Polish validation of the Internet Gaming Disorder-20 (IGD-20) Test

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Summary

Aim. The purpose of the present study was to validate the Polish version of the Internet Gaming Disorder–20 (IGD-20) Test that is consistent with DSM–5 diagnostic criteria.

Method. A total of 652 game players took part in the validation study. Confirmatory factor analysis was used to check the scale structure. Questionnaires measuring symptoms of psychopathology and desire thinking were used to estimate construct validity of the IGD–20. The analysis also considered the game genres most frequently chosen by players.

Results. Confirmatory factor analysis confirmed a 5-factor structure of the Polish version of IGD–20 questionnaire, which is consistent with previous findings in other language versions. Fit indices were evaluated collectively, indicating that the model has a good fit: $\chi2(142) = 690.059$; $p < 0.001$; RMSEA = 0.077 (90% CI: 0.071–0.083); CFI = 0.950; TLI = 0.940; SRMR = 0.053. Internal consistency is high (McDonald's $\omega = 0.93$). Analysis also showed significant correlations between problem gaming, symptoms of psychopathology, and desire thinking. Participants reported that they spent the least amount of time playing educational games, compared to other game genres; the frequency of educational games selection negatively correlated with the intensity of problematic gaming symptoms.

Conclusions. The validation study of the Polish version of the IGD–20 questionnaire has confirmed the good psychometric properties of the tool and its internal structure. Further research should focus on examination of gender differences and psychometric properties in the clinical sample of players.

Key words: internet gaming disorder, problematic gaming

Introduction

As can be seen from the growth of the gaming market, playing computer games is becoming an increasingly popular form of entertainment. Poland is the second largest gaming market in Eastern Europe, with a total value of USD 546 million [1]. Interestingly, 68% of Polish Internet users also play games [2]. The growing popularity of

computer games has led researchers to pay more attention to the negative consequences of excessive gaming. Due to the small amount of research on this issue and the lack of scientifically consolidated diagnostic characteristics in the literature, many terms have been attributed to this phenomenon. It is most commonly referred to as computer games addiction [3] or problematic gaming [4], among others [5]. Before discussing the diagnostic criteria of the newly proposed disorder, it is worth looking at the genres of computer games that are chosen by the players. This will allow a better understanding of the phenomenon of problematic gaming, as well as of the needs and motivations that can be met through different types of games.

Characteristics of computer games

Computer games can be run on personal computers (PCs), game consoles, smartphones and other devices. Among them there are online games that require Internet connection and allow real-time gameplay with other players (so-called multiplayer games). A review by King and Delfabbro [6] indicated that games and the experiences derived from them can be divided in several ways: (1) by genre, e.g., FPS, RPG; (2) platform, i.e., PC, consoles, mobile device; (3) goals set, e.g., defending against an opponent using violence, persuasion, or sneaking tactics. The gaming industry additionally distinguishes various types of products based on the perspective chosen to represent the world (first person or third person), the degree of imitation of the real world, and their themes. For the purposes of this research, game genres were chosen based on the literature on the subject [7, 8], the properties of the game, personal experience, and interviews with regular players. On this basis we distinguished 10 genres that were included in the study: RPG, MMORPG, FPS, simulators, arcade games, strategy, educational, sports, racing, and MOBA games. The proposed categorization is more detailed than Eichanbaum's [7], but corresponds to the postulates presented by Apperley [8] and the results of a recent meta-analysis on this topic [9]. It should also be noted that these genres are universal in the context of the platform used to play games. In a self-report questionnaire, the respondents indicated which categories of games they usually play. The following game genres are included:

(1)   RPGs (role-playing games; cRPG – computer role-playing game) are role-playing games in which the player takes on the role of a specific hero whose adventures are scripted within the created world. The player has the opportunity to develop his character and, often, to customize the appearance of the avatar. By completing quests, the player improves the skills and equipment of the hero.

(2)   MMORPGs (massively multiplayer online role-playing games) are similar to RPGs in terms of scope and mechanics. The important difference is the emphasis on cooperation between players. Users often have to complete tasks to increase their rank (known as "leveling"). MMO games may require players

to communicate and interact with other people. To achieve ever greater levels of character development, players often create or join "guilds". Sometimes the difficulty of the tasks forces players to join "raids" (joint expeditions) in order to complete them.

(3)   FPS (first-person shooter) games are characterized by first-person-perspective combat in which firearms are commonly used. The game mechanics are fast-paced and require perceptiveness and dexterity to achieve the best results. These games frequently focus on kill-death ratio, i.e., kills divided by deaths. This is a points-based presentation of the player's effectiveness that can be contrasted with other people's in-game achievements. Advanced players strive to maximize kills while minimizing deaths.

(4)   Simulators are games designed to imitate a certain part of reality. Mechanics faithfully reflect the imitated area of the real world and the laws of physics are accurately recreated. The most popular games in this genre are flying, truck driving, and farming simulators. Gamers receive the product which puts special attention to detail and the most faithful reflection of the laws governing the real world.

(5)   Arcade games are based on well-developed reflexes and the ability to operate a controller. These games emphasize the efficient performance of specific tasks in order to progress through the game. To achieve good results requires excellent dexterity. A separate subcategory that should be included in this genre is the interactive movie convention. To make progress, the player must accurately perform certain sequences on the controller, which requires manual skills.

(6)   Strategy games have many different mechanics, but they all focus on planning, acquiring information, and responding with the right strategy. This requires tactical and logistical skills as well as the ability to manage resources or armies. Most often, players fight duels or lead entire civilizations to victory.

(7)   Educational games emphasize the acquisition of new skills. By making the educational process entertaining, developers hope that such games will be more efficient than traditional learning tools.

(8)   Sports games imitate real team games. The rules of the game are in line with those of the corresponding real-world sport. Players fight each other in real time. This requires them to be familiar with the rules of the game and possess strategic skills and dexterity.

(9)   Racing games are based on winning against other players in car races. The aim of such games is to be faster than your opponents, i.e., other people or computer-controlled players. The major objective is not only defeating opponents in a given race—players can compete with each other on a global scale through online statistics that allow them to compare themselves with other players.

(10)   MOBA (multiplayer online battle arena) games are a subgenre of multiplayer strategy games. They are based on teams fighting against each other or individu-

ally in a virtual arena until victory. This genre shares many common elements with FPS games.

Researchers working in the field of computer games usually focus on players and their personality traits, such as social problems or aggression [10]; the relationship between gaming patterns and game genres is much less frequently tested. A study by Maroney et al. [11] took into account differences in game genres chosen by players. They showed significant differences between players of FPS and MMORPG games in terms of time spent playing and number of problematic gaming symptoms. It turned out that 46% of players chose to play most often in FPS games and 54% – in MMORPG games. The average amount of time devoted to playing games during the week by those playing FPS games more often was 20.17 hours (SD = 14.25), and for those who played MMORPG games more often – 27.35 hours (SD = 17.46). However, FPS players achieved higher results in the subscales of depression symptoms, loneliness, escapism and addiction to games than MMORPG players.

Gaming disorder

Despite the controversy behind the idea of computer games addiction [12, 13], in the 11th revision of the *International Statistical Classification of Diseases and Related Health Problems,* the World Health Organization (WHO) has adopted a new nosological diagnosis: gaming disorder [14]. This is the first disease classification that acknowledges pathological gaming as a separate diagnosis, understood as behavioral addiction, i.e., related to the disturbed pattern of use (computer games), rather than changes that take place at the physiological level. In the ICD-11, gaming disorder is defined as a pattern of addictive gaming behavior (video or digital games) and characterized by impaired control over gaming, increasing priority given to gaming over other activities to the extent that gaming takes precedence over other interests and daily activities despite negative consequences of continuation or escalation of gaming. The behavior pattern must be of sufficient severity to result in impairments in important areas of functioning (e.g., interpersonal relations, school, work) and would normally need to have been evident for at least 12 months.

On the other hand, in the 5th version of the *Diagnostic and Statistical Manual of Mental Disorders* classification (DSM-5), the American Psychiatric Association (APA) [15] identifies Internet Gaming Disorder (IGD) in a chapter on conditions which bear further investigation. It lists nine symptoms of the disorder: (1) preoccupation with playing, (2) withdrawal symptoms when playing becomes impossible (mainly irritability or anxiety), (3) tolerance resulting from habituation, (4) unsuccessful attempts to control playing, (5) loss of existing interests due to playing, (6) continuous engagement in playing despite the negative consequences, (7) misleading therapists and loved ones about time spent playing, (8) playing as a coping mechanism, and (9) high risk of losing

important relationships and impairment in important areas of functioning like school or work. For the condition to be diagnosed, at least five symptoms must be identified that have lasted not less than 12 months.

The debate preceding the introduction of gaming disorder focused primarily on the question of whether this is a phenomenon of co-occurrence with other disorders or whether it is a separate phenomenon [12]. Gaming disorder relatively often co-occurs with depression, anxiety disorders and ADHD [16]. However, the results of research conducted so far, support the legitimacy of isolating gaming disorder as a separate diagnostic unit and confirm the criteria contained in ICD-11 [17]. Research indicates differences in the incidence of problem gaming in different countries. For example, studies conducted on a representative sample from the general population in Norway indicate that 1.4% of respondents meet the criteria for this disorder [18], while 2.5% meet the criteria in Slovenia [19]. Other studies on populations of gamers have shown more frequent diagnoses, with 4.0% in South Korea [20], 3.1% in Slovenia [19], and 5.7% in Germany [21]. The most vulnerable age groups are children and youth, who have a steady increase in the risk of Internet addiction, which is associated with more frequent playing games [17]. In addition, younger and younger children are starting to use devices that enable the use of the Internet and playing digital games.

Internet Gaming Disorder Test (IGD-20)

There is still relatively little research into problematic playing and limited treatment options are becoming a big problem in the face of increasing occurrence of the problem. Therapeutic methods developed for other addictive behaviors and treatment of comorbid disorders are initially recommended [22]. Due to these deficiencies, it seems necessary to conduct more research on the phenomenon of problematic gaming; however, for this to be possible, appropriate screening tools are needed. The *Internet Gaming Disorder Test* (IGD-20) was developed to measure IGD [23]. This tool was created based on DSM-5 diagnostic criteria. The original version has good psychometric properties, which were verified by confirmatory factor analysis (CFA) and reliability analysis of the subscales as well as of the entire tool. IGD-20 is also consistent with the theoretical model that combines the common characteristics of substance and behavioral addiction [24]. To date, Spanish [25] and Chinese [26] adaptations have been made.

The IGD-20 test contains 20 items which are answered on a five-point Likert scale (possible answers: I strongly disagree, I disagree, I have no opinion, I agree, I definitely agree). The tool measures the overall occurrence of IGD symptoms as well as their occurrence on individual subscales: i.e., salience, mood modification, tolerance symptoms, withdrawal symptoms, conflict symptoms, and relapse symptoms. The salience subscale also includes questions that measure the extent to which gaming is the respondent's dominant activity (e.g., *I usually think about my next gaming session when I am not playing*). The mood modification subscale contains questions

about coping with emotions by playing (e.g., *I play games in order to cope with any bad feelings I might have*). The tolerance subscale measures the need to devote more and more time to playing (e.g., *I feel the need to spend an increasing amount of time engaged in playing games*). The withdrawal symptoms subscale measures the severity of symptoms associated with stopping playing (e.g., *I feel more irritable when I am not playing*). The conflict subscale measures negative consequences such as the loss of previous interests due to gaming, deceiving loved ones regarding the time spent on games, and losses in other areas of life caused by gaming (e.g., *I have lied to my family members about the amount of time I spend playing games; I believe my gaming is negatively influencing important areas of my life*). The relapse subscale contains items that measure the severity of the difficulties involved in trying to control gaming (e.g., *I would like to cut down my gaming time but it's too difficult to do*).

Due to the lack of Polish versions of the tools used to study problematic gaming, the main purpose of this work was to create a Polish version of IGD-20 and discuss the study, on the basis of which its basic psychometric properties and factor structure were checked.

Material and methods

Sample characteristics and procedure

A total of 713 players took part in the study. However, the final analyses took into account the responses of 652 people (531 men, 81.4%; 115 women, 17.6%; and 6 people identifying themselves as of another gender, e.g., intergender or non-binary, 0.9%). A total of 61 people were not included in the study due to either being too young (<15), giving only one type of answer, or estimating time spent on playing games at 0 hours. The age of the respondents ranged between 15 and 55 ($M = 21.86$; $SD = 6.71$). For the purposes of the study, a gamer was defined as anyone who plays computer games, regardless of how much time they devote to them or what genres they play. The average number of hours devoted to playing per week by the surveyed players was $M = 16.30$ h ($SD = 13.75$; min. = 1 h; max. = 84 h). The study received approval from the Research Ethics Commission of the Faculty of Psychology at the University of Warsaw.

Research tools

The first part of the study concerned the measurement of sociodemographic variables such as gender, age, years of education, relationship status, time spent playing, and game genres played. Next, the Symptom Checklist-27-plus (SCL-27-plus) questionnaire [27, 28], in Polish adaptation [22], was used to measure the level of psychopathological symptoms. This tool consists of 27 items on a five-point Likert scale

(possible responses: never, rarely, sometimes, often and very often). It measures the general level of psychopathological symptoms as well as symptoms separately on each subscale: depressive symptoms, vegetative symptoms, agoraphobic symptoms, social phobia symptoms, and pain symptoms. The indicators of internal validity (Cronbach's alpha) for the general index in studies on clinical and non-clinical samples were high – 0.90-0.92, and for individual subscales ranged from 0.77 to 0.88.

The Desire Thinking Questionnaire – Gaming Version [29] (DTQ-G) was also used. It is a relatively new measuring method of intensity of thoughts associated with addictive behavior (desire thinking). Thoughts like this involve preoccupation – ascertained at the verbal and imaginative level – with the activity that is desired (such as gaming or browsing the web) [30-32]. DTQ-G consists of 10 items with a six-point Likert scale with the answers "never – rarely – sometimes – often – very often – always". It measures the general level of intensity of desire thinking (general index), and has two subscales measuring imaginal prefiguration and verbal perseveration. The rates of internal validity (measured by McDonald's omega) were high for the entire questionnaire $\omega = 0.94$, for the verbal perseveration subscale $\omega = 0.91$ as well as for the imaginal prefiguration $\omega = 0.90$.

The Polish version of the IGD-20 test was used to measure problem gaming. The original version of the IGD-20 scale was independently translated by the authors of the study. The next step was to compare the obtained versions and disputed items. To do so, the Polish version was translated back into English by an independent translator. The translated version was compared with the original and checked for consistency by its authors. In addition, a pilot study of the translated tool was carried out on a sample of gamers ($n = 5$), who did not have any problems understanding the questionnaire.

Statistical analysis

General calculations were carried out in IBM SPSS 25 [33]. When calculating gender differences, persons who identified as a nonbinary gender were omitted due to too few observations ($n = 6$). Selected psychometric properties of the Polish version of the IGD-20 scale were tested in several stages by checking the internal reliability expressed by McDonald's omega. External reliability was checked by analyzing correlations with the intensity of problem gaming symptoms (IGD-20), the number of symptoms of psychopathology measured with SCL-27-plus, desire thinking (DTQ-G) and the amount of time devoted to playing games. The factor structure was confirmed in Mplus 6.12 [34] by confirmatory factor analysis (CFA). According to the recommendations, in order to determine the goodness of fit of the data to the model, various goodness of fit indices were taken into account at the same time. The following parameters were taken into account, in accordance with the most commonly used standards [35, 36]: RMSEA (Root Mean Square Error of Approximation) < 0.08 means acceptable fit and < 0.05 means good fit; CFI (Comparative Fit Index) > 0.90 and TLI (Tucker-

Lewis Index) > 0.90 means an acceptable fit, and CFI and TLI > 0.95 means a good fit; SRMR (Standardized Root Mean Square Residual) should be < 0.08. In addition, the relationship between game genres and the number of IGD symptoms was explored.

Results

Descriptive statistics

Descriptive statistics for the questionnaire's subscales, sociodemographic data, and gender differences are presented in Table 1. For questions about the general characteristics of games played, the respondents were asked to indicate which genres they play the most (up to 10 possible answers). Figure 1 presents the frequency that each genre was selected by players participating in the study. Table 2 shows the results of the statistically significant correlations (Spearman's Rho) between game genres, IGD-20 questionnaire subscales, and time spent playing. These analyses were conducted in order to answer the additional question about which of the distinguished game genres are associated with intensification of problematic gaming symptoms and longer playing times.

Table 1. **Descriptive statistics for each questionnaire with subscales and gender differences analyzed with the Mann-Whitney U test**

Characteristics of the sample	M (SD)		Mann-Whitney U test	Cohen's d
	Women (n = 115) Men (n = 531)			
Average weekly time spent playing computer games (in hours)	11.10 (13.08)	17.43 (13.66)	19024.00***	0.52
Average time spent playing games in one session (in minutes)	92.89 (87.09)	136.13 (116.16)	23193.00***	0.32
SCL-27-plus				
Total score	2.20 (0.70)	1.77 (0.56)	42127.00***	0.52
Depressive symptoms	2.32 (1.06)	1.91 (0.92)	37956.50***	0.32
Vegetative symptoms	2.06 (0.74)	1.64 (0.61)	41018.00***	0.47
Agoraphobic symptoms	1.85 (1.03)	1.37 (0.64)	39389.00***	0.39
Social phobia	2.53 (1.13)	2.01 (0.92)	38873.00***	0.37
Pain symptoms	2.17 (0.68)	1.81 (0.62)	40286.00***	0.43
IGD-20				
Total score	36.11 (12.61)	40.47 (12.40)	24075.50***	0.28
Salience and tolerance	11.37 (4.87)	12.65 (4.57)	24788.50**	0.25
Mood modification	8.17 (3.49)	8.36 (2.95)	29115.50ns	-
Withdrawal symptoms	4.99 (2.43)	5.32 (2.32)	27192.50ns	-

Conflict	6.52 (2.77)	8.04 (3.21)	21684.00***	0.39
Relapse	5.06 (2.23)	6.10 (2.56)	23337.50***	0.32
DTQ-G				
Total score	17.90 (8.74)	20.73 (9.46)	24353.00**	0.25
Imaginal prefiguration	10.03 (5.24)	11.57 (5.69)	25261.00**	0.21
Verbal perseveration	7.87 (4.25)	9.16 (4.53)	23841.00***	0.28
Years of education	13.59 (3.43)	13.15 (2.91)	-	-
Relationship status				
Single	56	327	-	-
In an informal relationship	54	145	-	-
Married	5	57	-	-
Divorced	-	2	-	-
Living location				
Village	21	146	-	-
City up to 50,000	50	122	-	-
City between 50,000-100,000	13	80	-	-
City between 100,000-500,000	14	71	-	-
City over 500,000	38	112	-	-

Note: *** $p < 0.001$, two-tailed; ** $p < 0.01$, two-tailed; [ns] – non-significant.; IGD-20 – Internet Gaming Disorder Scale; SCL-27-plus – Symptom Checklist-27-plus; DTQ-G – Desire Thinking Questionnaire – Gaming Version
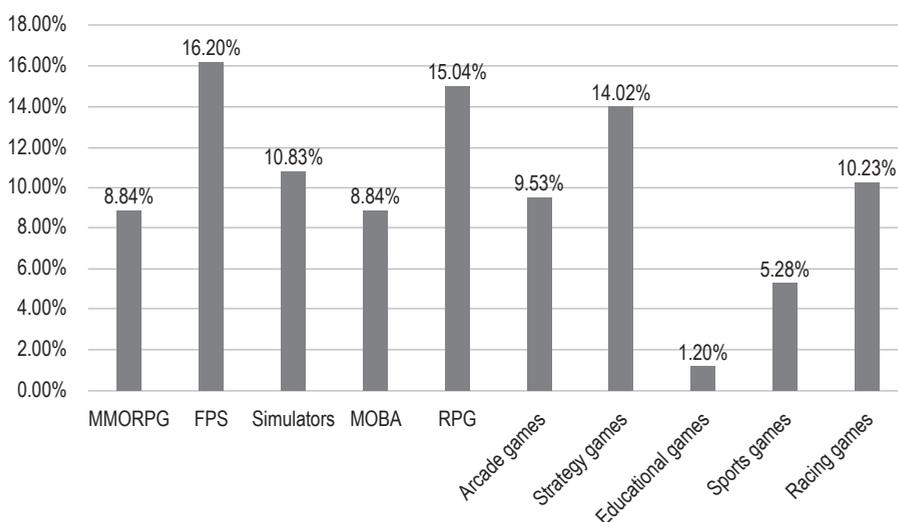

Figure 1. **Percentage comparison of game genres played by participants**

Table 2. **Statistically significant Spearman's Rho correlations between game genres and subscales of the IGD-20 questionnaire and time spent playing games**

	Total score	Salience and tolerance	Mood modification	Withdrawal symptoms	Conflict	Relapse	Time1	Time2
MMORPG	0.01	0.04	0.04	-0.01	-0.03	-0.07	0.12**	0.04
FPS	0.12**	0.14**	0.08*	0.04	0.11**	0.07	0.18***	0.11**
MOBA	0.12**	0.09**	0.05	0.07	0.09*	0.15***	0.20***	0.14***
RPG	0.04	0.06	0.07	0.03	-0.04	0.01	0.16***	0.15***
Simulators	0.00	0.02	0.00	-0.02	0.01	0.00	-0.04	-0.03
Arcade games	-0.05	-0.02	-0.01	-0.06	-0.06	0.09*	-0.02	-0.02
Educational games	-0.11**	-0.13**	-0.02	-0.11**	-0.07	-0.11**	-0.06	-0.08*
Sports games	-0.04	-0.05	-0.03	-0.01	-0.05	0.02	-0.04	-0.02
Racing games	0.05	0.06	0.01	0.06	0.11**	0.09*	-0.01	0.04
Strategy games	-0.03	-0.02	0.00	-0.01	-0.04	-0.03	0.00	-0.01

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; Time1 – Average weekly time spent playing computer games; Time2 – average time spent playing games in a single session; IGD-20 – Internet Gaming Disorder Scale; SCL-27-plus – Symptom Checklist-27-plus; DTQ-G – Desire Thinking Questionnaire – Gaming Version.

Factor structure

The factor structure of the scale was checked with CFA using the WLSMV (Weighted Least Square Mean and Variance Adjusted) estimator in Mplus. The six-factor model adopted for the initial version of the tool matched the data but factor loading for item 19 was statistically insignificant. After deleting this item, the index of model fit remained at a satisfactory level: $\chi^2(155) = 677.897$; $p < 0.001$; RMSEA = 0.075 (90% CI: 0.069-0.081); CFI = 0.954; TLI = 0.943; SRMR = 0.053. Similarly to the Chinese adaptation [26], there was a problem with the positive definition of the Psi matrix, which is the correlation-covariance matrix for latent variables. The problem probably occurred due to the large correlation of variables and concerned tolerance and significance factors. Following the solution used by Shu and colleagues [26], a five-factor model was created in which the salience and tolerance factors were combined into one factor. The proposed five-factor model fit the data, and fit indices (evaluated collectively) have remained satisfactory: $\chi^2(142) = 690.059$; $p < 0.001$; RMSEA = 0.077 (90% CI: 0.071-0.083); CFI = 0.950; TLI = 0.940; SRMR = 0.053.

The model with standardized estimators is shown in Figure 2. Factor loadings, except for item 2, were higher than 0.50, and ranged from 0.36 (for item 2) to 0.91.

Internal and external validity

The values of McDonald's omega internal reliability were: $\omega = 0.83$ for the salience and tolerance scale; $\omega = 0.82$ for mood modification; $\omega = 0.85$ for the withdrawal symptoms scale; $\omega = 0.76$ for conflict; $\omega = 0.78$ for the relapse scale; and $\omega = 0.93$ for the whole scale. Thus, all the McDonald's omega values obtained were high – above 0.70, while for whole scale it was very high – $\omega = 0.93$. In addition, a weak, positive correlation ($r = 0.29$; $p < 0.001$) was demonstrated between the intensity of IGD symptoms and the number of hours spent playing computer games. The convergent validity was then checked by correlating the subscales of the IGD-20 questionnaire with the SCL-27-plus subscales, which investigates symptoms of psychopathology, and DTQ-G, which investigates desire thinking. The results are shown in Table 3. A moderately strong, positive correlation of psychopathological symptoms (both for the general index and individual subscales) with the symptoms of problematic gaming was demonstrated using the Spearman Rho coefficient. Also, a moderately strong, positive correlation of desire thinking (for general index and imaginal prefiguration and verbal perseveration subscales) with the symptoms of problematic gaming was demonstrated, using the Spearman Rho coefficient.
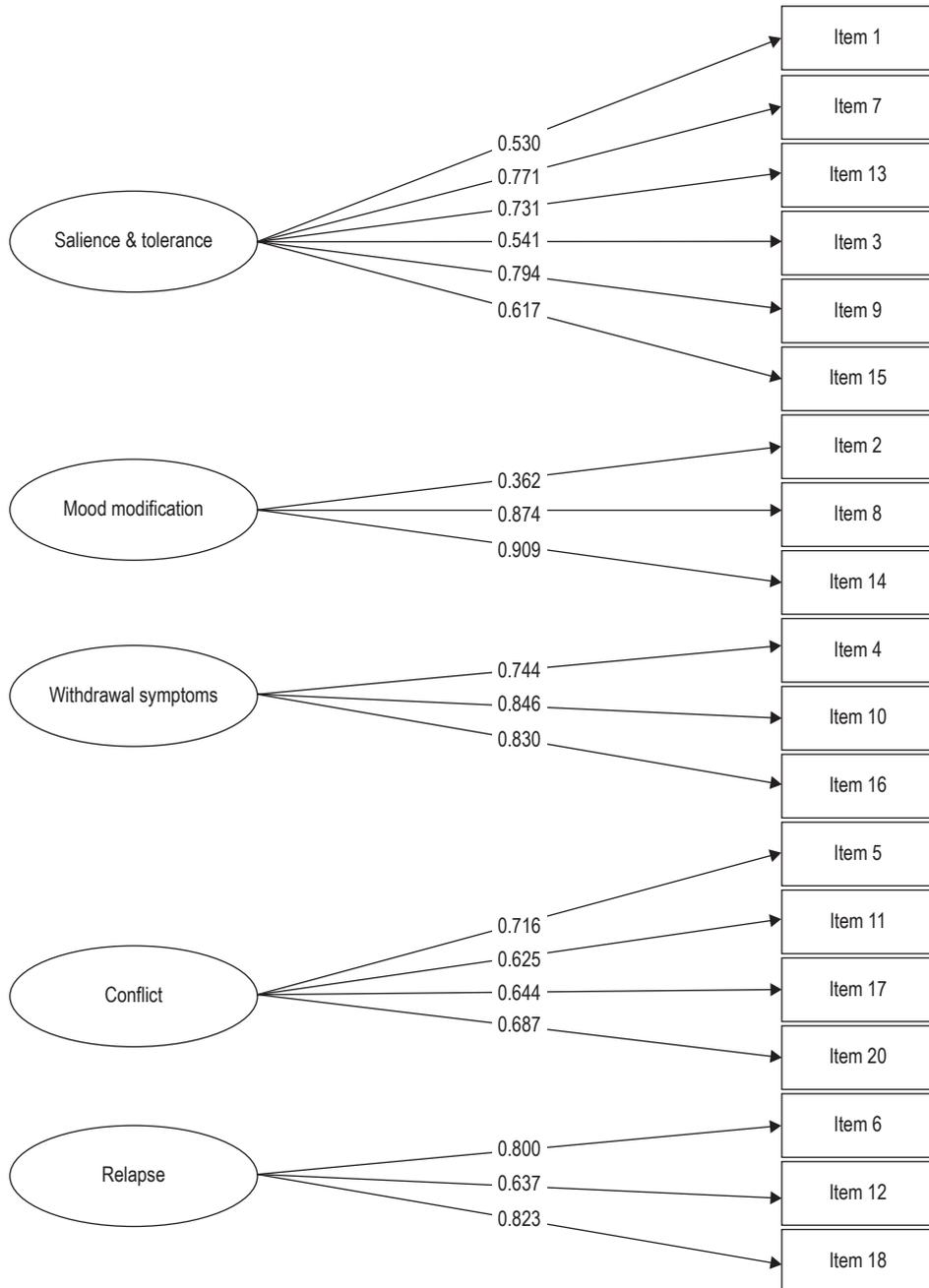
Figure 2. **Factor analysis model of the Polish version of the IGD-20 test with standardized effects and significant levels. Error terms and observed variables (all items from questionnaires) are omitted for clarity. All paths have p < 0.001**

Table 3. **Spearman Rho correlations between variables**

	Salience and tolerance	Mood modification	Withdrawal symptoms	Conflict	Relapse	IGD-20 total score	Depressive symptoms	Vegetative symptoms	Agoraphobic symptoms	Symptoms of social phobia	Pain symptoms	SCL-27-plus total score	Imaginal prefiguration	Verbal perseveration	DTQ-G total score
Salience and tolerance	-	0.47	0.65	0.58	0.63	0.87	0.21	0.18	0.18	0.26	0.13**	0.26	0.40	0.49	0.48
Mood modification	0.47	-	0.50	0.41	0.42	0.71	0.42	0.17	0.28	0.40	0.16	0.40	0.36	0.35	0.39
Withdrawal symptoms	0.65	0.50	-	0.57	0.60	0.80	0.25	0.20	0.25	0.31	0.17	0.31	0.43	0.52	0.50
Conflict	0.58	0.41	0.57	-	0.61	0.79	0.22	0.18	0.16	0.28	0.16	0.28	0.30	0.37	0.36
Relapse	0.63	0.42	0.60	0.61	-	0.80	0.14	0.12**	0.15	0.24	0.08*	0.19	0.35	0.43	0.42
IGD-20 total score	0.87	0.71	0.80	0.79	0.80	-	0.32	0.22	0.25	0.37	0.17	0.36	0.45	0.54	0.54
Depressive symptoms	0.21	0.42	0.25	0.22	0.14	0.32	-	0.35	0.52	0.65	0.36	0.78	0.20	0.18	0.20
Vegetative symptoms	0.18	0.17	0.20	0.18	0.12	0.22	0.35	-	0.43	0.44	0.66	0.71	0.19	0.16	0.19
Agoraphobic symptoms	0.18	0.28	0.25	0.16	0.15	0.25	0.52	0.43	-	0.66	0.36	0.72	0.22	0.19	0.22
Symptoms of social phobia	0.26	0.40	0.31	0.28	0.24	0.37	0.65	0.44	0.66	-	0.37	0.84	0.19	0.19	0.21
Pain symptoms	0.13**	0.16	0.17	0.16	0.08*	0.17	0.36	0.66	0.36	0.37	-	0.69	0.18	0.13	0.17
SCL-27-plus total score	0.26	0.40	0.31	0.28	0.19	0.36	0.78	0.71	0.72	0.84	0.69	-	0.25	0.22	0.25
Imaginal prefiguration	0.40	0.36	0.43	0.30	0.35	0.45	0.20	0.19	0.22	0.19	0.18	0.25	-	0.69	0.95
Verbal perseveration	0.49	0.35	0.52	0.37	0.43	0.54	0.18	0.16	0.19	0.19	0.13	0.22	0.69	-	0.86
DTQ-G total score	0.48	0.39	0.50	0.36	0.42	0.54	0.20	0.19	0.22	0.21	0.17	0.25	0.95	0.86	-

Note: All correlations except those marked with * and ** have p < 0.001; * p < 0.05; ** p < 0.01. IGD-20 – Internet Gaming Disorder Scale; SCL-27-plus – Symptom Checklist-27-plus; DTQ-G – Desire Thinking Questionnaire – Gaming Version.

Discussion

No tools for the study of problematic gaming based on the theoretical assumptions of DSM-5 or ICD-11 have been published to date in Poland. The aim of this study was to check the basic psychometric properties of the Polish version of IGD-20 and confirm its factor structure. This work confirms that the Polish version of IGD-20 can be considered a questionnaire with good psychometric properties. It can therefore be recommended for use in screening tests.

The results obtained indicate good internal consistency of the tool. McDonald's omega coefficients reached an acceptable value for all the IGD-20 subscales (> 0.76). On the other hand, an assessment of convergent validity between psychopathological symptoms, desire thinking and symptoms of problematic gaming showed moderately strong correlations between SCL-27-plus, DTQ-G and IGD-20. These results indicate the convergence, but also a partial distinctiveness of the desire thinking construct, which in assumptions has to be a predictor of addictive behavior [30-32]. Weak and moderate correlations between IGD-20 and Scl-27-plus subscales were also obtained. These results indicate the co-occurrence, but not the identity, of problematic gaming symptoms and psychopathological symptoms from the group of emotional disorders. This co-occurrence can be interpreted in the context of a model emphasizing the role of self-regulation in addictive gaming [37]. In this model, attention is drawn to the fact that playing games can, for some players, be used primarily to cope with negative emotional states.

The results of confirmatory factor analysis confirm the five-factor structure of the tool. This model is fairly well matched in terms of general fit index. Fit indices have been evaluated collectively, indicating that the model has a good or acceptable fit. The study did not confirm the six-factor structure that emerged in the original and Spanish versions of the scale; however, it is consistent with the results obtained in the Chinese sample. Nevertheless, it seems that the combination of tolerance and salience subscales can be interpreted as a great difficulty in the empirical separation of these factors. It is worth noting that the content of the questions in both subscales concerns the common area, which is the amount of time spent on playing. In addition, the correlation between tolerance and salience in studies that confirmed the six-factor structure was very high (> 0.94) [5, 25]. Both factors are undoubtedly related to each other, because as playing games gradually becomes an increasingly important activity in a person's life, he / she spends more and more time playing. Players spend more time gaming due to the need to reach higher ranks (levels) or to gain further achievements. This leads to the gradual development of tolerance [38].

The only difference compared to validation studies of other language versions was the low loading factor of one of the items on the conflict subscale (item 19). Due to the fact that it was not statistically significant, this item was finally removed from the subscale. The value of the loading factor, however, could have resulted from

the inverted form of the question, and this supposition is supported by the fact that a relatively low loading factor was also obtained in the case of item 2, which is also inverted. Further analysis needs to be carried out to see if this problem would occur on a scale of 20 questions, but transformed so that the tool is consistent and does not contain inverted questions.

It was determined that the frequency of choosing educational games negatively correlates with the intensity of IGD symptoms and the time spent on playing games. People who play educational games are presumably less susceptible to problematic gaming, which can be linked to the tendency for shorter gaming sessions associated with this genre. The second possible explanation is the less significant relationship between emotional regulation through educational games in comparison to other game genres. In addition, the frequency of choosing sports games, simulators, and strategy games did not correlate significantly with any of the IGD-20 subscales, nor with the time spent playing. Other game genres interact differently with symptoms or with different lengths of time spent playing games. These results are exploratory; they indicate differences between the effects that may accompany problematic gaming. Detailed study of these consequences is additionally hindered by game mechanics which sometimes make it difficult to clearly assign a given game to a single genre. Players are typically not limited to the choice of only one category of games. Further investigation of the differences between the various effects of the genres on the symptoms of problematic gaming could, however, potentially help us better understand the mechanisms involved in the development of the disorder.

In addition, the study took into account the occurrence of differences between men and women, despite the significant gender disparity (the study involved 531 men and only 115 women; this prevented us from performing all the analyses we had intended to). It was only confirmed that men play games more often [11], that IGD symptoms are more intense in men, and that men spend more time playing than women. It is probable that these factors make men more susceptible to problematic gaming. This indicates that gender differences are important in the development of the disorder.

Limitations

This study has at least several limitations, the major one being the fact that the IGD-20 needs to be further adapted for a non-clinical trial. For this reason, we did not take into consideration the cut-off point between players showing symptoms of the disorder and those who have no symptoms or who exhibit an insufficient number of symptoms for a diagnosis. Further research should therefore focus on testing the diagnostic value of the tool in a clinical trial. In addition, the examined group of players was also not representative. An additional limitation is the small loading factors of the two inverted items of the IGD-20 questionnaire (questions 2 and 19). This may be due to the fact that only these two questions are reversed. Subsequent studies should check

the functioning of the scale after reversing these items so that the entire questionnaire has a consistent form. Another limitation is the large disparity between the number of men and women. This did not allow for analyses to be broken down into groups by gender. Further research should, however, focus on explaining the observed gender differences in order to fully understand the development of problematic gaming.

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