A dissociation of impulsivity and gambling cognition pathways to gambling urges via motivation

Harvey H. C. Marmurek

OBJECTIVES: The present study explored the associations among problem gambling severity, trait impulsivity, gambling cognitions, gambling motivations, and gambling urges. The central question was whether the pathway linking trait impulsivity and gambling urges could be dissociated from the pathway linking gambling cognitions and gambling urges. Differential mediation along those pathways via gambling motivation was assessed.

METHOD: The participants were 202 patrons of a slot machine gambling venue who completed t standardized impulsivity and gambling related measurement scales in return for $30.

RESULTS: Gambling cognitions and motivation were more strongly correlated with problem gambling severity than was trait impulsivity. Mediation analyses showed that whereas the impulsivity to urge link was mediated by motivation, the cognition to urge link was not mediated by motivation.

CONCLUSION: Cognitive and motivational interventions for high-risk and/or addictive gamblers are expected to reduce the urge to gamble independently of a gambler’s trait impulsivity level.

Key Words: Gambling severity; Impulsivity; Gambling cognitions; Gambling urges; Gambling motivation

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Received: December 21, 2017, Accepted: February 21, 2018, Published: February 25, 2018

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Addict Clin Res Vol 2 No 1 February 2018
gambling urges via motivation for gambling and that gambling cognitions are directly linked to gambling urges.

**METHODS**

**Participants**

This research project received ethics approval from the Research Ethics Board at the author’s university. The participants were 202 (97 males; 105 females) patrons at a racetrackslots facility in Ontario Canada. A recruitment poster was placed adjacent to the entrance to the gambling area. The poster stated that a research team was on the premises to study “the characteristics of gamblers.” The poster indicated that participants would be paid $30. Patrons who wished to participate were directed by a member of the research team a room outside the gambling area where they completed a survey containing a series of standardized scales measuring problem gambling severity, trait impulsivity, gambling related cognitions, gambling motivation, and gambling urges. The survey was presented electronically or in paper format according to the preference of the participant.

**Measurement instruments**

The Problem Gambling Severity Index (PGSI) is a nine-item subset of the Canadian Problem Gambling Inventory (17). Respondents are asked to think about the past year and indicate the frequency for each item using a 4-point scale: 0=never; 1=sometimes; 2=most of the time; 3=almost always. The nine items are: How often have you felt that you needed to gamble with larger amounts of money to get the same feeling of excitement? How often have you gone back another day to try to win back the money you lost? How often have you borrowed money or sold anything to get money to gamble? How often have you felt guilty about the way you gamble or what happens when you gamble? How often has your gambling caused you any health problems, including stress or anxiety? How often has your gambling caused you any financial problems for you or your household?

The PGSI has been endorsed (18,19) as a reliable and valid index of the progression of gambling severity in non-clinical samples. In contrast to the South Oaks Gambling Screen (SOGS), the PGSI measure was developed explicitly for use with a general (rather than clinical) population. Factor analysis and the reliability analysis point to the existence of a single, underlying, problem gambling factor whereas the same analysis conducted on the SOGS items yielded multiple gambling factors. The original scoring of the PGSI classified four gambling subtypes on the basis of the sum of the responses across the nine items: 0=non-problem gambler; 1-2=low-risk gambler; 3-7=moderate-risk gambler; 8 or more=problem gambler. Non-problem and low-risk gamblers were described as not having experienced any adverse consequences from gambling, while moderate-risk and problem gamblers had experienced negative urgency scores were combined to yield an overall impulsivity score. Cronbach’s alpha for those items total scale was 0.80.

The Impulsivity scale (9) contains 59 items to which respondents indicate their level of agreement using a 4-point scale from 1=agree strongly to 4=disagree strongly. Five factors are identified: lack of deliberation; inability to stop; interpretive bias. Cronbach’s alpha for the total scale was 0.93.

The Gambling Urgency Scale (13) comprises the following six statements for which respondents indicate their level of agreement using a 7-point scale: All I want to do now is to gamble; It would be difficult to turn down a gamble this minute; Having a gamble now would make things seem just perfect; I want to gamble so bad that I can almost feel it; Nothing would be better than having a gamble right now. I crave a gamble right now. The scores for each statement are summed to yield an overall score. In the present study, Cronbach’s alpha across the six items was .92. A comparison for the two gambling subtypes (Table 2) showed that the high risk group has significantly higher gambling urge scores than did the low risk group.

**RESULTS**

**PGSI Categories**

Statistical analyses that focus on comparisons of gambling severity categories are typically based on defining a cut-off for pooling categories into two groups (22,23). The pooled low-risk and highrisk groups in the present study were based on the PGSI cut-off of 5 (20). There were 168 (90 female, 78 male) low-risk gamblers and 34 (15 female, 19) high-risk gamblers. The association between severity category and gender was not statistically significant, \( \chi^2(1)=1.01, p=.32 \). The difference in PGSI between the low-risk (\( M=1.14, SD=1.29 \)) and the high-risk (\( M=8.35, SD=3.43 \)) groups was statistically significant, \( t(200)=12.11, p<0.001, \) Cohen’s \( d=2.79 \).

**Group differences in impulsivity**

The top portion of Table 1 presents the mean and standard deviation values on the total score for each subscale of impulsivity (9). A comparison of the low-risk and high-risk gamblers on each factor showed that high-risk gamblers had statistically significant higher scores on only positive urgency and negative urgency. For the mediation analysis, the 23 positive and negative urgency scores were combined to yield an overall impulsivity score. Cronbach’s alpha for those items total scale was 0.95.

**Group differences in gambling related cognitions (GRC)**

The middle portion of Table 1 presents the mean and standard deviation values on the total score for each GRC subscale for the non-problem and problem gambling groups. A comparison of the two gambling severity subtype groups yielded statistically significant higher scores for the high-risk group on all subscales with the exception of social motivation. For the mediation analysis, the scores on the 21 items testing the significant four subscales were summed to yield an overall gambling motivation score. Cronbach’s alpha for those items total scale was 0.91.

**Group differences in motivations for gambling**

The bottom portion of Table 1 presents the mean and standard deviation values on the total score for each Gambling Motivation subscale for the non-problem and problem gambling groups. A comparison of the two gambling severity subtype groups yielded statistically significant higher scores for the high-risk group on all subscales with the exception of social motivation. For the mediation analysis, the scores on the 23 items testing the significant four subscales were summed to yield an overall gambling motivation score.
Dissociation Of Impulsivity And Gambling Cognition

TABLE 1
Means and standard deviations on impulsivity, gambling cognitions and gambling motivation.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Problem Gambling Severity Index (PGSI) Subtype</th>
<th>Non-problem (n=168; PGSI=0 - 4)</th>
<th>Problem (N=34; PGSI &gt;4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>t</td>
</tr>
<tr>
<td>Impulsivity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative Urgency</td>
<td>27.19 (6.63)</td>
<td>30.86 (6.13)</td>
<td>2.98*</td>
</tr>
<tr>
<td>Positive Urgency</td>
<td>26.39 (7.47)</td>
<td>31.85 (9.32)</td>
<td>3.61**</td>
</tr>
<tr>
<td>Lack of Planning</td>
<td>31.57 (5.47)</td>
<td>31.21 (4.06)</td>
<td>0.37</td>
</tr>
<tr>
<td>Lack of Perseverance</td>
<td>26.88 (5.54)</td>
<td>27.21 (2.75)</td>
<td>0.33</td>
</tr>
<tr>
<td>Sensation Seeking</td>
<td>32.42 (8.22)</td>
<td>31.97 (7.01)</td>
<td>0.3</td>
</tr>
<tr>
<td>Gambling Related Cognitions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expectancies</td>
<td>9.95 (4.75)</td>
<td>15.64 (5.44)</td>
<td>6.22**</td>
</tr>
<tr>
<td>Illusion of Control</td>
<td>7.39 (4.38)</td>
<td>10.44 (4.85)</td>
<td>3.63**</td>
</tr>
<tr>
<td>Predictive Control</td>
<td>13.96 (6.39)</td>
<td>16.94 (7.57)</td>
<td>4.01**</td>
</tr>
<tr>
<td>Inability to Stop</td>
<td>6.89 (3.42)</td>
<td>13.21 (7.16)</td>
<td>7.87**</td>
</tr>
<tr>
<td>Interpretive Bias</td>
<td>10.29 (5.69)</td>
<td>14.09 (5.75)</td>
<td>3.54**</td>
</tr>
<tr>
<td>Gambling Motivations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excitement</td>
<td>27.86 (6.94)</td>
<td>31.44 (4.63)</td>
<td>2.88*</td>
</tr>
<tr>
<td>Money</td>
<td>14.42 (4.47)</td>
<td>19.28 (3.36)</td>
<td>5.99**</td>
</tr>
<tr>
<td>Avoidance</td>
<td>12.68 (4.84)</td>
<td>17.36 (6.33)</td>
<td>4.87**</td>
</tr>
<tr>
<td>Social</td>
<td>9.98 (2.75)</td>
<td>10.5 (3.02)</td>
<td>0.94</td>
</tr>
<tr>
<td>Amusement</td>
<td>13.31 (3.39)</td>
<td>15.88 (2.35)</td>
<td>4.73**</td>
</tr>
</tbody>
</table>

* p<0.005; ** p<0.001

TABLE 2
Bivariate correlations and mediation (N=202).

<table>
<thead>
<tr>
<th>Correlations (all p&lt;0.001)</th>
<th>PGSI</th>
<th>Impulsivity</th>
<th>Cognitions</th>
<th>Motivation</th>
<th>Urges</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.3</td>
<td>0.49</td>
<td>0.65</td>
<td>0.53</td>
<td></td>
</tr>
</tbody>
</table>

Mediation Analyses

<table>
<thead>
<tr>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>0.59</td>
<td>0.07</td>
<td>0.51</td>
<td>8.31</td>
</tr>
<tr>
<td>b</td>
<td>0.19</td>
<td>0.03</td>
<td>0.41</td>
<td>5.81</td>
</tr>
<tr>
<td>c</td>
<td>0.19</td>
<td>0.04</td>
<td>0.36</td>
<td>5.37</td>
</tr>
</tbody>
</table>

Indirect effect (c'): 95% CI: [0.07, 0.16], p=0.001

<table>
<thead>
<tr>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>0.45</td>
<td>0.04</td>
<td>0.65</td>
<td>11.96</td>
</tr>
<tr>
<td>b</td>
<td>0.05</td>
<td>0.03</td>
<td>0.12</td>
<td>1.66</td>
</tr>
<tr>
<td>c</td>
<td>0.21</td>
<td>0.02</td>
<td>0.65</td>
<td>12.04</td>
</tr>
</tbody>
</table>

Indirect effect (c'): 95% CI: [-0.01, 0.05], p=0.10

Several approaches to testing the statistical significance have been proposed. The options reported here are the partial-posterior method for calculating the p value of an indirect effect, and the hierarchical Bayesian method for calculating the confidence interval (16). Table 2 summarizes the results of the mediation analyses. Both direct effects (c) for impulsivity->urges and cognitions>urges were statistically significant. In the impulsivity-motivation-urges pathways, impulsivity was directly related to motivation, motivation was independently related to urges, and the indirect pathway from impulsivity to urges was mediated by motivations. In contrast, for the cognition-motivation-urges pathways, cognition was directly related to motivation, motivation was not independently related to urges, and the indirect pathway from gambling cognitions to urges was not mediated by motivation.

DISCUSSION

The results of the present study confirmed that problem gambling severity among slot machine gamblers is associated with trait impulsivity, gambling related cognitions, gambling motivations, and gambling urges. However, trait impulsivity was the weakest predictor of problem gambling severity. Only two of the subscales of trait impulsivity (positive urgency; negative urgency) discriminated between low-risk and high-risk gamblers. Moreover, even when combining the two significant subscales as a predictor, trait impulsivity yielded the smallest effect among the correlates of problem gambling severity. The impulsivity traits of positive and negative urgency refer to the tendencies to act rashly when experiencing unusually positive...
or negative emotions, respectively (24). The association between problem gambling severity and the urgency scales is consistent with the hypothesis that deficits in emotion regulation contribute to excessive gambling (25). A stronger association between impulsivity and problem gambling severity may result if, rather than indexing impulsivity with measures of trait impulsivity, measures of impulse choice (discounting of delayed rewards) and/or measures of impulsive action (inhibition of a prepotent response) were correlated (26). However, the relation of those correlates to problem gambling and trait impulsivity is inconsistent (10,27).

An original feature of the current study was the examination of the relation between predictors of gambling severity (impulsivity, cognitions, and motivations) and the urge to gamble. Gambling urge was selected as the dependent measure in the mediation analyses given that urges are common to addictions despite gender and neural differentiation among different addictions. For example, urges for cocaine and gambling are primed specifically by the context-specific videos that lead to activation in different neural structures (28). The mediation analyses demonstrated that whereas the link between trait impulsivity and urge to gamble was mediated by motivation, the link between gambling cognitions and urge to gamble was direct.

These results may have implications for the treatment of problem gambling. Pharmacological treatments may attempt to address urges directly (29). However, more common interventions involve cognitive and motivational restructuring with most successful outcomes for cognitive-behavioral interventions (30). That pattern is consistent with the finding of the current study that there is a direct link from gambling cognitions to the urge to gamble. Therefore, cognitive restructuring would be expected to lead to adjustments in the urge to gamble.

A critical limitation on generalizing from the present results to implications for intervention is that the PGSI is designed as a screen for problem gambling severity rather than as an assessment tool to diagnose gambling pathology. It would be a mischaracterization to categorize the high-risk gamblers in the present study as pathological or addictive (31). Nonetheless, slot machines provide the structure (high event frequency; continuous play; potential for immediate rewards) of gambling activities that may foster a gambling addiction. Considering recreational, problem, and addictive gambling as graduated points on a continuum warrants a careful analysis of how a gambler’s underlying personality, cognitive and motivational determinants guide transitions along the continuum.

CONCLUSION
Cognitive and motivational interventions for high-risk and/or addictive gamblers are expected to reduce the urge to gamble independently of a gambler’s trait impulsivity level.

CONFLICT OF INTEREST
This research was funded by The Ontario Problem Gambling Research Centre. The author has no conflict of interest.

ACKNOWLEDGEMENT
The author thanks his students Monique Carvalho, Joshua D’Aville, and Jessica Switzer for their contributions to data collection and manuscript preparation.

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