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Reliability and Validity of Three Instruments (DSM-IV, CPGI, and PPGM) in the Assessment of Problem Gambling in South Korea

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Abstract   Most research on the assessment, epidemiology, and treatment of problem gambling has occurred in Western jurisdictions. This potentially limits the cross-cultural validity of problem gambling assessment instruments as well as etiological models of problem gambling. The primary objective of the present research was to investigate the reliability and validity of three problem gambling assessment instruments within a South Korean context. A total of 4,330 South Korean adults participated in a comprehensive assessment of their gambling behavior that included the administration of the DSM-IV criteria for pathological gambling (NODS), the Canadian Problem Gambling Index (CPGI), and the Problem and Pathological Gambling Measure (PPGM). Cronbach alpha showed that all three instruments had good internal consistency. Concurrent validity was established by the significant associations observed between scores on the instruments and measures of gambling involvement (number of gambling formats engaged in; frequency of gambling; and gambling expenditure). Most importantly, kappa statistics showed that all instruments have satisfactory classification accuracy against clinical assessment of problem gambling conducted by South Korean clinicians (NODS $\kappa = .66$; PPGM $\kappa = .62$; CPGI $\kappa = .51$). These results confirm that Western-derived operationalizations of problem gambling have applicability in a South Korean setting.

Keywords   Validity · Reliability · Assessment · Korea · Problem gambling

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Introduction

Several instruments exist for the assessment of problem and pathological gambling (for a review see Abbott and Volberg 2006; Neal et al. 2005; Stinchfield et al. 2007). However, three of these instruments have dominated the research literature: the DSM-IV criteria for pathological gambling (APA 1994); the Canadian Problem Gambling Index (CPGI) (Ferris and Wynne 2001); and the South Oaks Gambling Screen (SOGS) (Lesieur and Blume 1987). The reliability of these instruments is well established by their high levels of internal consistency and test–retest reliability (Abbott and Volberg 2006; Neal et al. 2005; Stinchfield et al. 2007). These instruments also have reasonable evidence of validity as established by their correlations with gambling frequency and expenditure, as well as independent clinical assessment of problem gambling status (Abbott and Volberg 2006; Neal et al. 2005; Stinchfield et al. 2007; Williams and Volberg 2010, 2013).

A considerable amount of research has also identified reliable correlates of problem gambling as assessed by these instruments, with these correlates being: male; young age (18–25); impulsivity; risk-seeking tendencies; vulnerability to addictive behaviour (particularly substance abuse); vulnerability to mental health problems (particularly mood disorders); abusive upbringing; parental involvement/modelling of gambling; early onset of gambling behaviour; peer group involvement in gambling; lower income; antisocial personality disorder; cultural tradition of gambling; gambling opportunities being readily available; experiencing an 'early big win'; playing electronic gambling machines (EGMs) that provide a high frequency of reinforcement; and gambling fallacies (Crockford and el-Guebaly 1998; Lorains et al. 2011; Petry 2005, 2007; Petry et al. 2005; Rush et al. 2008; Toneatto and Nguyen 2007; Turner et al. 2008; Westphal and Johnson 2007; Williams et al. 2012a).

However, an important limitation of all of this research is that it has been done almost exclusively in Western jurisdictions. As an illustration of this research bias, of the 202 published population prevalence studies of gambling and problem gambling, only 11 have actually been conducted in non-Western jurisdictions (Williams et al. 2012a, b). Particularly noticeable is the lack of research on Asian gambling, despite the fact that Asians constitute 60 % of the world's population and spend more on casino gambling than any other region of the world (PwC 2012). The research that does exist on this population is focused primarily on Asian communities within Western jurisdictions (Loo et al. 2008; Raylu and Oei 2004). However, gambling among Asian immigrants may not be reflective of Asian gambling more generally due to the stress of acculturation (Raylu and Oei 2004; Salant and Lauderdale 2003) and the fact that people who choose to immigrate may be more tolerant of risk.

The reliability and validity of the existing problem gambling assessment instruments may not be the same in Asian cultures (McMillen 2007). On the contrary, there are often reliable cross-cultural differences in the patterns with which different psychological disorders manifest themselves (Draguns and Tanaka-Matsumi 2003). Part of this has to do with the different cultural meaning of gambling in different cultures (McGowan 2004; McMillen 2007). Western culture has always been ambivalent about the morality of gambling and there have been many cycles of legal availability followed by prohibition. Gambling in current Western society has also had a stronger commercial element to it. In contrast, gambling is a much more well accepted and integrated part of many Asian countries. It has a stronger social element to it and is commonly engaged in at home and at social events by all ages and both genders for recreational purposes and to foster social bonding (Kim et al. 2004; Loo et al. 2008; Raylu and Oei 2004). Another important

difference concerns the fact that Western beliefs about gambling outcomes are strongly influenced by mathematical probability theory developed in Europe in the 1600s, whereby the outcomes of 'games of chance' are seen as probabilistic events governed by physical principles (Schwartz 2006).[1] In contrast, Asian cultures tend to have a stronger belief that gambling outcomes are not deterministic, but rather something that can be influenced and/ or that luck can be cultivated (Bovee 1998; Duong and Ohtsuka 2000; Lee et al. 2009; Loo et al. 2008).

Different communication styles also impact cross-cultural assessment. Self-disclosure of problems tends to be less common in Asian culture because of heightened concerns about stigma and shame (e.g., Chen 1995; Lauber and Rossler 2007; Okazaki and Kallivayalil 2002). At the same time, Asians tend to display a greater degree of response acquiescence to questions posed (Locke and Baik 2009; Johnson et al. 2005).

Hence, there are clear theoretical reasons why problem gambling might have different behavioral and psychological manifestations in a different culture and that the existing instruments might not be applicable in an Asian context. Consequently, some researchers have modified existing instruments with the goal of better assessing problem gambling in Chinese sports gamblers (Li et al. 2012) or Korean adolescents (Park and Jung 2012). However, before developing a totally new instrument it is worthwhile to examine the cross-cultural reliability and validity of the existing Western-derived instruments.[2] This is the primary objective of the present study.

Methods

From July 7 to September 9, 2011 email invitations to complete an online survey were sent out to a random sample of South Korean online panelists who were members of the Embrain Asia Panel. Solicitation continued until a final sample of 4,330 people was obtained. At the time of the survey, there were 490,000 South Korean members of the Asia Panel, stratified to be representative of the South Korean population on basic demographic characteristics. Embrain recruits panelists via phone solicitation, email solicitation, self-referrals, recommendation by other panel members, and street recruitment.

A total of 20.1 % of the solicited online panelists completed the survey. Several procedures were employed to better ensure representative sampling and valid responding. This included stratified sampling to ensure that each age × gender cell represented at least 50 % of their true proportion in the 2010 South Korean census; post hoc weighting to compensate for household size and sampling deviations from census age × gender distributions; use of question wordings that best correspond to objective measures of gambling activity (i.e., Wood and Williams 2007); introducing the survey as a study about 'health and recreational behaviour' (rather than 'gambling') so as not to bias the sample toward gamblers (Williams and Volberg 2009)[3]; and only administering questions about problem gambling to individuals who have gambled at least once a month on some format

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[1] Most Westerners 'know' this, even if their gambling behavior is not consistent with this knowledge.

[2] It is important to note that in the Li et al. (2012) study, 22 of the 24 items used in the final instrument (Scale of Assessing Problem Gambling) derived from existing Western-derived instruments.

[3] Questionnaires that are introduced as 'gambling surveys' produce artifactually high prevalence rates of gambling and problem gambling due to higher participation rates of gamblers and higher refusal rates of nongamblers (Williams and Volberg 2009, 2010).

in the past year so as to decrease false positive identification (Williams and Volberg 2010, 2011).

All participants in the 2011 survey were solicited in the same fashion in July–September 2012 to complete the identical survey so as to examine changes that had occurred in the past year. A total of 3,261 people complied in 2012, representing a 75.3 % retention rate.

Questionnaire

The survey had sections on comorbidities, past year gambling behavior, gambling motivations, gambling fallacies, problem gambling, and demographics. The survey was translated into Korean and then back-translated to ensure the accuracy of the translation. Each section of the questionnaire is described below:

Participant Demographics

Age, gender, marital status, highest level of education, employment status, household income, number of people in household, number of children, whether or not the person was an immigrant, and which geographic region they resided in.

Comorbidities

Substance abuse was assessed with a single question that asked "Have you had any problems with drugs or alcohol in the past 12 months. By this we mean difficulties in controlling their use that has led to negative consequences for you or other people?" General health was assessed with a question that asked about how they would rate their general health in the past 12 months with the response options being excellent (1), good (2), fair (3), and poor (4). Happiness and stress were assessed with questions that asked about overall level of happiness/stress in the past 12 months with response options being very low (1), low (2), moderate (3), high (4), and very high (5). Mental health problems were assessed with the question "In the past 12 months, have you had any serious problems with depression, anxiety or other mental health problems?"

Gambling Behaviour

The 15 questions in this section asked about the frequency of participation and average expenditure for each of the different types of gambling available in South Korea, using questions with optimal wording for obtaining this information (Wood and Williams 2007). More specifically, people were asked "In the past 12 months, how often have you played or bet money on [specific gambling format]?", and provided with closed ended response options. If they engaged in the activity they were then asked to provide an open-ended answer to the question "Roughly how much money do you spend on [specific gambling format] in a typical month? ('spend' means net win or loss)". Several gambling activities are currently legal in Korea, including various forms of social gambling (Hwatu or 'flower cards' being particularly popular) (Kim et al. 2004). The commercial forms of gambling that are available are: instant lotteries, traditional lotteries, sports betting (on soccer, baseball, basketball, volleyball, golf, and Korean traditional wrestling), horse race betting, bicycle race betting, motorboat race betting, and slot machines and table games in casinos.

Gambling Motivation

A single question that asked about the person's main reason for gambling.

Gambling Fallacies

This section consisted of the 10 item Gambling Fallacies Measure (unpublished scale developed by R. Williams) which assesses the statistical misconceptions commonly associated with gambling (failure to understand the independence of random events, superstitious beliefs, illusion of control, belief in luck, failure to consider base rates or the law of large numbers, etc.). This test has been administered to over 30,000 people from various countries in the past 9 years. It has good 1 month test–retest reliability ($r = .70$) and has consistently shown a significant positive correlation with problem gambling status and gambling frequency. Gambling fallacies are known to be an important correlate of problem gambling (Williams et al. 2012a, b) as well as often being a focus of therapeutic intervention (Fortune and Goodie 2010).

Problem Gambling

This section consists of the 24 unique questions that comprise the Canadian Problem Gambling Index (CPGI) (Ferris and Wynne 2001), the NORC DSM-IV Screen for Gambling Problems (NODS) (Gerstein et al. 1999), and the Problem and Pathological Gambling Measure (PPGM) (Williams and Volberg 2010, 2013). The PPGM is a relatively new instrument that has been shown to have superior correspondence to clinical assessment as compared to the SOGS, CPGI, and NODS (Williams and Volberg 2010, 2013). All instruments in the present study used a past-year time frame [The SOGS was not used in the present study, as although it was the dominant instrument in the 1980s and 1990s, it is not commonly used today (Williams et al. 2012a, b)].

Problem Gambling Instrument Scoring and Classification

Anyone without past year participation or expenditure on any form of gambling was designated a Non-Gambler ($n = 951$). Gamblers fell into different classifications depending on the instrument. For the NODS, someone who obtains a score of 0 is designated a non-problem gambler. A score of 1–2 = at-risk gambler; 3–4 = problem gambler; and 5+ = pathological gambler (Gerstein et al. 1999). For the CPGI: 0 = non-problem gambler; 1–2 = low risk gambler; 3–7 = moderate risk gambler; and 8+ = problem gambler (Ferris and Wynne 2001). To be designated as a Problem Gambler on the PPGM the person must have a Problems Subscore of 1 or higher and an Impaired Control subscore of 1 or higher; or a Total Score of 3 or higher with a reported frequency and expenditure on gambling equal to or greater to that reported for the unambiguously identified problem gamblers. A PPGM Pathological Gambler is someone with a Problems subscore of 1 or higher, an Impaired Control subscore of 1 or higher, and a Total Score of 5 or higher. A PPGM At Risk Gambler is someone who does not meet criteria for problem or pathological gambling, but has a Total Score of 1 or higher. A PPGM Recreational Gambler is a gambler who does not meet criteria for At Risk, Problem, or Pathological Gambling (Williams and Volberg 2010, 2013).

Clinical Assessment Procedure

Gamblers in the 2011 survey were selected for clinical assessment on the basis of having one or more of the following criteria: (a) one or more positive responses to any of the 24 problem gambling questions from any of the three instruments; (b) reported more than 570,000 in Korean won (₩) (US$1 = ₩1,147) in gambling losses in a typical month; and/or (c) reported gambling at least two or three times a month. This resulted in a total of 1,577 individuals being selected for assessment. All other participants ($n = 1,797$) were designated Recreational Gamblers, the only designation possible in the absence of any problem gambling symptomatology and/or significant gambling involvement.

Two psychiatrists from Seoul National Hospital with experience in assessing and treating addictions were independently provided with a detailed written profile of each selected participant's: (a) reported past year gambling behavior (frequency and expenditure on each format); (b) answers to the 24 unique items that make up the CPGI, NODS, and PPGM (questions from the instruments mixed together and no summary scores provided); (c) answers to questions about motivation for gambling, gambling fallacies, help-seeking for gambling problems, and family history of problem gambling; (d) answers to questions about substance use and mental health issues; and (e) relevant demographics (age, marital status, children, employment, income) (In other words, all of the sections in the questionnaire with the exception of a few questions in the demographic section (gender, level of education, # of people in household, immigrant status, geographic region) were provided to the clinicians to aid in their assessments).

In total, these two-page written profiles provided answers to 56 questions. The two clinicians were trained briefly in the rating procedure and then over a period of several weeks independently read each profile and assessed the person's likely gambling status. The choices available to them were Recreational Gambler, At-Risk Gambler, Problem Gambler, and Pathological Gambler. Detailed written definitions of these categories were provided to guide their ratings (see Table 1).

All cases in which the two clinicians disagreed ($n = 601$; 38.1 %) were reviewed to obtain a consensus decision. After combining people who were automatically designated as Recreational Gamblers with the clinician-assessed classifications, a total of 2,924 people were assessed as Recreational Gamblers, 272 assessed as At-Risk Gamblers, 100 assessed as Problem Gamblers, and 78 assessed as Pathological Gamblers.

Results

Internal Consistency–Reliability

Cronbach's alpha was used to assess the internal consistency of the three instruments. Using the survey data from 2011, a Cronbach's alpha of .89 was obtained for the CPGI, .84 for the NODS, and .89 for the PPGM. In 2012 a Cronbach's alpha of .90 was obtained for the CPGI, .88 for the NODS, and .92 for the PPGM. In all cases these values are well above the minimum criteria $\alpha = .70$ suggested by Nunnally (1978).

Concurrent Validity

Concurrent validity was investigated by examining the relationship between scores on the problem gambling instruments and self-report of gambling involvement. More specifically,

Table 1 Definitions of gambler types used by clinical assessors

Pathological gambler	*Pathological gambling* is equivalent to *severe problem gambling* and is characterized by severe difficulties in controlling gambling behaviour leading to serious adverse consequences
	The criteria for pathological gambling are the same as problem gambling except there is greater impaired control and more severe consequences. These consequences may be more severe either because they impact more areas (financial, psychological, health, relationship, school/work, legal) and/or because the problems are more serious
Problem gambler	*Problem gambling* is characterized by difficulties in limiting money and/or time spent on gambling which leads to adverse consequences for the gambler, others, or for the community
	Requires evidence of (a) impaired control over gambling behavior, and (b) adverse consequences deriving from this impaired control. Furthermore
	Impaired control occurs repeatedly
	Adverse consequences must be 'significant'
	A person cannot be a problem gambler unless he/she also reports some minimal amount of time, frequency or money spent gambling in the time frame in which he/she is reporting loss of control and adverse consequences
	Person does not meet criteria for pathological gambling
At-risk gambler	An *at-risk gambler* is someone who is at risk for becoming a problem or pathological gamblers either because
	They evidence some adverse consequence(s) from gambling but no symptoms of loss of control; OR
	They evidence some symptoms of loss of control but no adverse consequences; OR
	They evidence some adverse consequences and loss of control, but not at a level sufficient to meet criteria for problem or pathological gambling; OR
	They have a gambling frequency and/or expenditure that is significantly above average (especially in the context of their employment status, income, and debt)
Recreational gambler	A *recreational gambler* is someone who gambles without meeting criteria for *at-risk, problem or pathological gambling*

From Neal et al. (2005), refined based on feedback from gambling experts in Canada, Sweden, and the United States

problem gambling classification and instrument total score as they relate to number of different types of gambling engaged in, maximum frequency of gambling reported, and total reported expenditure on all forms of gambling. The results are reported in Table 2. As can be seen, all three instruments demonstrated significant associations with all three measures of gambling involvement in both 2011 and 2012. The pattern of association was similar for all three instruments.

Construct Validity

Construct validity assesses the degree to test measures what it purports to measure. Each of these tests purports to assess recreational/nonproblem gambling; at-risk gambling; and problem/pathological gambling. A reasonable assessment of whether these tests have construct validity is to establish how well these instrument-determined categories correspond to the independent clinical assessment of these same entities by South Korean clinicians.

A kappa statistic of .55 was obtained for the NODS and .51 for the PPGM when comparing the four clinician classifications versus the four instrument classifications.[4] It was not possible to examine the direct correspondence between all of the clinical rating categories and the CPGI categories, as they did not perfectly match (clinical categories: recreational, at-risk, problem, pathological; and CPGI categories: non-problem, low risk, moderate risk, severe problem).

For the purposes of comparison across all three instruments some of the categories were combined so as to produce three categories (recreational/nonproblem; at-risk; and problem/pathological) and two categories (recreational/nonproblem/at risk; and problem/pathological). For three categories a kappa statistic of .41 was obtained for the CPGI, .61 for the NODS, and .57 for the PPGM. For two categories a kappa statistic of .52 was obtained for the CPGI, .67 for the NODS, and .62 for the PPGM. Landis and Koch (1977) characterize kappa values of .41–.60 as moderate and .61–.80 as substantial. Thus, it would appear that all three instruments have satisfactory classification accuracies, although the CPGI is weaker than the NODS and PPGM.

The relationship between the instrument versus clinician categorization in a 2×2 contingency table can also be described by the indices of sensitivity, specificity, positive predictive power, negative predictive power, and diagnostic efficiency. The results of this analysis are seen in Table 3. As can be seen, all three instruments have excellent specificity, negative predictive power, and overall diagnostic efficiency. However, all three instruments have weak positive predictive power. The CPGI also has weak sensitivity, whereas the sensitivity of the NODS and PPGM is very good.

Discussion

The primary objective of this study was to assess the cross-cultural reliability and validity of three Western-derived assessment tools (CPGI, DSM-IV, and PPGM) commonly used in the assessment of problem gambling. The present research has found that all three instruments have satisfactory reliability and validity in a South Korean population, but that the DSM and the PPGM have a somewhat higher correspondence to clinical assessment and would be the preferred instruments in this context.

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[4] Nongamblers are excluded from the calculation of these kappa statistics.

Table 2 Kendall tau b correlations between the instruments and gambling behavior

	Number of gambling formats	Maximum frequency of gambling	Total $ spent on gambling
2011			
CPGI total score	.30*	.09*	.26*
CPGI category	.35*	.52*	.35*
NODS total score	.40*	.13*	.30*
NODS category	.40*	.42*	.33*
PPGM total score	.39*	.12*	.30*
PPGM category	.40*	.46*	.35*
2012			
CPGI total score	.37*	.15*	.33*
CPGI category	.72*	.77*	.38*
NODS total score	.43*	.15*	.33*
NODS category	.74*	.74*	.35*
PPGM total score	.41*	.15*	.33*
PPGM category	.74*	.76*	.39*

* $p < .01$

Table 3 Classification accuracy of the CPGI, NODS, and PPGM in distinguishing problem from non-problem gamblers

	CPGI	NODS	PPGM
Sensitivity	52.3 %	83.2 %	83.2 %
Specificity	97.8 %	96.7 %	95.9 %
Positive predictive power	56.7 %	58.5 %	52.9 %
Negative predictive power	97.4 %	99.0 %	99.0 %
Diagnostic efficiency	95.4 %	96.0 %	95.2 %
κ	.52	.67	.62

Sensitivity: % of individuals clinically assessed as problem gamblers that also receive this designation on the assessment instrument

Specificity: % of individuals clinically assessed as non-problem gamblers that also receive this designation on the assessment instrument

Positive predictive power: % of individuals that are designated as problem gamblers on the assessment instrument that are confirmed as problem gamblers in the clinical assessment

Negative predictive power: % of individuals that are designated as non-problem gamblers on the assessment instrument that are confirmed as non-problem gamblers in the clinical assessment

Diagnostic efficiency: Number of true positives (correctly identified as problem gamblers) + true negatives (correctly identified as non-problem gamblers) divided by the total sample size

κ: A quantitative measure of overall agreement after taking chance agreement into account

The cross-cultural applicability of these instruments is an important finding, and provides support for studies that have used these tools in South Korea (e.g., Williams et al. 2013). It also lends credence to the contention that these tools have broader applicability to the Asian context.

As legal gambling opportunities continue to expand in Asia it is important to have problem gambling assessment instruments that are both reliable and valid for policy makers, treatment providers, and researchers. These instruments establish the prevalence of problem gambling, the actual number of problem gamblers in need of treatment, the types of gambling most strongly associated with problem gambling, and the demographic characteristics of problem gamblers. Changes in the prevalence of problem gambling from one time period to the next, and/or differences between the prevalence in one jurisdiction relative to another, provide important information about the incidence of problem gambling and the potential effectiveness of policies and treatments implemented to mitigate gambling's harm.

The present study has a few limitations. The clinical rating procedure diverges from the more typical approach of direct clinician–patient interviewing using a structured interview guide. It is unknown whether the same results would have been obtained if this more traditional procedure had been employed. Our results are also likely somewhat dependent on the clinicians used, with potentially different results being obtained with different clinicians. Of final note, certain measures of classification accuracy (i.e., positive predictive power, negative predictive power, kappa) are influenced by the base rate prevalence of the condition being assessed. The base rate of problem and pathological gambling in the present study (4.1 %) is lower than would be found in some clinical settings.

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