample comprised 287 individuals, including 140 females, with an average age of $M = 29.60$, $SD = 4.31$. The self-reported average duration of a single uninterrupted gaming session in the last month for these subsamples was $M = 2.75$ hours, $SD = 3.12$, and $M = 2.74$, $SD = 3.52$, respectively. Detailed information regarding the demographic structure of all samples is provided in Table 1.

The study was conducted in compliance with the Declaration of Helsinki and approved by the Institute of Psychology's Ethical Committee at John Paul II Catholic University of Lublin. No personal data was collected.

Materials

The Craving for Internet Gaming Scale (CIGS) is a self-report instrument developed based on the Penn Alcohol Craving Scale (PACS) [15]. It comprises five items, with responses provided on a 7-point scale (0-6). The item content was entirely adopted from the PACS, with the distinction that the word 'alcohol' was replaced with 'internet gaming.' The questions pertain to the frequency and amount of time spent thinking about internet gaming, the pleasure derived from it, the difficulty in resisting it, and the immediate intensity of craving for it. The original scale demonstrated acceptable criterion-related and structural validity. Both exploratory and confirmatory factor analyses confirmed the unidimensional nature of the construct. The scale also exhibited high reliability across three different samples (Cronbach's α ranging from 0.88 to 0.91).

The translation from English to Polish was performed by two independent translators, who subsequently reconciled their versions into a consistent one. To enable potential comparisons, the existing Polish translation of the PACS was also considered [47]. Finally, a third translator performed the back-translation. The complete translation of the scale is provided in Appendix 1.

Table 1. Sample structure including place of residence, marital status, and the primary device used by the participants for gaming. The results are presented for the entire sample and subdivided into two randomly selected subsamples

Category	Entire sample [a]	Subsample 1 [b]	Subsample 2 [c]
Residence			
Village	24.52	22.57	26.48
City up to 20,000 inhabitants	12.35	13.89	10.80
City up to 100,000 inhabitants	22.96	23.96	21.95
City above 100,000 inhabitants	40.17	39.58	40.77
Marital status			
Single	31.30	26.39	36.24
Non-marriage relationship	31.13	32.99	29.27
Married	36.00	39.24	32.75
Divorced	0.17	1.39	1.39
Widowed	1.39	0.00	0.35
Primary gaming device			
Desktop	16.35	15.97	16.72
Laptop	24.52	22.57	26.48
Tablet	1.91	2.08	1.74
Home video game console	13.22	13.19	13.24
Smartphone	42.96	44.79	41.11
Handheld game console	1.04	1.39	0.70

[a] N = 575, [b] N = 288, [c] N = 287; the values have been provided in percentage points.

The Gaming Disorder Test (GDT) comprises four items related to the diagnostic criteria for gaming disorder as indicated by the World Health Organization [48]. It is acknowledged as the scale that best operationalizes the criteria for this phenomenon [49, 50]. In the present study, we used the Polish adaptation by Cudo *et al.* [49]. The scale obtained internal consistency coefficients with a Cronbach's α of 0.89, McDonald's ω of 0.89, and average variance extracted (AVE) of 0.70.

The Game Transfer Phenomena Scale (GTPS) was created to measure the phenomenon of the experience of altered sensory perceptions, automatic thoughts, and behaviors related to video game content and mechanics when not playing. The GTPS assesses five dimensions, three of which are linked to (i) altered perceptions, which include (ia) altered visual perceptions, (ib) altered body perceptions, and (ic) altered auditory perceptions, along with (ii) automatic mental processes, and (iii) actions and behaviors [51]. The questionnaire comprises 20 items concerning the frequency of occurrences of states that manifest when an individual is not engaged in gaming. In the current study, the Polish adaptation by Cudo *et al.* was utilized [52]. Regarding the individual subscales, the reliability analysis results were as follows for α, ω, and AVE respectively: (ia) 0.85, 0.85, and 0.59; (ib) 0.89, 0.89, and 0.67; (ic) 0.88, 0.89, and 0.67; (ii) 0.90, 0.90, and 0.70; (iii) actions and behaviors 0.92, 0.92, and 0.74.

The Motives for Online Gaming Questionnaire (MOGQ) [53], in its Polish adaptation by Grzegorzewska and Cierpiałkowska [54], is a scale evaluating the motivational basis of online gaming. The questionnaire consists of 27 items. Participants indicate the frequency with which specific motives drive their engagement in gaming. The scale encompasses seven key motivational factors: (i) social, (ii) escape, (iii) competition, (iv) coping, (v) skill development, (vi) fantasy, and (vii) recreation. The values of α, ω, and AVE were respectively: (i) 0.87, 0.87, 0.63, (ii) 0.90, 0.91, 0.71, (iii) 0.88, 0.88, 0.66, (iv) 0.84, 0.85, 0.60, (v) 0.92, 0.92, 0.74, (vi) 0.91, 0.91, 0.72, and (vii) 0.82, 0.82, 0.61.

The Immersion Questionnaire is the Polish adaptation of a questionnaire designed to measure the sensation of being immersed in the gaming world [55, 56]. The scale comprises 27 questions assessing the unidimensional construct of immersion. The internal consistency coefficients were α = 0.91, ω = 0.92, and AVE = 0.39.

The Depression Anxiety Stress Scales (DASS-21) consists of 21 items that assess symptoms of three negative emotional states [57]. The Depression scale quantifies the construct associated with a loss of self-esteem and motivation, as well as a lack of belief in being able to achieve substantial life goals. Scores on the Anxiety scale are associated with the intensity of experienced anxiety, a predisposition to acute fear reactions, and fear-related physiological factors. Furthermore, individuals obtaining high scores on the Stress scale experience a state of persistent arousal, tension, and exhibit a low threshold for frustration. In the current study, the Polish translation by Zawislak *et al.* [58] was used. The reliability coefficients for the Depression scale

were α = 0.91, ω = 0.92, and AVE = 0.61. For the Anxiety scale, α = 0.89, ω = 0.89, and AVE = 0.55, while for the Stress scale, α = 0.91, ω = 0.91, and AVE = 0.60.

The Brief Self-Control Scale (BSCS), in its Polish adaptation by Pilarska and Baumeister [59], is a shortened 13-item version of The Self-Control Scale [60]. It measures self-control, defined as an individual's capacity for self-regulation by controlling their thoughts, emotions, impulses, and regulating performance, in terms of perseverance or speed and accuracy in performing a task. Concerning the internal consistency of the scale, the coefficient values were observed as α = 0.82, ω = 0.82, and AVE = 0.28.

Statistical analysis

Statistical analyses were performed using the R programming language and the jamovi software [61, 62]. The assessment of scale reliability was carried out with the semTools package [63]. To verify structural validity, Confirmatory Factor Analysis (CFA) was calculated using the lavaan package [64]. The second subsample was used for criterion-related validity analysis. Positive correlations were expected between the CIGS and GDT, the Immersion Questionnaire, GTP, MOGQ, DASS-21, and the average duration of a single uninterrupted gaming session in the last month. These indices are related to problematic gaming or gaming addiction [48, 49, 51-53, 55, 65]. Due to the observed poor self-regulation and impulsive behavior in individuals with IDG [66], we also anticipated a negative correlation with BSCS. Furthermore, one-way analysis of variance was used to compare the results on the CIGS scale obtained in distinct groups.

RESULTS

Table 2 presents the correlations between items and the mean and standard deviation values calculated for the entire sample. The analyses conducted revealed statistically significant differences between groups regarding the variable 'Type of Device' within the male cohort: $F(3, 136) = 3.94$, $p = 0.010$. The post-hoc analysis with the Games-Howell test showed a statistically significant difference between laptops and smartphones. Gamers who use laptops as their primary device demonstrated higher scores ($t(161.1) = 2.95$, $p = 0.019$, Cohen's $d = 0.41$). Detailed results are provided in Table 3. Additionally, a statistically significant difference emerged ($t(573) = 3.64$, $p < 0.001$, Cohen's $d = 0.30$), indicating that men generally achieved higher scores ($M = 2.30$) than women ($M = 2.00$) in the CIGS.

Reliability

Analyses demonstrated the very high reliability of CIGS, defined as internal consistency. The coefficient values in the first subsample were as follows: α = 0.89, ω = 0.90, and AVE = 0.63, while in the second subsample, they were α = 0.90, ω = 0.90, and AVE = 0.65.

Structural validity

The conducted CFA demonstrated an excellent fit of the one-dimensional model to the data: $\chi^2 = 10.00$, $df = 5$, $p = 0.075$, CFI = 0.994, GFI = 0.987, AGFI = 0.961, TLI = 0.988, IFI = 0.994, and SRMR = 0.017. Only the RMSEA value was at an acceptable level: 0.059, 90% CI [0.00; 0.11]. The results indicate a superior fit of the model compared to the original study. However, factor loadings remain similar. The CFA performed on the second subsample also showed an excellent fit of the one-dimensional model to the data across all indicators: $\chi^2 = 6.10$, $df = 5$, $p = 0.297$, RMSEA = 0.028, 90% CI [0.00; 0.09], CFI = 0.999, GFI = 0.992, AGFI = 0.975, TLI = 0.997, IFI = 0.999, and SRMR = 0.012. Factor loadings for both analyses are presented in Table 4.

Criterion-related validity

Table 5 presents the results of the correlation analysis between the CIGS and the other scales, with 95% confidence intervals. The CIGS demonstrated statistical-

Table 2. Mean values for the items along with standard deviations in the entire sample, and inter-correlations between items using Kendall's tau-b coefficient

Item	*M*	*SD*	Item 1	Item 2	Item 3	Item 4
1. In the past week, how often have you thought about internet gaming or about how good internet gaming would make you feel?	2.30	1.26				
2. In the past week at its most severe point, how strong was your craving for internet gaming?	2.27	1.27	0.67			
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?	1.93	1.08	0.63	0.62		
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?	1.87	1.16	0.51	0.54	0.54	
5. Keeping in mind your responses to the previous questions, please rate your overall average craving for internet gaming during the past week.	2.42	1.17	0.65	0.63	0.60	0.52

M – mean, SD – standard deviation; all correlations were statistically significant at p < 0.001

ly significant associations with all measured variables. The correlation coefficient varied, ranging from a lower limit of a moderate relationship with the Stress scale from the DASS-21 ($r = 0.20$, $p < 0.001$) to a strong value with the GDTS ($r = 0.58$, $p < 0.001$). The CIGS also showed a moderate positive correlation with the average duration of a single uninterrupted gaming session in the last month. In the case of the relationship with BSCS, a moderate negative correlation was observed ($r = –0.31$, $p < 0.001$).

DISCUSSION

This study aimed to verify the psychometric properties of the Polish adaptation of the CIGS. The scale demonstrated high reliability, as assessed in terms of internal consistency. Moreover, the outcomes of the confirmatory factor analysis indicate an excellent fit of the one-factor model to the data, providing substantial support for its structural validity. The Polish translation of the CIGS has also been found to be valid in terms of criterion-related validity. As expected, the scale positively correlates with the measures associated with gaming disorder as well as the average duration of a single uninterrupted gaming session in the last month. In particular, a high correlation with the Gaming Disorder Test indicates a close relationship between the measured construct and the diagnostic criteria for gaming disorder. This aligns with observations regarding the significance of internet gaming craving in the diagnosis of IGD [11, 33, 34]. Furthermore, the negative correlation with the Brief Self-Control Scale suggests that individuals with a high level of craving for internet gaming may exhibit lower self-regulation capabilities in controlling their thoughts, affective responses, impulsivity, and regulating their task performance [59, 60]. This finding is consistent with findings from studies on self-control in IGD [67]. Individuals manifesting problematic gaming or gaming disorder tend to pursue instant gratification in the form of gaming, consequently reducing their capacity to exert control over their behavior. In gamers who do not exhibit problematic use, cognitive functions serve to inhibit craving, whereas in those with gaming disorder inhibitory control is notably diminished [66].

The examination of the outcomes derived from the analysis of responses on the CIGS scale suggests the potential presence of gender differences. Male participants achieved significantly higher scores in comparison to females. Moreover, among male participants, a difference was observed between those who used different types of gaming devices most frequently. Those who primarily used laptops scored significantly higher than those whose primary gaming device was a smartphone. This observation may be attributed to the greater accessibility

Table 3. Group differences in CIGS scores across residence, marital status, and primary gaming device, considering gender stratification

	Category	Female	Male
Residence	Village	1.89 ^{a}	2.20 ^{a}
	City up to 20,000 inhabitants	1.97 ^{a}	2.46 ^{a}
	City up to 100,000 inhabitants	1.98 ^{a}	2.29 ^{a}
	City above 100,000 inhabitants	2.09 ^{a}	2.32 ^{a}
	F(df)	0.59 (3.271) $p = 0.620$	0.55 (3.296) $p = 0.651$
Marital status	Single	2.05 ^{a}	2.30 ^{a}
	Non-marriage relationship	1.93 ^{a}	2.13 ^{a}
	Married	2.06 ^{a}	2.43 ^{a}
	Divorced	1.83 ^{x}	3.10 ^{x}
	Widowed	1.20 ^{x}	–
	F(df)	0.53 (2.265) $p = 0.592$	1.96 (2.295) $p = 0.142$
Primary gaming device	Desktop	2.38 ^{a}	2.42 ^{a,b}
	Laptop	1.90 ^{a}	2.44 ^{a}
	Tablet	1.77 ^{x}	1.93 ^{x}
	Home video game console	2.21 ^{a}	2.42 ^{a,b}
	Smartphone	1.95 ^{a}	2.04 ^{b}
	Handheld game console	2.40 ^{x}	3.00 ^{x}
	F(df)	1.47 (3.64) ^{w} $p = 0.232$	3.94 (3,136) ^{w} $p = 0.010$

Pairwise comparisons of column means indicate which pairs of cells (within a specific row) are significantly different – significance is denoted using different subscript letters and is calculated at the 0.05 significance level. ^{x} indicates that a particular category was not included in the analysis due to insufficient sample size. The analyses conducted using the Welch test due to a violation of the assumption of homogeneity of variances have been denoted by the symbol ^{w}.

Table 4. Standardized factor loadings with bootstrap 95% confidence intervals calculated on 5000 samples

	Item 1	Item 2	Item 3	Item 4	Item 5
Subsample 1	0.80 (0.75; 0.85)	0.83 (0.78; 0.87)	0.76 (0.69; 0.80)	0.70 (0.63; 0.76)	0.87 (0.83; 0.91)
Subsample 2	0.87 (0.83; 0.90)	0.83 (0.77; 0.87)	0.78 (0.73; 0.83)	0.70 (0.63; 0.76)	0.81 (0.76; 0.86)

All results were statistically significant at $p < 0.001$.

Table 5. Pearson's *r* coefficients with 95% confidence intervals for the correlations between the CIGS and the scales used in the criterion-related validity analysis

Variable	*r*
The average duration of a single uninterrupted gaming session in the last month	0.29 (0.18; 0.40)
GDT	0.58 (0.50; 0.65)
GTPS: Altered Auditory Perceptions	0.52 (0.43; 0.60)
GTPS: Altered Body Perceptions	0.46 (0.37; 0.55)
GTPS: Altered Visual Perceptions	0.49 (0.40; 0.58)
GTPS: Automatic Mental Processes	0.48 (0.39; 0.57)
GTPS: Actions and Behaviors	0.43 (0.33; 0.52)
MOGQ: Social	0.36 (0.25; 0.46)
MOGQ: Escape	0.50 (0.40; 0.58)
MOGQ: Competition	0.43 (0.33; 0.52)
MOGQ: Coping	0.52 (0.43; 0.60)
MOGQ: Skill_development	0.37 (0.27; 0.47)
MOGQ: Fantasy	0.50 (0.41; 0.58)
MOGQ: Recreation	0.37 (0.27; 0.47)
Immersion Questionaire	0.57 (0.47; 0.63)
DASS-21: Depression	0.27 (0.16; 0.37)
DASS-21: Anxiety	0.24 (0.19; 0.35)
DASS-21: Stress	0.20 (0.08; 0.30)
BSCS	–0.31 (–0.41; –0.21)

All correlations were statistically significant at $p < 0.001$.

of smartphones, leading to faster satisfaction of the gaming desires and, consequently, a reduced intensity (or duration) of experienced craving.

Our findings are the first to demonstrate that the CIGS maintains its robust psychometric properties in different cultural settings. The development of a widely used questionnaire should not only facilitate a better understanding of the nature of IGD but also contribute to the refinement of addiction criteria and the improvement of the diagnostic process [6, 42]. Consequently, future research should prioritize the adaptation of the CIGS in diverse cultural contexts. Additionally, it is advisable to undertake comprehensive investigations into potential intergroup differences in the levels of craving for internet gaming.

The study had several limitations. It relied on self-report data and followed a cross-sectional design. It is important to note that, despite the inclusion of attention-checking questions, some participants may have responded in a careless or biased manner [68]. Furthermore, participants were recruited online, specifically from the Polish research panel Ariadna, rather than through random population sampling. As a result, caution is warranted when generalizing the findings.

CONCLUSIONS

The present study has successfully conducted the adaptation and validation of the CIGS within a Polish sample. The results have provided robust evidence concerning the scale's reliability and validity, demonstrating significant correlations between the CIGS and various scales measuring related aspects of video game use, gaming disorder and self-control. We hope that these findings will contribute to a better understanding of IGD and offer a reliable measuring instrument for further research and clinical applications.

Conflict of interest

Absent.

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