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An examination of the validity and reliability of the Positive Play Scale: findings from a Canadian national study

Nassim Tabri[a], Richard T. A. Wood[b], Kahlil Philander[c] and Michael J. A. Wohl[a]

[a]Department of Psychology, Carleton University, Ottawa, Canada; [b]GamRes Limited, Hawkesbury, Ontario, Canada; [c]School of Hospitality Business Management, Carson College of Business, Washington State University, Everett, WA, USA

ABSTRACT

The Positive Play Scale (PPS) is a self-report measure that assesses responsible gambling beliefs and behaviours amongst players. The PPS was shown to be a reliable and valid measure that consisted of four subscales: Personal Responsibility, Gambling Literacy, Honesty and Control, and Pre-commitment. However, the PPS development research had limitations, including the use of an exploratory statistical approach, treating the non-normally distributed PPS item-level data as continuous, and the use of samples that consisted mainly of older players living in British Columbia, Canada. Herein, we replicated and extended the four-factor structure of the PPS using exploratory structural equation modelling with PPS item-data modelled as ordered categorical in a large and demographically diverse sample of players from across Canada (N = 5751). Once again, the four-factor structure of the PPS provided an excellent fit to the data. PPS factors were all internally consistent. Results also replicated and extended findings from prior research. Specifically, all PPS subscales were negatively correlated with measures of disordered gambling beliefs and behaviours, risk factors (e.g. impulsivity) and gambling motives (e.g. financial). Findings indicate that the PPS is a reliable and valid tool that assesses responsible gambling beliefs and behaviours, which can be used to inform responsible gambling initiatives.

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Responsible gambling; corporate social responsibility; disordered gambling; positive play; structural equation modelling

In the field of gambling studies, numerous self-report scales have been developed that assess disordered beliefs and behaviours about gambling (e.g. Ferris & Wynne, 2001; Steenbergh, Meyers, May, & Whelan, 2002; for a review of various measures, see Caler, Vargas Garcia, & Nower, 2016). Although such scales have been shown to be a valid and reliable way to understand disordered gambling (e.g. Currie, Hodgins, & Casey, 2013; Orford, Wardle, Griffiths, Sproston, & Erens, 2010; Philander, Gainsbury, & Grattan, 2019), people with past-year disordered gambling beliefs and behaviours only comprise between 0.1% to 5.8% of the adult population (for a review of worldwide prevalence rates, see Calado & Griffiths, 2016). The focus on disordered gamblers, however, ignores the majority of people who play largely without problems, but who may or may not be gambling responsibly. Since distorted beliefs about gambling and excessive gambling behaviour are implicated in the aetiology of

CONTACT Nassim Tabri nassim.tabri@carleton.ca Department of Psychology, Carleton University, 1125 Colonel By Drive, Ottawa, Ontario K1S 5B6, Canada

gambling disorders (Blaszczynski & Nower, 2002), understanding those characteristics may be important to the prevention of harms. The recently developed Positive Play Scale (PPS; Wood, Wohl, Tabri, & Philander, 2017) was the first measure to assess responsible gambling beliefs and behaviours, and although good psychometric properties were reported, validation across a larger and more diverse population base is needed to understand the scale's generalizability. To this end, we assessed the validity and reliability of the PPS with a sample of 5,751 players from across Canada.

The development and psychometric properties of the PPS

In consultation with players and experts, Wood et al. (2017; see Study 1) created an array of items using the following definition of responsible gambling:

> Responsible gambling means only spending what is affordable to lose and sticking to personally allocated spend and time limits (formal or informal). Responsible play includes honesty and openness with self and others about personal gambling habits. Belief in luck or other superstitions may be present, but they do not have a significant negative impact on play. There is recognition that gambling will always involve some degree of chance (p. 3).

The generated PPS items were then tested and refined across two studies in which four subscales were identified. The *Personal Responsibility* subscale assesses the extent to which players accept that they hold the ultimate responsibility for the amount of money and time they spend gambling. The *Gambling Literacy* subscale assesses the extent to which players hold an accurate understanding about their (low) odds of winning. The *Honesty and Control* subscale assesses the extent to which players are open and truthful with others about the amount of money and time they spend gambling and are in control of their gambling behaviour. Lastly, the *Pre-commitment* subscale assesses to the extent players consider how much money and time they should spend gambling.

Initial testing of the PPS showed it to have good psychometric properties. The composed items of each subscale held together well and had good to excellent internal consistency. Additionally, in terms of test-retest reliability over a one-month period, the PPS subscales had moderate and positive autocorrelations, which is consistent with the notion that PPS beliefs and behaviours are malleable. The subscales were also shown to have convergent validity, as evidenced by small to moderate negative correlations between the PPS subscales on the one hand and known risk factors for disordered gambling (e.g. trait impulsivity and neuroticism) on the other hand. In contrast, the PPS subscales had small to moderate positive correlations with conscientiousness, financial satisfaction, and a general sense to of self-efficacy to face difficulty. Together, these initial results suggest that the PPS is a psychometrically sound self-report measure that is both reliable and valid.

However, there were some statistical and methodological issues that limit the generalizability of the original findings. In the PPS development paper (Wood et al., 2017), the construct validity of the PPS subscales was assessed using principal component analysis (PCA) that were conducted for the items that assess responsible beliefs (personal responsibility and gambling literacy) and behaviours (honesty and control, and pre-commitment), respectively. Within this testing strategy it is unclear whether the four-factor structure of the PPS would replicate when the PPS beliefs and behaviour items are analysed

simultaneously. Furthermore, PCAs are exploratory and validation would be improved through a confirmatory statistical approach, such as confirmatory factor analysis (CFA; see Kline, 2016). Alternative structures of the PPS items were not tested and ruled-out relative to the four-factor structure of the PPS identified via the PCAs.

Moreover, participants' responses to the PPS items were non-normally distributed. That is, responses were characterized by negative skew and kurtosis because most participants agreed with each PPS item. The developers of the PPS treated the non-normally distributed PPS item data as continuous in all analyses, which is potentially problematic because doing so may lead to biased estimates for factor loadings and internal consistency.

Perhaps most importantly, participants were residents of a single province in Canada (British Columbia). As well, many participants were between 55 and 65 or over 65 years old – an age group that has been shown to have less severe gambling problems relative to younger players (Calado & Griffiths, 2016). Thus, it is unclear whether the four-factor structure of the PPS identified via PCAs would replicate in a more demographically and geographically diverse sample of players. Indeed, as noted in the limitations of the PPS development paper, application of the PPS in a more generalizable sample of players would improve confidence in the scale's external validity.

The need for replication and extension: overview of the current study

The purpose of the current study was to replicate and extend the psychometric properties of the PPS using statistical and methodological approaches that overcome the limitations of prior PPS psychometric research. To do so, we used a large Canadian sample of players from each gambling jurisdiction (i.e. province). We treated participants' responses to the PPS items as ordered categorical and tested the four-factor structure of the PPS by analysing all PPS items (beliefs and behaviours) simultaneously.

Furthermore, we used exploratory structural equation modelling (ESEM; see Marsh, Morin, Parker, & Kaur, 2014) to test the four-factor structure of the PPS. ESEM is a combination of the best aspects of exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). In ESEM, questionnaire items are allowed to load on more than one latent factor (as in EFA) and models with different numbers of latent factors can be estimated and compared (as in CFA). In the analyses, we conducted an *a priori* confirmatory test of the four-factor PPS model. We also tested three alternative models (single-factor, two-factor, and three-factor models).

To examine internal consistency of the PPS subscales, we used McDonald's coefficient ω (McDonald, 1970). Unlike coefficient α (see Cronbach, 1951), coefficient ω does not assume that the factor loadings of items on a given scale are identical. Instead, coefficient ω takes into account the varying factor loadings of the items. Coefficient ω is computed as a ratio of true score variance among the items of a subscale (i.e. sum of the standardized factor loadings squared) divided by the total variance of the items (i.e. sum of the standardized factor loadings squared plus error variance). Simulation research has showed that coefficient ω is more accurate relative to Cronbach's α when factor loadings on a given factor differ and when there are moderate to strong correlations between factors (Şimşek & Noyan, 2013).

Lastly, we examined the convergent validity of the PPS subscales through associations with constructs that have been linked to gambling in prior research. These constructs were disordered gambling severity, erroneous gambling beliefs, financially focused self-concept, and impulsivity. As in Wood et al. (2017), we expected that PPS scores would be negatively associated with disordered gambling severity, erroneous gambling beliefs, financially focused self-concept, and impulsivity. We also extended our analysis to examine how PPS scores may relate to gambling motives (i.e. enhancement, coping, financial, and social). Because these gambling motives have been shown to be positively associated with disordered gambling severity (e.g. Dechant, 2014; Schellenberg, McGrath, & Dechant, 2016; Tabri, Wohl, Eddy, & Thomas, 2017), we expected that the PPS subscales would be negatively associated with enhancement, coping, financial, and social motives for gambling.

Method

Participants

In 2017, a third-party survey company (Research Now) recruited 7,980 Canadians who gamble from their established online panel of 500,000 people. Research Now was responsible for identifying and contacting participants and remunerating participants in the form of points redeemable for gift cards. A total of 15,991 surveys were started and 7,980 were completed, which corresponds to a completion rate of 49.9%. Approximately 1,000 participants were recruited from most regions in Canada: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, a conglomerate of Atlantic Provinces that share some gambling-related operations (i.e. New Brunswick, Prince Edwards Island, and Newfoundland and Labrador), and Nova Scotia. Within each of these regions, quota sampling was used to recruit an equal number of men and women of which 80% gambled in the last month and all had gambled in the last year. This sampling strategy helped ensure that we obtained a sample of players who recently gambled.

We excluded participants recruited from Quebec (n = 1,000) to reduce possible noise created from including a translated version of the scale (participants completed the scale in French). We also excluded participants who had missing data (n = 97)[1] and who failed one or more attention checks (n = 1,132; e.g. 'please respond 1 to this question'). Participants who fail attention checks have been shown to provide lower quality data compared to participants who pass attention checks (e.g. Gummer, Roßmann, & Silber, in press). The final sample consisted of 5,751 participants (see Table 1 for demographic information).

Formal ethics approval for a secondary analysis of the data was granted by the first author's institution Human Research Ethics Committee.

Procedure and measures

After providing informed consent, participants completed a questionnaire battery that included most of the questionnaires used by Wood et al. (2017) to examine the validity of the PPS. The questionnaires were completed online and presented in a single order that began with basic demographic questions (e.g. age, gender) followed by questions about the type of games played and frequency of play. Questions about income, education level and ethnicity were presented at the end of the survey. The main body of the survey contained

Table 1. Distributions of participants' age, gender, ethnicity, education, and income.

Mean age in years	47.59 (range: 18–89)
Gender	
Male	48.3%
Female	51.6%
Other	0.1%
Ethnic/racial background	
Asian (e.g. Chinese, Japanese, Korean)	4.2%
South Asian (e.g. East Indian, Pakistani, Punjabi, Sri Lankan)	1.1%
South East Asian (e.g. Cambodian, Indonesian, Laotian)	0.8%
Arab/West Asian (e.g. Armenian, Egyptian, Iranian, Lebanese, Moroccan)	0.3%
Black (e.g. African, Haitian, Jamaican, Somali)	1.0%
Latin American/Hispanic	0.5%
Aboriginal	3.2%
White/Euro-Caucasian	85.6%
Other	1.9%
Prefer not to answer	1.3%
Education	
Elementary school	1.0%
High School	25.8%
College	21.7%
Vocational training	14.8%
University (undergraduate)	15.9%
University (graduate)	13.0%
University (post graduate)	7.0%
Prefer not to answer	0.7%
Income	
Under $25,000	6.7%
$25,000 to under $40,000	12.1%
$40,000 to under $60,000	15.4%
$60,000 to under $80,000	16.4%
$80,000 to under $100,000	14.0%
$100,000 to under $150,000	17.4%
$150,000 or more	8.0%
Prefer not to answer	10.0%

the PPS followed by the remaining behavioural and attitudinal scales of which the following were examined in the current research:

Positive Play Scale (PPS; *Wood et al., 2017)*

The PPS consists of 14 items divided across four subscales: Personal responsibility, gambling literacy honesty and control, and pre-commitment (see Table 2 for a list of items). Items assessing personal responsibility and gambling literacy were anchored at 1 (*strongly disagree*) and 7 (*strongly agree*), whereas items assessing honesty and control and pre-commitment were anchored at 1 (*never*) and 7 (*always*). Participants were asked to respond in relation to the gambling in the last month.

Disordered gambling severity

The Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001) was used to assess disordered gambling severity. The PGSI consists of nine questions ($\alpha = .79$) that measure the extent of problem gambling behaviours and the consequences of engaging in problem gambling behaviours, over the last 12 months. Response options were anchored at 0 (*never*) and 3 (*almost always*). The responses were summed with higher scores indicating greater problem gambling severity.

Table 2. Descriptive statistics of all PPS items.

	Response scale proportions (%)							Other properties		
Item	1	2	3	4	5	6	7	*M*(*SD*)	Skew	Kurtosis
I felt in control of my gambling behaviour	1.60	0.60	1.40	2.40	5.00	10.20	78.90	6.55(1.12)	−3.16	10.57
I was honest with my family and/or friends about the amount of MONEY I spent gambling	1.80	1.30	1.90	2.70	5.20	8.30	78.80	6.48(1.24)	−2.84	7.83
I was honest with my family and/or friends about the amount of TIME I spent gambling	1.70	1.10	1.50	2.70	5.00	7.80	80.20	6.52(1.20)	−2.99	8.92
I only gambled with MONEY that I could afford to lose	1.70	0.80	2.00	3.30	5.60	9.60	77.00	6.47(1.21)	−2.75	7.57
I only spent TIME gambling that I could afford to spend	1.40	0.80	1.50	2.60	5.10	9.90	78.70	6.53(1.14)	−3.03	9.52
I considered the amount of MONEY I was willing to lose BEFORE I gambled	1.50	0.90	1.50	2.80	5.70	11.10	76.60	6.50(1.15)	−2.90	8.79
I considered the amount of TIME I was willing to spend BEFORE I gambled	2.50	1.10	2.60	5.00	7.20	11.40	70.20	6.28(1.39)	−2.23	4.52
I should be able to walk away from gambling at any time.	0.50	0.30	0.80	1.80	3.80	8.60	84.20	6.71(0.83)	−3.79	16.88
I should be aware of how much MONEY I spend when I gamble.	0.40	0.10	0.30	1.10	2.80	8.30	87.00	6.79(0.68)	−4.59	26.92
It's my responsibility to spend only money that I can afford to lose.	0.30	0.10	0.20	1.00	2.10	7.30	89.0	6.82(0.63)	−5.19	34.92
I should only gamble when I have enough money to cover all my bills first.	0.60	0.10	0.40	1.00	2.30	5.80	89.80	6.81(0.71)	−5.16	91.67
Gambling is not a good way to make money.	2.10	1.10	2.30	5.90	7.40	11.60	69.60	6.28(1.36)	−2.18	4.39
My chances of winning get better after I have lost [reversed]	3.30	1.50	3.40	7.70	5.70	11.00	67.50	6.14(1.54)	−1.90	2.76
If I gamble more often, it will help me to win more than I lose [reversed]	2.90	1.00	2.60	6.30	6.20	11.40	69.60	6.24(1.44)	−2.14	4.04

N = 5751.

Erroneous gambling beliefs

The Gambling Beliefs Questionnaire (GBQ; Steenbergh et al., 2002) consists of 21 items that are divided into two subscales. The first subscale consists of eight items that measure control beliefs about gambling (e.g. 'My knowledge and skill in gambling contribute to the likelihood that I will make money'). The second subscale consists of 13 items that measure beliefs in luck (e.g. 'Where I get money to gamble doesn't matter because I will win and pay it back'). Response options were anchored at 1 (*strongly disagree*) and 7 (*strongly agree*). Items for each subscale were averaged such that they reflected greater beliefs in control over gambling outcomes (α = .87) and greater beliefs in luck (α = .94).

Gambling motives

The Gambling Motives Questionnaire – Financial (GMQ-F; Dechant, 2014) consists of four items (α = .78) that assess financial motives (e.g. 'To win money'), four items (α = .87) that assess coping motives (e.g. 'To forget your worries'), four items (α = .91) that assess enhancement motives (e.g. 'Because it makes you feel good'), and four items (α = .84) that assess social motives (e.g. 'To be sociable'). Response options were anchored at 1 (*never or almost never*) and 4 (*almost always or always*). Responses for each motive were averaged and coded such that higher scores indicate greater endorsement of the motive.

Financially focused self-concept

The 4-item Financially Focused Self-concept scale (FFS; Tabri et al., 2017) was used to measure the extent to which a player's self-concept is focused on financial success. These items were: 'How I feel about myself is largely based on the amount of money I have,' 'My moods are influenced by the amount of money I have,' 'People will think less of me if I don't have a lot of money,' and 'The opportunities that are available to me depend on the amount of money I have.' Responses options were anchored at 0 (*not at all*) and 4 (*extremely*). Responses were averaged such that higher scores reflect greater FFS ($\alpha = .83$).

Impulsivity

The short form Barratt Impulsiveness Scale (BIS; Spinella, 2007), consists of the 5-items that assesses the extent to which people engage in non-planning (e.g. 'I say things without thinking'), 5-items that assess motor impulsivity (e.g. 'I act on impulse'), and 5-items that assess attentional impulsivity (e.g. 'I am restless at lectures or talks'). Response options were anchored at 1 (*rarely/never*) and 4 (*almost always/always*). We averaged responses across subscales such that higher scores reflect greater impulsivity ($\alpha = .77$).

Data analytic approach

In the ESEM analyses, all PPS items were modelled as ordered categorical variables using the robust diagonally weighted least squares (WLSMV) method of estimation. To adjudicate model fit, the mean and variance adjusted likelihood ratio chi-square test of model fit (χ^2), comparative fit index (CFI), root mean square error of approximation (RMSEA), and weighted root mean square residual (WRMR) were used. An excellent model fit would be reflected by a statistically nonsignificant χ^2 and a CFI close to 1 as well as an RMSEA of .05 or less with zero in its 95% confidence interval, and a WRMR value less than 1 (see Kline, 2016). We compared the fit of the hypothesized four-factor model to the fit of the alternative models using a WLSMV chi-square difference test ($\Delta\chi^2$). In the ESEM analyses, we also corrected the standard errors of all parameter estimates based on how the data were nested within provinces. The ESEM analyses were conducted using Mplus version 8 (Muthén & Muthén, 1998–2017).

In the ESEM analyses, we also included two residual correlations to statistically control for method variance due to similarity in item wording (see Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). The first residual correlation was between the item 'I was honest with my family and/or friends about the amount of MONEY I spent gambling' and the item 'I was honest with my family and/or friends about the amount of TIME I spent gambling.' The second residual correlation was between the item 'I considered the amount of MONEY I was willing to lose BEFORE I gambled' and the item 'I considered the amount of TIME I was willing to spend BEFORE I gambled.' Both residual correlations were included in all models.

Internal consistency of the PPS subscales was estimated using McDonald's coefficient ω based on the results of the ESEM analysis. As such, McDonald's ω reflects the reliability of the underlying latent continuous factor of a given subscale – not the reliability of the observed items on a given subscale. We also report estimates of Cronbach's α for each PPS subscale because it is the most popular measure of internal consistency. However, note that Cronbach's α will be underestimated when items on a given scale do not have identical

factor loadings, when there are correlations between the error variances of items on a given scale, or both (see McNeish, 2018). To examine convergent validity, the observed items of each PPS subscale were averaged to form their respective subscales. We then computed Pearson correlations between each PPS subscale and all other substantive variables.

Results

Descriptive analyses

Descriptive statistics for the PPS items are reported in Table 2. All PPS items were negatively skewed and kurtotic (see Table 2) – most participants had a high score on each PPS item. These findings confirm that treating participants' PPS responses at the item-level as ordered categorical in the ESEM analyses is appropriate.

Structure of the PPS

The hypothesized four-factor ESEM of the PPS with two residual correlations provided a marginal fit to the data (see Table 3). Inspection of the residual matrix indicated that adding two residual correlations would improve model fit. The first residual was between the item 'I should be able to walk away from gambling at any time' and the item 'I should be aware of how much MONEY I spend when I gamble.' The second residual correlation was between the item 'I only gambled with MONEY that I could afford to lose' and the item 'I considered the amount of MONEY I was willing to lose BEFORE I gambled.' The model with the two additional correlated residuals provided an excellent fit to the data (see Table 3). The magnitude of the two residual correlations were positive and very small ($rs < .10$), but including them in the model improved model fit, $\Delta\chi^2(2) = 55.15$, $p < .0001$.

A single factor model provided a poor fit to the data (see Table 3). Reducing the number of factors from four to one worsened model fit, $\Delta\chi^2(36) = 7607.89$, $p < .0001$. Likewise, a two-factor alternative model provided a poor fit to the data (see Table 3) and reducing the number of factors from four to two worsened model fit, $\Delta\chi^2(23) = 1175.05$, $p < .0001$. Similarly, a three-factor alternative model provided a poor fit to the data (see Table 3) and reducing the number of factors from four to three worsened model fit, $\Delta\chi^2(11) = 314.20$, $p < .0001$. Taken together, the hypothesized four-factor model was the superior model and reflected the factor structure very well (see Table 3).

Table 3. Test of model fit and fit indices for hypothesized and alternative models of the PPS.

Model	χ^2 (*df*)	CFI	RMSEA and 95% CI	WRMR
Hypothesized model				
Four factors	99.75(39)**	.99	.02 [.01, .02]	.47
Four factors + two residual correlations	50.99 (37)	1	.01 [.00, .01]	.28
Alternative models				
One factor	8738.92 (73)**	.86	.14 [.14, .15]	8.65
Two factors	1202.18 (60)**	.98	.06 [.06, .06]	2.43
Three factors	295.41 (48)**	1	.03 [.03, .03]	.96

CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; CI = Confidence Interval; WRMR = Weighted Root Mean Square Residual.
N = 5751
*$p < .05$; **$p < .001$.

Standardized factor loadings from the ESEM analysis of the four-factor model are reported in Table 4. As expected, items measuring honesty and control, pre-commitment, personal responsibility, and gambling literacy loaded moderately-to-strongly on separate factors with few and small cross-loadings on other factors. The latent factor for honesty and control was strongly correlated with the latent factor for pre-commitment ($r = .82$, $z = 42.22$, $p < .001$) and moderately correlated with the latent factors for personal responsibility ($r = .66$, $z = 25.66$, $p < .001$) and gambling literacy ($r = .32$, $z = 14.63$, $p < .001$). Likewise, the latent factor for pre-commitment was strongly correlated with the latent factors for personal responsibility ($r = .71$, $z = 38.40$, $p < .001$) and gambling literacy ($r = .38$, $z = 24.09$, $p < .001$). The latent factors for personal responsibility and gambling literacy were moderately correlated ($r = .55$, $z = 33.75$, $p < .001$). Although the associations between the PPS subscale factors were positive and ranged from moderate to strong, the ESEM analyses indicated that the PPS factors are empirically distinct.

Internal consistency of the PPS subscales

Participants, on average, scored high on personal responsibility ($M = 6.78$, $SD = 0.60$), gambling literacy ($M = 6.22$, $SD = 1.22$), honesty and control ($M = 6.52$, $SD = 1.06$), and pre-commitment ($M = 6.45$, $SD = 1.04$). Internal consistency estimates for personal responsibility ($\omega = .94$, $\alpha = .86$), gambling literacy ($\omega = .83$, $\alpha = .68$), honesty and control ($\omega = .87$, $\alpha = .87$), and pre-commitment ($\omega = .90$, $\alpha = .87$) were good to excellent reliability.

Convergent validity of the PPS

As expected, higher scores on each of the PPS subscales were distinct from and negatively correlated with scores on the PGSI as well as with scores on the GBQ luck and control subscales and all the gambling motives (see Table 5). Furthermore, higher scores on the

Table 4. Standardized factor loadings for the PPS items from the exploratory structural equation model with four factors.

Item	Factor 1	Factor 2	Factor 3	Factor 4
I felt in control of my gambling behaviour	**0.80****	0.04	0.09**	0.04**
I was honest with my family and/or friends about the amount of MONEY I spent gambling	**0.66****	0.20*	0.04*	0.06**
I was honest with my family and/or friends about the amount of TIME I spent gambling	**0.55****	0.31**	0.05*	0.07**
I only gambled with MONEY that I could afford to lose	0.17*	**0.70****	0.05	0.02
I only spent TIME gambling that I could afford to spend	−0.06	**1.00****	0.01	0.02*
I considered the amount of MONEY I was willing to lose BEFORE I gambled	0.24**	**0.50****	0.17**	0.02
I considered the amount of TIME I was willing to spend BEFORE I gambled	0.16*	**0.66****	0.05*	−0.02*
I should be able to walk away from gambling at any time.	0.27**	−0.02	**0.66****	0.01
I should be aware of how much MONEY I spend when I gamble.	0.13**	−0.04*	**0.85****	0.01
It's my responsibility to spend only money that I can afford to lose.	−0.05	0.03	**0.96****	0.01
I should only gamble when I have enough money to cover all my bills first.	−0.11**	0.06*	**0.91****	0.03
Gambling is not a good way to make money.	−0.04	0.10*	0.26**	**0.32****
My chances of winning get better after I have lost [reversed]	0.04	−0.04**	0.01	**0.85****
If I gamble more often, it will help me to win more than I lose [reversed]	−0.02	0.01	−0.01	**1.00****

N = 5751.
*$p < .05$; **$p < .001$.

Table 5. Pearson correlations between the PPS subscales and other measured constructs.

	M(*SD*)	Personal Responsibility	Gambling Literacy	Honesty and Control	Pre-commitment
PGSI (total score)	1.73(3.86)	−0.436**	−0.337**	−0.565**	−0.535**
Illusion of control	21.52(10.49)	−0.241**	−0.500**	−0.215**	−0.231**
Belief in luck	24.41(14.28)	−0.385**	−0.624**	−0.360**	−0.368**
Financial motive	2.35(0.81)	−0.108**	−0.233**	−0.139**	−0.163**
Coping motive	1.44(0.62)	−0.320**	−0.386**	−0.379**	−0.356**
Enhancement motive	2.41(0.87)	−0.136**	−0.226**	−0.216**	−0.197**
Social motive	1.74(0.69)	−0.188**	−0.295**	−0.177**	−0.189**
FFS	1.47(1.01)	−0.197**	−0.272**	−0.242**	−0.285**
Impulsivity	1.93(0.46)	−0.247**	−0.216**	−0.281**	−0.342**

PGSI = Problem Gambling Severity Index; FFS = Financially Focused Self-Concept. Sample size for the correlations ranged between 5,751 and 5,708 because of missing data on the non-PPS variables.
*$p < .05$; **$p < .01$.

PPS subscales were each associated with lower impulsivity and FFS (see Table 5). The magnitude of these correlations ranged from small to moderate.

Discussion

The current research replicates and extends the robust psychometric properties of the PPS using a more rigorous statistical approach and testing strategy with a large demographically and geographically diverse sample of players. Indeed, we confirmed that the PPS consists of four empirically distinct and correlated subscales: Personal Responsibility, Gambling Literacy, Honesty and Control, and Pre-Commitment. The four-factor model provided an excellent fit to the data compared to three alternative and more parsimonious models (i.e. single factor, two-factor, and three-factor models). Thus, the current research provided a rigorous confirmation of the four-factor structure of the PPS.

In terms of reliability, we showed that the PPS subscales each have good to excellent internal consistency. We also found that participants, on average, had high scores on all of the PPS subscales. That is, most participants reported having responsible gambling beliefs and engaging in responsible gambling behaviours. These findings replicate and extend the results observed in the PPS development paper (see Wood et al., 2017) with a much larger demographically and geographically diverse sample of players. Thus, the PPS has good external validity.

We also showed that the PPS subscales have good convergent validity. More specifically, players with higher scores on the PPS subscales had less severe disordered gambling beliefs, tendencies, and symptoms. The magnitude of these associations were moderate, which suggests that the PPS is not simply measuring the absence of disordered gambling. In addition, players with higher scores on the PPS subscales were less impulsive and financially focused. These results replicate prior PPS research (see Wood et al., 2017) in a larger and more demographically diverse sample of players from across Canada.

Furthermore, as expected, players with higher scores on the PPS subscales were less likely to gamble for financial gain, to cope with negative affect, to enhance positive affect, and for social reasons – four gambling motives that have been shown to be linked with disordered gambling in prior research (e.g. Dechant, 2014; Schellenberg

et al., 2016; Tabri et al., 2017). Importantly, the magnitude of associations between the PPS subscales and the gambling motives were small-to-moderate. This suggests that players with higher PPS scores are not gambling for reasons that may lead them to develop gambling problems.

Limitations and implications

The PPS is a self-report measure and thus may not equate with how players gamble. Therefore, an area of future research would be to assess the relation between how players respond with the PPS and how they play using, for example, player-account data. In the current research, we did not examine the temporal measurement invariance of the PPS and so it is unclear whether the factor-structure and meaning of the factors transcend time. As with other self-report measures, responses may also be biased by social desirability. However, participants were anonymous and were unaware of how other participants were responding. As such, the impact of social desirability bias is likely minimal. Nevertheless, future PPS-related research should measure this potential bias in players who score high on the PPS. Lastly, although the sample was demographically and geographically diverse, it was not a probability sample of Canadian gamblers. Future validation work can consider representative and non-Canadian samples.

The PPS can also be used to inform and guide responsible gambling initiatives. For example, if an operator finds that young adult players have low scores on the gambling literacy (compared to older players), it may behoove them to develop a responsible gambling awareness campaign that includes age-appropriate messaging about how to play positively and responsibly (e.g. gambling for entertainment, winning at gambling is not predictable). Follow-up PPS testing may later be utilized to see whether gambling literacy scores improve following exposure to the campaign.

Conclusions

The current research provides support for the originally reported factor structure of the PPS using a confirmatory statistical approach with a large demographically and geographically diverse sample of players. We also modelled the PPS data at the item-level in these analyses to obtain appropriate estimates of reliability for each PPS subscale and provide convergent validity for the measure. Together, the results indicate that the PPS is a reliable and valid self-report measure of responsible gambling attitudes and behaviour that has robust psychometric properties.

Note

1. Results remained virtually unchanged after including participants with missing data in the analyses using Full Information Maximum Likelihood.

Compliance with ethical standards

Ethical review and approval was not required for this study as per the institutional and national requirements. All participants were responding to a survey that was part of a prior agreement with

Research Now. Nevertheless, participants were fully informed about the nature of the study, provided their written consent to take part and were free to withdraw at any point. All data was anonymized and the study was carried out in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments. As well, the secondary analysis of the data was reviewed and approved by Carleton University's Research Ethics Board – B.

Conflict of interest

Funding sources

The research was led by GamRes Limited—a research consultancy service that implements and evaluates responsible gambling strategies—and funded by the Canadian Responsible Gambling Association (CRGA).

Competing interests

In the interest of transparency, all authors have directly or indirectly conducted previous consultancy work for CRGA. Importantly, however, in conducting the current study, the authors were given full consent to investigate, analyze, and report all findings that the authors perceived to be relevant for understanding the Positive Play Scale—CRGA did not have a role in determining the aims and outcomes of the current study. Therefore, we do not consider there to be a conflict of interest between the authors of this manuscript and the funders of the research.

Constraints on publishing

All authors reported no constraints on publishing the submitted manuscript.

Disclosure statement

Dr. Nassim Tabri has received consulting fees from the gambling industry in Canada, New Zealand, the US, and the UK via GamRes Limited—a research and consultancy service that designs, implements, and evaluates responsible gambling strategies. He has also received research funds from Gambling Exchange Ontario (GREO).

Over the last 20 years, Dr. Richard Wood has been funded to undertake responsible gambling projects for more than 50 gaming companies, regulators and government organizations worldwide. These projects have included; research funds to develop responsible gambling tools, funds to evaluate existing responsible gambling tools and consultancy fees to apply research evidence to assist the gambling industry to develop responsible gambling initiatives and/or to assess the possible risk of proposed gambling products for players who may be at an increased risk for developing a gambling problem.

Since 2015, Dr. KahlilPhilander has received research funds from the Washington State Gaming Commission, Manitoba Gambling Research Program, UNLV International Centre for Gaming Regulation, U.S.-Japan Business Council, Wynn Resorts, Board of Regents of the Nevada System of Higher Education. He has received consulting payments from British Columbia Lottery Corporation, Responsible Gambling Council of Canada, the Commonwealth of The Bahamas, West Virginia Lottery, Indiana Gaming Commission, Intralot, and iDevelopment and Economic Association. He has received reimbursement for travel from the Northeast Asia Economic Association Forum, National Council for Problem Gambling, International Association of Gaming Advisors, National Centre for Responsible Gambling, North American State and Provincial Lottery Association, Evergreen Council on Problem Gambling, Global Gaming Expo Asia, and Alberta Gambling Research Institute.

Dr. Michael J. A. Wohl has received research funding from federal granting agencies in Canada and Australia unconnected to his gambling research. In relation to his gambling research, he has received research funds from provincial granting agencies in Canada. He has also received direct and indirect research funds from the gambling industry in Canada, United States of America, United Kingdom, Australia, and Sweden. Additionally, he has served as a consultant for the gambling industry in Canada, United States of America, United Kingdom, and New Zealand. A detailed list can be found on his curriculum vitae (http://carleton.ca/bettermentlabs/wp-content/uploads/CV.pdf).

Notes on contributors

Dr. Nassim Tabri is an Assistant Professor in the Department of Psychology at Carleton University. His research is focused on etiological and maintenance factors underlying addictive and other health-compromising behaviors.

Dr. Richard T. A. Wood is the President and founder of Gamres Limited where he undertakes responsible gambling research and consultancy services.

Kahlil Philander is an Assistant Professor in the School of Hospitality Business Management. He also holds an appointment as an Honorary Lecturer in the School of Psychology at the University of Sydney. His research interests are in the socio-economic impacts of gambling.

Dr. Michael J. A. Wohl (Professor of Psychology) examines factors that lead to excessive play (e.g., erroneous cognitions, craving) and means to increase responsible gambling (e.g., setting a limit on play). Recently, attention has been paid to the promotion of positive play and the influence loyalty program membership can have on gambling behavior. Ultimately, he is interested processes that promote positive behavioral change.

ORCID

Nassim Tabri http://orcid.org/0000-0002-7085-9350
Kahlil Philander http://orcid.org/0000-0002-0747-0772

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