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FULL-LENGTH REPORT

# Functional impairment, insight, and comparison between criteria for gaming disorder in the *International Classification of Diseases, 11 Edition* and internet gaming disorder in *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*

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## ABSTRACT

*Aim:* This study evaluated the consistency between the *International Classification of Diseases, 11th Edition* (*ICD-11*) for gaming disorder (*ICD-11*-GD) and *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (*DSM-5*) criteria for internet gaming disorder (*DSM-5*-IGD). Moreover, the functional impairment of participants and their insight of their GD were evaluated. *Methods:* We recruited 60 participants with GD, 45 participants who engaged in hazardous gaming (HG), and 120 controls based on a diagnostic interview. Their operationalization of functional impairment and stage of change were evaluated by interviews and questionnaires, including the Brief Gaming Negative Consequence Scale (BGNCS). *Results:* We observed satisfactory consistency (kappa value = 0.80) with a diagnostic accuracy of 91.5% between the *ICD-11*-GD and *DSM-5*-IGD criteria. Furthermore, 16 participants with IGD in DSM-5 were determined to have HG based on the *ICD-11* criteria. Participants of GD group experienced impaired functioning in their health (96.7%), career (73.3%), social life (61.6%), academic performance (36.7%), and job performance (35%). Moreover, a proportion of them were in the pre-contemplation (25.0%), contemplation (61.7%), preparation (10%), and action stages (3.3%). *Conclusion:* There is a good consistency between *ICD-11*-GD and *DSM-5*-IGD criteria. The *ICD-11* criteria have a high threshold for diagnosing GD. HG criteria could compensate for this high threshold and identify individuals with a gaming-related functional impairment who require help. Most of the participants with GD were in the early stage of change. Interventions to promote their insight are essential. The BGNCS can be used to examine the negative consequences of gaming and aid mental health professionals in assessing functional impairment.

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## KEYWORDS

gaming disorder, hazardous gaming, *ICD-11*, functional impairment, stage of change, insight

## INTRODUCTION

Gaming is one of the most popular leisure activities in the world—healthy gaming benefits educating or training (Cade & Gates, 2017). However, a small proportion of gamers experience negative consequences from excessive gaming (Stevens, Dorstyn, Delfabbro, & King, 2021). The *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5) proposed criteria for Internet gaming disorder (*DSM-5*-IGD criteria) in section III to foster research on this dysfunctional gaming. It is not an official diagnosis as its validity and utility require further studies (American Psychiatric Association, 2013). In 2019, the *International Classification of Diseases, 11th Edition* (*ICD-11*) defined gaming disorder (*ICD-11*-GD criteria) as addictive behavior and indicated hazardous gaming (HG) as a problem associated with health behaviors (World Health Organization, 2019). The diagnostic criteria, threshold, and classification of GD or IGD differ between these diagnostic systems. Moreover, studies have raised concerns regarding the diagnostic validity of GD because of the lack of adequate empirical information, such as that insight, negative consequences, and functional impairment (Dowling, 2014; Kardefelt-Winther, 2014; Starcevic, 2017). Understanding how individuals with GD perceive their excessive gaming behavior is crucial to preventing its misdiagnosis. An empirical study must examine the consistency between the *DSM-5*-IGD and *ICD-11*-GD criteria for GD and elucidate the negative consequence and functional impairment of patients with GD.

### Diagnosis of GD and IGD

The *DSM-5*-IGD criteria include preoccupation with gaming, withdrawal symptoms, tolerance, unsuccessful attempts to quit gaming, excessive gaming despite negative consequences, loss of interest, deceiving, escape, and functional impairment (American Psychiatric Association, 2013). The diagnosis is established when individuals fulfill five or more of these criteria during 12 months; a previous clinical study reported the satisfactory validity of the *DSM-5*-IGD (Ko et al., 2014). However, two criteria—escape and deceiving—were determined to have controversial validity (Ko et al., 2014). Furthermore, two criteria—tolerance and withdrawal—are not defined biologically in the DSM-5 (Billieux, Schimmenti, Khazaal, Maurage, & Heeren, 2015; Kaptsis, King, Delfabbro, & Gradisar, 2016). Moreover, preoccupation and tolerance could be experienced by engaged gamers with a harmonious passion that usually did not impair their function (Billieux et al., 2017). Thus, functional impairment should be a required feature in diagnosing GD.

In the *ICD-11*-GD criteria, GD is defined as a dysfunctional pattern of gaming characterized by impaired control, an increased priority given to gaming over other interests and daily activities, excessive gaming despite its negative consequences, and functional impairment (World Health Organization, 2019). Despite differences in the criteria between the *DSM-5*-IGD and *ICD-11*-GD, their diagnostic accuracy (DA) for GD was 91.6% in a clinical study (Higuchi, Nakayama, Matsuzaki, Mihara, & Kitayuguchi, 2021).

The *ICD-11* describes HG as a pattern of gaming behavior that increases the risks of harmful physical or mental health consequences. Ko, Lin, Lin, and Yen (2020) reported that 63.8% and 36.2% of individuals with *DSM-5*-IGD fulfilled the *ICD-11*-GD and HG criteria, respectively (Ko et al., 2020). However, no study has evaluated the DA of the criteria for HG and compared it with those for *DSM-5*-IGD based on their severity.

### Functional impairment and health problems in GD

Kardefelt-Winther et al. (2017) suggested functional impairment with the repeated, and chronic course should be revealed in diagnosing GD. Krossbakken, Pallesen, Molde, Mentzoni, and Finserås (2017) reported that functional impairment is a key criterion for differentiating addictive gamers from engaged gamers. However, the relationship between functional impairment and GD remains unclear (Przybylski, Weinstein, & Murayama, 2017). Ko et al. (2020) reported that 89.9% of patients with *DSM-5*-IGD diagnosis had a functional impairment, and most of them experienced health problems. Higuchi et al. (2021) demonstrated impairment in the daily activities and academic and job performance of students with GD. The authors suggested examining the gaming pattern of individuals whose GD persisted in their adulthood. Thus, a tool must be developed to evaluate functional impairment and health problems and their severity in adults with GD.

### Insights into GD

Kardefelt-Winther et al. (2017) reported that functional impairment could be a consequence of a deliberate choice. However, the perception of functional impairment might depend on the individual being aware of their disorder (i.e., the insight stage) or having the motivation to change. The transtheoretical model posits that an addictive behavior change involves progress through the following six stages: pre-contemplation, contemplation, determination, action, maintenance, and relapse or termination (Vilela, Jungerman, Laranjeira, & Callaghan, 2009). According to a study on smoking behavior, individuals with advanced stages take more process of changes to quit their smoking. Further, the effective intervention should be determined based on their insight stage (Prochaska & DiClemente, 1983). Thus, it is essential to understand the stage of individuals with GD when implementing a treatment. However, no diagnostic interview study has explored the insights of individuals with GD.

We hypothesized that: (1) there is a consistency between DSM-5-IGD and *ICD-11*-GD criteria; (2) HG could compensate for the high threshold of DSM-5-IGD and *ICD-11*-GD criteria; (3) Individuals with GD experience significant functional impairment and is at an early stage of change with lower insight. Thus, this study investigated the consistency between the *ICD-11*-GD and the *DSM-5*- IGD criteria, evaluated the functional impairment and health

problems of individuals with GD or HG, and determined the awareness of individuals regarding their GD.

## METHODS

### Participants

We recruited participants by posting an advertisement on the bulletin board system of a university. Adults aged between 20 and 40 years with completed upper secondary education were eligible for inclusion in this study. An experienced psychiatrist, the corresponding author, diagnoses GD or HG using a semi-structural interview based on *ICD-11* criteria (Appendix 1). The IGD diagnosis was determined by interviewing schedule based on *DSM-5*- IGD criteria (Ko et al., 2020). In addition, the Chinese version of the Mini International Neuropsychiatric Interview (Sheehan et al., 1998) was used to evaluate the psychiatric comorbidity and exclude prospective participants with psychotic disorders, bipolar I disorder, or substance use disorder. Furthermore, an interview was conducted to exclude participants with intellectual disabilities or brain injury based on tracing their medical and schooling history.

The participants were divided into a GD, HG, or control group according to a psychiatric semi-structural diagnostic interviewing (Appendix 1) based on the *ICD-11* criteria. Each participant with GD was matched with two sex-matched and age-matched (±3 years) controls. Participants who engaged in excessive gaming but did not fulfill the diagnostic criteria for GD were included in the HG group.

The GD, HG, and control groups had 60, 45, and 120 participants; all gave their written informed consent. This study was approved by the Institutional Review Board of Kaohsiung Medical University Hospital, Taiwan.

### Measures

**DSM-5-*IGD* *criteria.*** We conducted a semi-structured interview to examine the severity and frequency of each *DSM-5* criterion for IGD based on our previous study (Ko et al., 2020). The participants who met five or more criteria were included in the IGD group (American Psychiatric Association, 2013).

**ICD-11-*GD* *criteria.*** The diagnostic criteria for GD are as follows: (1) impaired control over gaming habits, (2) increased priority given to gaming, and (3) continued gaming (>25 h per week; Ko et al., 2020) despite negative consequences. Individuals are diagnosed as having GD if these behavioral patterns cause considerable functional impairment over a period of >12 months. The definitions are listed in appendix 1. The frequency threshold in appendix 1 is referred to a previous diagnostic study for *DSM-5*-IGD (Ko et al., 2020). All the criteria were diagnosed only when they were persistent and clinically significant as suggested by *ICD-11* (World Health Organization, 2019).

***Diagnostic Criteria for HG.*** HG refers to a pattern of gaming behavior that increases the risk of harmful physical or mental health consequences. During diagnostic interviewing, participants demonstrating impairment in academic, social, family functioning, unhealthy behaviors, or health problems associated with gaming were included in the HG group if they did not meet the *ICD-11* criteria for GD.

***Clinical Global Impression Scale.*** The Clinical Global Impression Scale (CGI) developed by Busner and Targum (2007) was modified to determine the severity of IGD (Yen et al., 2017). We used the following CGI question for IGD: "Considering your total clinical experience with this particular population, how mentally ill is the patient at this time?" This modified CGI scale scoring range 1–7 was used to determine IGD severity in this study. A higher score indicates a higher severity.

***The insight stage.*** According to a previous study on smokers (Velicer et al., 1995), we divided the participants in the GD group into the pre-contemplation, contemplation, preparation, and action stages based on information collected in the diagnostic interview. We inquire about the intent to control gaming and why. If positive, we ask how they plan to do with it and its result. The stages were defined as follows:

(a) Precontemplation: No intent to control one's gaming
(b) Contemplation: Intent to control one's gaming in 6 months (intent to control gaming without any plan or preparation)
(c) Preparation: Preparation to control one's gaming in 1 month (planning, preparation, or discussion to control one's gaming).
(d) Action: Taking measures to control one's gaming.

The participants' motivation to change and the point at which they recognized their disorder (which we call the insight stage) were objectively evaluated during the interview. In addition, the participants were asked to complete a self-reported dichotomous questionnaire to obtain information on their ideas, decisions, and planning with regard to controlling their gaming and decision about their gaming life again.

***Brief Gaming Negative Consequence Scale.*** The Brief Gaming Negative Consequence Scale (BGNCS) was developed in this study to examine the negative consequences of gaming on occupational performance, academic performance, social interaction, family interaction, health, and safety. This scale includes six questions (Appendix 2), and the participants' responses ranged from *not at all* (score of 1) to *severe* (score of 4) for each question. The scale was used to determine the severity of the negative consequences of IGD. The Cronbach's alpha value was 0.82.

***Chen Internet Addiction Scale-gaming version.*** The Chen Internet Addiction Scale (CIAS) is a 4-point, 26-item self-reported scale used to examine the five dimensions of Internet addiction: compulsive use, withdrawal, tolerance, problems with interpersonal relationships, and problems with health and time management (Chen, Weng, Su, Wu, & Yang, 2003).

The colloquial expressions of the CIAS were modified to reflect the participants' online gaming experiences better, and the Cronbach's alpha value of the scale was 0.96 (Ko, Yen, Chen, Chen, & Yen, 2005). The total CIAS score was from 26 to 104, with higher CIAS-G scores indicating more severe IGD.

### Procedure

We examined the participants' functional impairments, health problems, and stage of insight. In addition, the participants were asked to complete the CGI, BGNCS, and CIAS-gaming version (CIAS-G).

### Statistical analysis

We performed a chi-square test to analyze the association of diagnostic criteria for GD between the *ICD-11* and *DSM-5*. An analysis of variance with a post hoc test was performed to evaluate differences in age, educational levels, and scores in the CGI, CIAS-G, and BGNCS among the IGD, HG, and control groups and the differences in functional impairment and the stage of change between the GD and HG groups. A Pearson correlation analysis was performed to examine the correlation between the scores of the CGI, CIAS-G, and BGNCS and the dimensions of functional impairment. The receiver operating characteristic (ROC) curve was created by plotting the true positive rate (TPR) against the false positive rate (FPR) at various threshold settings of BGNCS to determine its diagnostic ability. A *P-value* of $< 0.05$ was considered statistically significant. All statistical analyses were performed using SPSS version 26 (IBM Corp. Released, 2019).

### Ethics

All relevant ethical safeguards have been met in relation to subject protection and we have complied with the Declaration of Helsinki. All participants had completed the informed consent. This study was approved by the Institutional Review Board of Kaohsiung Medical University Hospital, Taiwan.

## RESULTS

No significant differences in age, sex, and educational level were observed among the GD, HG, and control groups (Table 1). Most of the GD (95.0%) participants and HG (84.4%) groups played games daily. Furthermore, 71.6% in the GD group and 42.2% in the HG group played games for more than 40 h per week.

### Association between the *ICD-11*-GD and *DSM-5*-IGD criteria

The DA (True positive + True negative/All) of the *DSM-5*-IGD criteria for GD was 91.5% (The lower part of Table 2). A total of 57 participants fulfilled both the *ICD-11*-GD (95.0%) and *DSM-5*-IGD (78.1%) criteria. Furthermore, three (5.0%) participants fulfilling *ICD-11*-GD criteria were included in the control group (2.0%) by *DSM-5*-IGD criteria. On the other hand, sixteen (21.9%) participants fulfilling *DSM-5*-IGD criteria were included in the HG group (35.6%) by *ICD-11*-GD criteria. The kappa value between the *ICD-11*-GD and *DSM-5*-IGD criteria was 0.80 ($P < 0.001$).

### Sensitivity (Sen.) and Specificity (Spe.) of each criterion for *ICD-11*-GD diagnosis

The diagnostic criteria of *ICD-11*-GD, namely impaired control over gaming habits, increased priority given to gaming to the extent that gaming tasks take precedence over other activities, continued gaming despite negative consequences, and functional impairment, had a Sen. of 100% (first part of Table 2). They also have adequate specificity.

The results of the chi-square analysis indicated a significant association between the criteria item of *DSM-5*-IGD and *ICD-11*-GD diagnosis. We observed adequate Sen., Spe., and DA of the *DSM-5*-IGD criteria items for *ICD-11*-GD diagnosis (second part of Table 2), namely preoccupation (Sen.: 78.3%, Spe.: 90.9%, and DA: 87.6%), withdrawal (Sen.: 80.0%, Spe.: 83.6%, and DA: 82.6%), loss of interest (Sen.: 76.7%, Spe.: 84.2%, and DA: 82.2%), and escapism (Sen.: 73.3%, Spe.: 84.8%, and DA: 81.8%). Furthermore, we noted a lower Sen. of 61.7% with adequate Spe. (93.3%) and DA (84.8%) for tolerance. The criterion of deceiving had a lower Sen. of 50.0% and a lower DA of 76.9% for GD diagnosis, despite its adequate Spe. of 86.7%.

### Sen. and Spe. of each criterion for *DSM-5*-IGD (Supplement data 1)

The results indicated adequate Sen., Spe., and DA of the *DSM-5* diagnostic criteria for IGD: preoccupation, withdrawal, loss of interest, escapism, loss of control, continued gaming despite negative consequences, and functional impairment. A lower Sen. was noted in criteria of Tolerance (Sen.: 61.6%, Spe.: 98.0%, and DA: 86.2%) and deceiving (Sen.: 52.1%, Spe.: 90.8%, and DA: 78.2%).

### Functional impairment and health problems of GD and HG in the *ICD-11*

The analysis of variance results demonstrated that the GD group had higher scores in the CIAS-G ($F = 180.15$, $P < 0.001$), CGI ($F = 761.27$, $P < 0.001$), and BGNCS ($F = 80.49$, $P < 0.001$) than did the HG group, whereas the HG group had a higher score in Tukey's post hoc analysis than did the control group (Second part of Table 1). We noted that GD group experienced health problems (96.7%), functional impairment in the dimensions of career (73.3%), social interaction (61.6%), academic performance (36.7%), and job performance (35%; First part in Table 3). Furthermore, 73.3% of the participants in the GD group experienced impairment in three or more dimensions of impairments or health problems. The HG group also experienced health problems (86.7%), functional impairment in career (24.4%), social interaction (22.2%), academic performance (17.8%), and job performance (11.1%; First part in Table 3). Furthermore, 11.1% of the HG group participants

*Table 1.* The demographic data, gaming behavior, and severity of gaming disorder (GD) in GD, hazardous gaming (HG), and control group

| Variable | Control ($N$ = 120) N (%)/Mean (SD) | Hazardous Gaming ($N$ = 45) N (%)/Mean (SD) | Gaming disorder ($N$ = 60) N (%)/Mean (SD) | $\chi^2$/F | Post Hoc |
|---|---|---|---|---|---|
| Gender | | | | | |
| Female | 28 (50.0) | 14 (25.0) | 14 (25.0) | 1.17 | |
| Male | 92 (54.4) | 31 (18.3) | 46 (27.2) | | |
| Educational level | | | | | |
| High school | 8 (66.7%) | 2 (16.7%) | 2 (16.7%) | 7.45 | |
| College | 82 (48.5%) | 35 (20.7%) | 52 (30.8%) | | |
| Master or higher | 30 (68.2%) | 8 (18.2%) | 6 (13.6%) | | |
| Gaming Frequency/week | | | | | |
| Never | 6 (100.0) | 0 (00.0) | 0 (00.0) | 83.94*** | |
| Two days or less | 49 (100.0) | 0 (00.0) | 0 (00.0) | | |
| Three-five days | 24 (70.6) | 7 (20.6) | 3 (8.8) | | |
| Nearly everyday | 41 (30.1) | 38 (27.9) | 57 (41.9) | | |
| Gaming time per week | | | | | |
| 10 h or less | 69 (98.6) | 1 (1.4) | 0 (00.0) | 149.06*** | |
| 11–25 h | 28 (77.8) | 8 (22.2) | 0 (00.0) | | |
| 26–40 h | 19 (35.8) | 17 (32.1) | 17 (32.1) | | |
| 41–55 h | 4 (9.3) | 14 (32.6) | 25 (58.1) | | |
| 56 h or more | 0 (00.0) | 5 (21.7) | 18 (78.3) | | |
| In shool | | | | | |
| Students | 37 (4; 51.4) | 16 (3; 22.2) | 19 (8; 26.4) | 0.34 | |
| Non-students | 83 (54.2) | 29 (19.0) | 41 (26.8) | | |
| Among Non students | | | | | |
| Regular job | 70 (66.0) | 20 (18.9) | 16 (15.1) | 31.18*** | |
| Irregulat job | 1 (10) | 1 (10) | 8 (80) | | |
| No job | 12 (32.4) | 8 (21.6) | 17 (45.9) | | |
| Age | 27.18 ± 4.56 | 26.60 ± 5.00 | 26.42 ± 4.54 | 0.62 | |
| CIAS-G | 40.22 ± 14.70 | 66.40 ± 9.75 | 79.48 ± 11.62 | 198.85*** | GD > HG > Controls |
| CGI | 1.10 ± 0.30 | 2.33 ± 0.48 | 4.55 ± 0.98 | 680.94*** | GD > HG > Controls |
| BGNCS | 7.48 ± 2.33 | 9.98 ± 2.51 | 12.48 ± 3.22 | 74.32*** | GD > HG > Controls |
| Dimensions of impairment | 0.00 ± 0.00 | 1.62 ± 0.86 | 3.03 ± 0.76 | 636.67*** | GD > HG > Controls |
| The duration of excessive gaming | | | | | |
| 0–4 years | | | 7 | | |
| 5–9 years | | | 22 | | |
| 10 year or more | | | 31 (51.6%) | | |

*$P$ < 0.05, **$P$ < 0.01, ***$P$ < 0.001.
CIAS-G: score of Chen Internet Addiction Scale-gaming version.
CGI: Clinical Global Impression Scale.
BGNCS: Brief Gaming Negative Consequence Scale.

experienced three or more dimensions of impairments or health problems. Lastly, the BGNCS was correlated with the severity of IGD and the dimensions of impairment in the GD group (Table 4).

## Insight of GD and HG group

The self-reported data indicated that a proportion of the GD group considered reducing or controlling their gaming (83.3%), considered quitting their gaming (33.3%), had a discussion with their friends regarding leaving gaming (25.0%), decided to continue gaming as before even if they could turn back time (70.0%; the second part of Table 3), and had the motivation to undergo treatment or change their excessive gaming behavior (71.6%; the third part of Table 3). The participants in the GD group were in their precontemplation (25.0%), contemplation (61.7%), preparation (10%), and action stages (3.3%) based on interviewing (second part of Table 3).

We also evaluate the self-reported insight among the HG group. The proportion of them considered reducing or controlling their gaming (80.0%), considered quitting their gaming (28.9%), had a discussion with their friends regarding leaving gaming (24.5%), or decided to continue gaming as before even if they could turn back time (64.4%) are similar to GD group.

## Cut-off point of the BGNCS for differentiating HG from IGD

In the receiver operating characteristic (ROC) analysis of the BGNCS scores, the areas under the ROC curve were 91.8%

*Table 2.* The diagnostic accuracy of ICD-11 and DSM-5 criteria for gaming disorder

| Variable | Control $N = 120$ (%) | Hazardous Gaming $N = 45$ (%) | Gaming disorder $N = 60$ (%) | $\chi^2$ | Sensitivity | Specificity | Diagnostic accuracy |
|---|---|---|---|---|---|---|---|
| Loss of control | | | | | | | |
| Yes | 9 (9.5) | 26 (27.4) | 60 (63.2) | 145.874*** | *100%* | *78.8%* | *84.5%* |
| No | 111 (85.4) | 19 (14.6) | 0 (00.0) | | | | |
| Increased Priority in gaming | | | | | | | |
| Yes | 6 (7.3) | 16 (19.5) | 60 (73.2) | 155.875*** | *100%* | *86.7%* | *90.3%* |
| No | 114 (79.7) | 29 (20.3) | 0 (00.0) | | | | |
| Excessive gaming (>25 h/weed) despite negative consequence | | | | | | | |
| Yes | 0 (00.0) | 36 (37.5) | 60 (62.5) | 195.567*** | *100%* | *78.2%* | *84.0%* |
| No | 120 (93.0) | 9 (7.0) | 0 (00.0) | | | | |
| Functional impairment (academic, job, social, and carrier) | | | | | | | |
| Yes | 0 (00.0) | 25 (29.4) | 60 (70.6) | 177.731*** | *100%* | *84.8%* | *88.9%* |
| No | 120 (85.7) | 20 (14.3) | 0 (00.0) | | | | |
| Preoccupation | | | | | | | |
| Yes | 1 (1.6) | 14 (22.6) | 47 (75.8) | 120.707*** | *78.3%* | *90.9%* | *87.6%* |
| No | 119 (73.0) | 31 (19.0) | 13 (8.0) | | | | |
| Withdrawal | | | | | | | |
| Yes | 6 (8.0) | 21 (28.0) | 48 (64.0) | 105.750*** | *80.0%* | *83.6%* | *82.6%* |
| No | 114 (76.0) | 24 (16.0) | 12 (8.0) | | | | |
| Tolerance | | | | | | | |
| Yes | 1 (2.1) | 10 (20.8) | 37 (77.1) | 88.232*** | *61.7%* | *93.3%* | *84.8%* |
| No | 119 (67.2) | 35 (19.8) | 23 (13.0) | | | | |
| Loss interest | | | | | | | |
| Yes | 10 (13.9) | 16 (22.2) | 46 (63.9) | 86.162*** | *76.7%* | *84.2%* | *82.2%* |
| No | 110 (71.9) | 29 (19.0) | 14 (9.2) | | | | |
| Deceiving | | | | | | | |
| Yes | 8 (15.4) | 14 (26.9) | 30 (57.7) | 44.295*** | *50.0%* | *86.7%* | *76.9%* |
| No | 112 (64.7) | 31 (17.9) | 30 (17.3) | | | | |
| Escape | | | | | | | |
| Yes | 7 (10.1) | 18 (26.1) | 44 (63.8) | 88.020*** | *73.7%* | *84.8%* | *81.8%* |
| No | 113 (72.4) | 27 (17.3) | 16 (10.3) | | | | |
| IGD in DSM-5 | | | | | | | |
| IGD | 0 (00.0) | 16 (21.9) | 57 (78.1) | 164.953*** | *95.0%* | *90.3%* | *91.5%* |
| Controls | 120 (78.9) | 29 (19.1) | 3 (2.0) | | | | |
| CGI | | | | | | | |
| 1 Normal | 108 (100.0) | 0 (00.0) | 0 (00.0) | 335.543*** | | | |
| 2 Excessive gaming | 12 (28.6) | 30 (71.4) | 0 (00.0) | | | | |
| 3 Mild | 0 (00.0) | 15 (57.7) | 11 (42.3) | | | | |
| 4 Moderate | 0 (00.0) | 0 (00.0) | 15 (100.0) | | | | |
| 5 Marked | 0 (00.0) | 0 (00.0) | 24 (100.0) | | | | |
| 6 Severe | 0 (00.0) | 0 (00.0) | 10 (100.0) | | | | |

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.
IGD in DSM-5: Internet gaming disorder diagnosis based on criteria of *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*.
CGI: Clinical Global Impression Scale.
Diagnostic accuracy: (True positive + True negative)/All.

for diagnosing GD (GD group vs. control group; Fig. 1A) and 87.3% for diagnosing HG (HG and GD groups vs. control group; Fig. 1B). According to the results, a score of ≥11 had the highest DA (True positive and True negative/All) of 87.8% for GD with a kappa value of 0.72. Furthermore, a score of ≥9 was the best cut-off point for screening those with functional impairment in both the HG and GD groups (80% Sen. and 75.8% Spe.). This score can be used as a threshold for identifying individuals with gaming-related problems.

## DISCUSSION

### Comparison between the *ICD-11*-GD and *DSM-5*-IGD criteria

This study compared the *DSM-5*-IGD and *ICD-11*-GD criteria. The kappa value of 80% indicated adequate consistency between the *DSM-5*-IGD and *ICD-11*-GD criteria. This result agrees with that reported by Higuchi et al. (2021). In addition, this study evaluated the *ICD-11* diagnostic

*Table 3.* The functional impairment and stage to insight of hazardous gaming and gaming disorder group

| Functional impairment | Hazardous Gaming $N = 45$ (%) | Gaming disorder $N = 60$ (%) | $\chi^2$ | *P*-value |
|---|---|---|---|---|
| Job | | | | |
| Yes | 5 (19.2) | 21 (80.8) | 7.88 | 0.005 |
| No | 40 (20.1) | 39 (19.6) | | |
| Carrier | | | | |
| Yes | 11 (20.0) | 44 (80.0) | 24.64 | 0.000 |
| No | 34 (20.0) | 16 (9.4) | | |
| Academic | | | | |
| Yes | 8 (26.7) | 22 (73.3) | 4.50 | 0.034 |
| No | 37 (19.0) | 38 (19.5) | | |
| Social | | | | |
| Yes | 10 (21.3) | 37 (78.7) | 16.18 | 0.000 |
| No | 35 (19.7) | 23 (12.9) | | |
| Health problems | | | | |
| Yes | 39 (40.2) | 58 (59.8) | 3.65 | 0.056 |
| No | 6 (4.7) | 2 (1.6) | | |
| Dimensions of impairment (including health problems) | | | | |
| 0 | 0 (00.0) | 0 (00.0) | 343.508 | 0.000*** |
| 1 | 25 (100.0) | 0 (00.0) | | |
| 2 | 15 (48.4) | 16 (51.6) | | |
| 3 | 2 (7.1) | 26 (92.9) | | |
| 4 | 3 (14.3) | 18 (85.7) | | |
| Interviewing for insight | | N (collum percentage) | | |
| Motivation for treatment or change[a] | | | | |
| Yes | | 43 (71.6) | | |
| No | | 17 | | |
| The stages of motivation to change | | | | |
| Precontemplation | | 15 (25.0) | | |
| Contemplation | | 37 (61.7) | | |
| Preparation | | 6 (10.0) | | |
| Action | | 2 (3.3) | | |
| Maintenance | | 0 (0) | | |
| Self-reported insight | | N (collum percentage) | | |
| Thinking about decreasing or controlling gaming time? | | | | |
| Yes | 36 (80.0) | 50 (83.3) | | |
| No | 9 | 10 | | |
| It is time to quit gaming? | | | | |
| Yes | 13 (28.9) | 20 (33.3) | | |
| No | 32 | 40 | | |
| Discussed with friends about quitting gaming? | | | | |
| Yes | 11 (24.5) | 15 (25.0) | | |
| No | 34 | 45 | | |
| Keep gaming as before if the life restarts again? | | | | |
| Yes | 29 (64.4) | 42 (70.0) | | |
| No | 16 | 18 | | |

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.

*Table 4.* The correlation between score of Brief Gaming Negative Consequence Scale, dimensions of impairment, and severity of IGD

| Variable | Dimensions of impairment | CIAS-G |
|---|---|---|
| Brief Gaming Negative Consequence Scale | 0.44**- | 0.44** |
| Dimensions of impairment | | 0.47** |

**$P < 0.01$.

CIAS-G: score of Chen Internet Addiction Scale-gaming version.

criteria for HG. A total of 16 participants who fulfilled the *DSM-5*-IGD criteria were diagnosed as having HG. Among them, 10 participants did not meet the criterion of increased priority, 5 did not meet the criterion of impaired control, 1 did not fulfill the negative consequence, and three did not meet the criterion of functional impairment. Thus, the *ICD-11*-GD had a higher threshold, resulting in excluded individuals without functional impairment. Furthermore, because all the requirements should be fulfilled, those with no typical presentations, such as increased priority given to

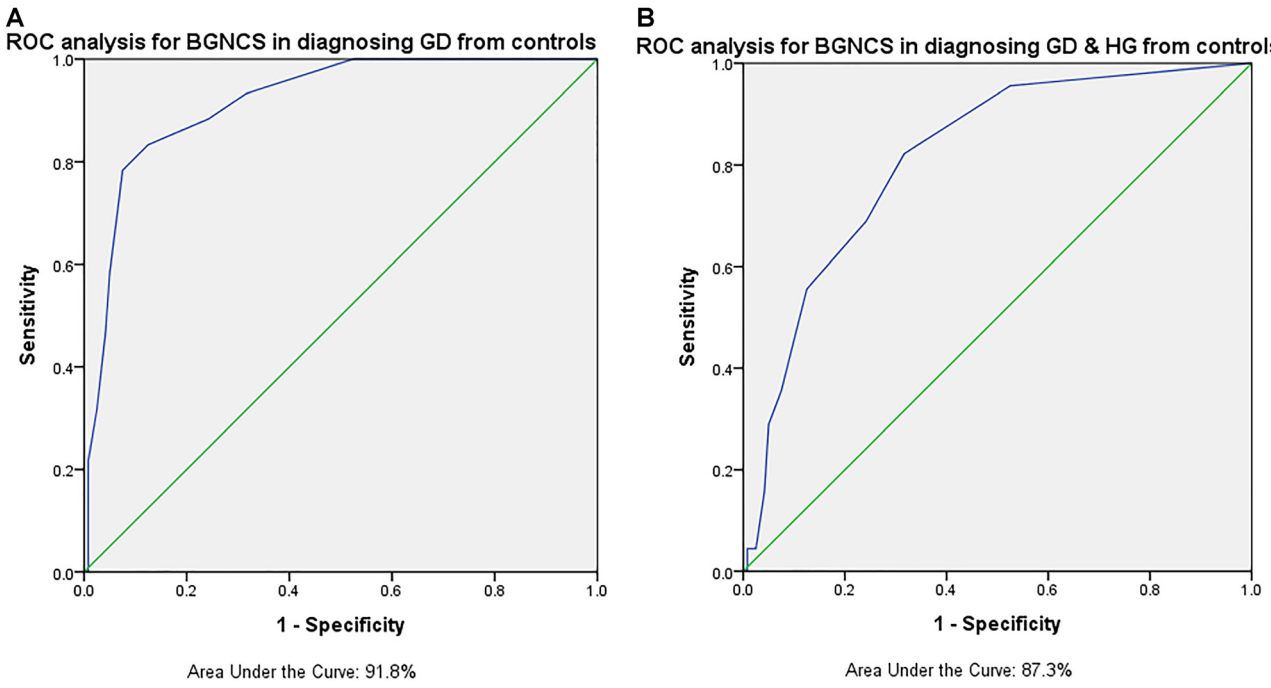


*Fig. 1.* The ROC analysis for diagnostic accuracy of ***Brief Gaming Negative Consequence Scale (BGNCS)*** in diagnosing gaming disorder or hazardous gaming from controls

gaming and impaired control, could be excluded. However, those with no specific presentations experience gaming-associated academic, occupational, career, social, and health problems will be also excluded. Thus, they are diagnosed with HG even if they do not fulfill the *ICD-11*-GD criteria This finding supports the hypothesis of a previous study (Ko et al., 2020) that HG compensates for the false negative results of the *ICD-11*-GD criteria.

In our study, three participants with *ICD-11*-GD and 29 with HG did not fulfill *DSM-5*-IGD criteria as inadequate criteria (<5). However, all of them experienced at least one gaming-related problem, such as health problems (86.7%). Thus, individuals with gaming-related problems could lose the chance to get help under *DSM-5*-IGD criteria. Determining gaming-related problems and implementing interventions, such as improving sleep hygiene and performing the exercise, are necessary to prevent HG progression to GD. This result indicates that the *ICD-11* criteria for HG can be used to identify individuals with a negative consequence or functional impairment whom the DSM-5 criteria for IGD could miss.

The *ICD-11*-GD criteria have relatively fewer criteria than the *DSM-5*-IGD criteria. This might save time, but limit the assessment for GD. Some IGD criteria, such as preoccupation with gaming, withdrawal symptoms such as irritability when Internet gaming is taken away, and loss of interest exhibited high DA for GD. The withdrawal symptoms might contribute to impaired control in gaming. The presentation of "preoccupation with gaming" and "loss of interest" can be similar to "increased priority given to gaming over other life interests and daily activities." Although they are not included as diagnostic criteria for GD, these symptoms can be used to identify individuals engaging in uncontrolled gaming. When a diagnosis cannot be confirmed based on the *ICD-11*-GD criteria, these symptoms can be assessed to contribute to a final diagnosis.

Addiction and engagement in gaming are distinct from each other but are correlated (Deleuze, Long, Liu, Maurage, & Billieux, 2018). Vallerand et al. revealed that obsessive passion contributes to an internal pressure to engage in activity and causes persistent negative consequences. On the other hand, harmonious passion leads to choosing to engage it and promote healthy adaption (Vallerand et al., 2003). However, it is a challenge to differentiate GD from engagement in gaming with passion. The Delphi study of Castro-Calvo et al. (2021) suggest tolerance, deceiving, and escapism in *DSM-5*-IGD criteria are limited in validity in diagnosing GD from high engagement (but non-problematic) gaming. In line with this suggestion, this presenting study demonstrated that tolerance and deceiving had lower sensitivity. These two criteria need to be modified or excluded in revising criteria in the DSM system. On the other hand, functional impairment is required for *ICD-11*-GD criteria. It also emphasized “high engagement for developing skills” in "boundaries with normality" to prevent overdiagnosis based on only heavy gaming. Thus, experts in a Delphi study agree that *ICD-11*-GD criteria are likely to diagnose GD without pathologizing healthy gaming (Castro-Calvo et al., 2021).

## Functional impairment and health problems

Health problems were the most frequently experienced problems in both the GD (96.7%) and HG (86.7%) groups.

We observed that 51.7% of the participants in the GD group engaged in excessive gaming for more than ten years and were thus more likely to experience physical complications. A disrupted sleep cycle (65%) and immobilization (65%, for ≥4 h in ≥3 days per week) were the most frequently experienced health-related problems, followed by inadequate sleep (36.7%; <4 h in ≥3 days per week). This result is compatible with a previous study demonstrating that obesity, delayed sleep phase disorder, and insomnia were the common complications of IGD (Ko et al., 2020). Thus, sleep problems should be routinely evaluated among individuals with GD. Moreover, sleep hygiene, behavior, or medical intervention should be provided. Sleep hygiene can prevent such individuals from gaming all night, helping them get adequate sleep and improving their everyday functioning.

To investigate the chronic effect of GD, this study recruited participants aged between 20 and 40 years. In this study, 51.6% of the participants in the GD group engaged in excessive gaming for more than ten years. Thus, only 31.7% of the participants were school students. Furthermore, 26.7% and 13.3% of the nonstudent participants in the GD group had regular and irregular jobs, respectively. However, 35% of the participants in the GD group experienced functional impairment in job performance due to excessive gaming. They experienced fatigue at work because of inadequate sleep or used a smartphone for gaming at work. In addition, 73.3% of the participants in the GD group experienced functional impairment in their careers due to excessive gaming. They did not have a job or lacked the motivation to get a job because of being occupied with gaming (38.3%). Thus, 45% perceived their life as falling below their expectations because of gaming. Therefore, GD group had a higher self-reported BGNCS score than did the HG and control groups. This study provided empirical evidence for functional impairment under chronic GD.

## Assessment of negative consequences

In this study, the negative consequences of gaming were subjectively assessed using the BGNCS. This is the first scale developed to examine the negative consequences of GD. This scale did not assess the symptoms of addiction, which might exaggerate the resistance of clinical cases. The correlation of the BGNCS with the CIAS-G and functional impairment dimensions demonstrated the BGNCS' clinical utility for assessing the severity of GD. Evaluating these gaming-related problems using brief self-reported questionnaires, such as the BGNCS, could provide information on their functional impairment. The BGNCS had a satisfactory DA of 91.8% and 87.3% in the ROC analysis for differentiating GD or HG from controls. Individuals with a score of ≥11 should be further evaluated for GD. A score of ≥9 can be used as a threshold for identifying those with gaming-related problems. The BGNCS can be used to identify the negative consequences of gaming and to further arrive at a diagnosis of GD and HG, and design appropriate interventions.

## Realization of HG and GD in the insight stage

Based on the stages involved in changing an individual's smoking behavior, increasing the individual's consciousness is the first step to enhancing their motivation to change (Prochaska & DiClemente, 1983). According to self-reported functional impairment, most of the participants in the GD group exhibited concern toward their gaming behavior. The second stage of behavior change is self-reevaluation which involves determining how one thinks about oneself concerning the problem behavior (Prochaska & DiClemente, 1983). In our study, 83.3% of the participants in the GD group demonstrated the self-reevaluation stage and considered reducing or controlling their gaming time. Self-liberation is the next step that involves making a commitment to act (Andersen, 2007). However, only one-third of the participants considered quitting gaming. Building a helpful relationship is critical for initial action (Prochaska & DiClemente, 1983). Only one-fourth of the participants had ever discussed quitting gaming with their friends. Approximately two in three participants in the GD group preferred continuing gaming even if they could turn back time. This result demonstrated their ambivalence in making a decision or taking action to change. The HG group demonstrated a similar insight in self-reported data. This result might indicate the same ambivalence among gamers with a risk of getting gaming-related problems.

In the interview, only 13.3% of the participants in the GD group had prepared or implemented measures to change their gaming behavior. Our result suggested that most chronic cases of IGD had not prepared to change their gaming behavior and need help from mental health professionals.

Because most of the participants in the GD group were at the early stage of change and had not prepared for change in their gaming behavior, the first step of intervention for a chronic case of GD should be a motivational interview that can help them move from the pre-contemplation to the preparation stage. Discussing the individual's life vision, the harmful consequences of gaming, the barriers impeding change, and the benefits of change are essential in this stage. The BGNCS can be utilized to help them appreciate the negative consequences of gaming. Assessing functional impairment and health problems can help identify individuals with GD requiring intervention. A problem-oriented intervention for negative consequences can be an initial step in helping patients. The awareness of these problems helps them transition to the preparation stage where they develop a commitment to controlling their gaming.

## Limitations

This study has several limitations that should be addressed. First, the evaluation was solely based on the participants' responses to a psychiatric interview. Additional information should be gathered from other individuals, such as parents or partners. Second, recall bias could not be excluded without the direct observation of some unhealthy behaviors. Third, the difficulty in recruiting community cases limited the study's sample size, which is relatively small for comprehensively assessing the validity of the

criteria or scale. Further studies to recruit a larger sample are necessary to support the results.

## CONCLUSION

The results demonstrated satisfactory consistency between the *ICD-11*-GD criteria and *DSM-5*-IGD criteria The diagnostic criteria for HG can be used to compensate for the high threshold of the *ICD-11*-GD criteria and identify individuals with functional impairment who do not meet the *DSM-5*-IGD criteria. In our study, 73.3% of the participants in the GD group experienced three or more dimensions of problems, particularly in health and career. However, 86.7% of those in the GD group were in the early stage of change and had not prepared to change their excessive gaming behavior. The BGNCS can be used to evaluate the negative consequences of gaming. The assessment of functional impairment and health problems due to excessive gaming can facilitate correct diagnosis and motivate individuals with GD to change their excessive gaming behavior.

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*Author contributions:* J-Y. Y. drafted the manuscript. W-P. C., P-Y. L. and P-C. L. acquired and analyzed the data. S. H. interpreted the data and contributed to the final draft. C-H. K. designed this study and provided the final approval for the version to be published.

*Conflict of interest:* The authors declare that they have no conflicts of interest.

## SUPPLEMENTARY DATA

Supplementary data to this article can be found online at https://doi.org/10.1556/2006.2022.00079.

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## Appendix 1

### The severity and frequency threshold of each criteria of internet gaming disorder in this presenting study.

| Criteria | Threshold: fulfill one of the listed criteria |
|---|---|
| Loss of control in gaming | 1. Repeated fails in attempts to control gaming<br>2. Difficulty in controlling gaming when required (e.g., before an examination or during work) for ≥3 in 7 required days.<br>3. Gaming longer or more intense than intended for ≥3 days per week. |
| Increased Priority | 1. The priority given to gaming is over other daily activities and gaming should be taken firstly. |
| Negative consequences | 1. The psychosocial problems included academic, job, carrier, social, and health problems in this study.<br>2. Keep excessive gaming (>25 h per week) |
| Functional impairment because of gaming | 1. Impairment of academic performance (skipping more than half the number of classes, skipping the midterm or end-of-year exams, dropping out, or causing an academic crisis).<br>2. Impairment of professional life (impaired performance, repeated lateness, skipping work, or loss of unable to keep job)<br>3. Impairment of carrier (lack of motivation to find a job, learn, or prepare for a required examination; unstable or no job for a long time; a long term disappointed life)<br>4. Impairment of social relationships (lack of interaction or social activity, getting into conflict with other family members) because of over engagement in online gaming.<br>5. For severe events, such as failing more than half the number of classes or ending a relationship, one event was sufficient. For moderate events, such as a lack of interaction or impaired performance, the impairment needed to be repeated, as previously noted. |

The severity and frequency threshold is referred to the previous study (Ko et al., 2020).

## Appendix 2

### *Brief Negative Consequence Scale (BNCS)*

Please answer whether long-term engagement in games causes you the following problems. Please check the corresponding box in the right column according to the severity of the problems over the past year.

| 1 | Compromised work performance or loss of work opportunity | Not at all | Minor | Moderate | Severe |
|---|---|---|---|---|---|
| 2 | Compromised academic performance, expulsion, or suspension | 1 | 2 | 3 | 4 |
| 3 | Negative effect on interpersonal relationships | 1 | 2 | 3 | 4 |
| 4 | Compromised family relationships or intimate relationships or rupture of such relationships | 1 | 2 | 3 | 4 |
| 5 | Health problems or risks (e.g., insomnia, long-term mental incompetence, immobilization (>4 h), obesity, and so on.) | 1 | 2 | 3 | 4 |
| 6 | Near or actual danger (e.g., car accident, accident, forgetting to turn off the gas, fall, and so on.) | 1 | 2 | 3 | 4 |