IMPULSE AND REASON:
JUSTIFICATIONS IN PROBLEM GAMBLING

by

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B.Sc., University of Toronto, 2021

A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in

The Faculty of Graduate and Postdoctoral Studies

(Psychology)

THE UNIVERSITY OF BRITISH COLUMBIA

(Vancouver)

August 2023

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The following individuals certify that they have read, and recommended to the Faculty of Graduate and Postdoctoral Studies for acceptance, the thesis entitled:

**Impulse and reason: Justifications in problem gambling**

submitted by Ruolin (Raymond) Wu in partial fulfillment of the requirement for the degree of Master of Arts in Psychology

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Abstract

Impulsivity is a core component of problem gambling. This conventionally entails acting without thinking. However, people may use deliberate, intentional justifications to grant themselves permission to gamble. Across 3 studies, I examined the degree to which gambling justifications were associated with problem gambling severity and gambling behaviour. Participants were gamblers who had experience with, or were currently, trying to reduce their gambling. In Studies 1 and 2, participants reported their gambling justifications and completed standard measures of impulsivity, cognitive distortions, and problem gambling severity. I found that justifications were positively associated with problem gambling severity even after controlling for impulsivity and cognitive distortions. These results were replicated in Study 2 with an improved design. In Study 3, I used a daily diary approach to examine fluctuations in justifications, craving, positive and negative affect, and gambling behaviour over a 21-day window. Results showed that justifications were positively, albeit modestly, associated with next-day gambling even after controlling for craving, positive affect, and negative affect. These findings indicate that justifications are a neglected aspect of cognition in gamblers that cannot be explained by impulsivity, cognitive distortions, craving, or affect, and may contribute to self-control failures and thus recovery from problem gambling.
Lay Summary

People with gambling problems show heightened impulsivity which implies a tendency to act without thinking. However, people also deliberately find reasons (“justifications”) to grant themselves permission to indulge in a desired behaviour. In this thesis, I examined the degree to which impulsivity and using justifications are associated with gambling problems and gambling behaviour. Results showed that justifications contributed to gambling problems and gambling behaviour beyond impulsivity, indicating that justifications are an aspect of cognition in gambling problems.
Preface

I completed all stages of the research under the supervision and guidance of Dr. Luke Clark. The Behavioural Research Ethics Board at the University of British Columbia approved the present studies (H21-03770 and H23-00265). The work is original and unpublished. I presented Studies 1 and 2 as a poster at the 22nd International Centre for Responsible Gambling Conference on Gambling and Addiction.
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Chapter 1: Introduction

Problem gambling is characterized by a loss of control over gambling. When faced with a choice to gamble or to abstain from gambling, people with problem gambling repeatedly make the choice to gamble despite past commitments to stop. This is conventionally viewed as resulting from heightened impulsivity. However, from social and consumer psychology, it is well-recognized that people use reasons to justify their prospective choices, and this reasoning is presumably deliberate and intentional (De Witt Huberts et al., 2014a; Feurer & Haws, 2022). There is a possibility that people construct thoughts, such as “I’ve worked hard today” to grant themselves permission to gamble. These justifications may be related to problem gambling severity and gambling behaviour in addition to, or even in spite of, elevations in impulsivity. Building on past psychological theory on motivated reasoning (Kunda, 1999; Zaki & Hughes, 2015), self-licensing (De Witt Huberts et al., 2014a; Feurer & Haws, 2022), and cognitive distortions (Fortune & Goodie, 2012; Goodie & Fortune, 2013), the present research investigated the degree to which the use of gambling justifications is related to problem gambling severity and gambling behaviour.

Literature Review

Gambling is a popular form of entertainment that involves betting on an outcome of an unpredictable event. In rare cases, people who gamble may develop Gambling Disorder. Formerly known as pathological gambling, this diagnosis was grouped as an impulse control disorder but was reclassified as a substance related and addictive disorder in the 5th edition of the Diagnostic Statistical Manual of Mental Disorders (American Psychiatric Association, 2013). Gambling Disorder is characterized by various negative consequences (Hodgins et al., 2011), but many regular gamblers who fall below the threshold for diagnosis can still suffer harms from
gambling. On a gradient, those who gamble more experience poorer physical health (e.g., less exercise), mental health (e.g., depression, anxiety), higher financial strain (e.g., credit card debt, missing mortgage payments), and higher risk of future harms (e.g., unemployment, mortality; Muggleton et al., 2021).

A key etiological factor of problem gambling and other addictive behaviours is impulsivity. In the influential UPPS model, impulsivity is conceptualized as a multidimensional personality trait consisting of urgency (the tendency to act rashly under extreme emotions), lack of premeditation (the tendency to act without thinking), lack of perseverence (the inability to remain focused on a task), and sensation seeking (the tendency to seek out novel experiences; Whiteside & Lyman, 2001). More recent work distinguishes between positive and negative affective states within the urgency construct (Whiteside et al., 2005; c.f., Billieux et al., 2021). Behaviorally, impulsivity has been conceptualized as the inability to inhibit prepotent responses (e.g., go/no go or stop-signal tasks) or to delay gratification (e.g., delay discounting task; MacKillop et al., 2016). Across the various operationalizations of impulsivity (Strickland & Johnson, 2021), both self-report and behavioral measures of impulsivity are elevated in people with problem gambling severity and other addictive behaviors (Verdejo-Garcia et al., 2008).

Impulsivity has been extensively studied in the context of gambling. For instance, in a meta-analysis with 52 independent studies, people with Gambling Disorder showed higher impulsivity across numerous measures of impulsivity, including response inhibition and delay gratification, than controls (Ioannidis et al., 2019). Similarly, across both clinical and subclinical samples, trait impulsivity and especially urgency were related to problem gambling severity (Billieux et al., 2012; Blain et al., 2014; Haw, 2017; Ledgerwood et al., 2009). Prospective studies show that during development impulsivity in youth predicts future problem gambling
(Cosenza & Nigro, 2015; Pagani et al., 2009; Slutske et al., 2005). Similarly, recent work found that in a sample of online participants impulsivity was associated with problem gambling severity one year later (Williams et al., 2023). Impulsivity has also been a focus in predicting treatment outcomes in problem gambling, where there is evidence for effects on both relapse (De Wilde et al., 2013; Goudriaan et al., 2008) and treatment dropout (Alvarez-Moya et al., 2011).

This is in line with prominent theories of addiction that propose that neurocognitive deficits in self-control are central to problem gambling and other addictive disorders (Baler & Volkov, 2006; Bechara, 2005; Tang et al., 2015). Dual process models suggest that self-control failure arises from a dynamic and ongoing competition between automatic and controlled processes. Automatic processes quickly appraise stimuli in terms of emotional and motivational significance via implicit or learned associations (e.g., experiencing cravings triggered by cues), whereas controlled processes are conscious, intentional, and deliberate (e.g., recognizing and trying to suppress cravings). Self-control failure is thus conventionally viewed as resulting from hyperactive automatic processes that override controlled processes (Metcalf & Mischel, 1999). Though, others have noted that both automatic and controlled processes can both promote and hinder self-control (Flayelle et al., 2023; Newell & Shanks, 2014).

A second well-recognized feature of problem gambling is cognitive distortions (Potenza, 2014). Cognitive distortions refer to irrational thoughts about gambling. For instance, people may believe that they have agency over chance (e.g., lucky charms), make inaccurate predictions about chance outcomes (e.g., gambler’s fallacy), and misattribute wins and losses (e.g., attribute wins to skill and losses to chance; Raylu & Oei, 2004a). These have been robustly linked problem gambling (Fortune & Goodie, 2012; Goodie & Fortune, 2013; Leonard et al., 2012). Cognitive distortions are similar to impulsivity in that they have also been suggested to be driven
by the fast, rapid acceptance of beliefs (Fortune & Goodie, 2012). Indeed, this theoretical link has also been supported by work showing strong associations between cognitive distortions and trait impulsivity in both undergraduate and clinical samples (MacKillop et al., 2006; Michalczuk et al., 2011).

Engagement in gambling and addictive behaviours more generally may also be driven by reflective, goal-directed processes (Berkman et al., 2017; Hogarth, 2020). This is a well-recognized pathway in consumer behaviour (Bagozzi & Dholakia, 1999) and more recent work has begun to recognize similarities between processes that support addiction and universal human behaviours (Kopetz et al., 2013). Given that reasoning processes are influenced by one’s goals, referred to as motivated reasoning (Kunda, 1990; Zaki & Hughes, 2015), strong desires towards gambling observed in people with high levels of gambling problems may influence their reasoning in such a way that ultimately promotes their goal to gamble. For instance, people often rationalize their gambling losses to make them less aversive (Kermer et al., 2006) and maintain a sense of mastery over their gambling (Gilovich, 1986). Gamblers reason towards gambling in numerous ways (Ejova & Ohtsuka, 2020).

One way in which gamblers may do this is through the use of justifications. The central idea here is that when people are deciding between two options (e.g., a vice versus a virtuous product), they can use justifications to allow themselves to relax self-control and choose the more desirable product. This process has also been referred to as self-licensing (De Witt Huberts et al., 2014a). For instance, people may use justifications such as “I’ve worked hard today” to temporarily disengage from their goal to eat healthily and proceed to eat unhealthy foods. Theoretically, justifications have been suggested to be deliberative and even strategic (Feurer & Haws, 2022; Rishika et al., 2022). Justifications may be triggered by cravings (De Witt Huberts
et al., 2014b) and function as a means to attain desires via motivated reasoning (Kunda, 1990; Zaki & Hughes, 2015). Interestingly, although the use of justifications have not been examined in problem gambling, cognitive models of substance use propose that people engage in thoughts that make it more permissible to engage in addictive behaviours, referred to as permissive beliefs, which resemble justifications and have also been proposed to be triggered by cravings (Beck et al., 1993; Tiffany, 1990).

There are particular kinds of justifications. One notable route is through perceived effort and achievement. Prior work in consumer behavior has shown that experimentally inducing feelings of effort and achievement, referred to as justification cues, led people to increase their choice of a vice (e.g., chocolate cake) over a virtue (e.g., fruit salad; Kivetz & Zhang, 2002). Likewise, when presented with hedonic products, people often reported reasons related to recently working hard to justify choosing the more desirable product (De Witt Huberts et al., 2014b). Another common source of justifications is prior self-control. Smokers may use a sustained period of abstinence to justify “just one cigarette.” In a laboratory study, when presented with the option to make a purchase, participants who declined a prior purchase generated more reasons to make a current purchase, and these reasons were positively associated with actually making the purchase (Mukhopadhyay & Johar, 2009).

Given that a primary negative consequence of gambling is financial (Swanton & Gainsbury, 2020), perceptions of having disposable funds may be a particularly relevant justification for gambling (Feurer & Haws, 2022). For instance, gamblers may use a financial windfall to grant themselves permission to relax self-control and gamble (Dahan, 2021). Additionally, past work has shown that optimistically thinking about using self-control in the future (Khan & Dhar, 2007; Zemack-Rugar & Corus, 2018), experiencing departures from
routine events (e.g., being on holiday; Prinsen et al., 2016), and experiencing both prior positive and negative events (Fishback et al., 2005; Soman & Cheema, 2004) can be used to justify desirable choices. These seemingly disparate justifications have been suggested to reflect a single construct that drive desirable choices, though the degree to which they exist in the context of gambling is unclear.

Proximal factors may also undermine the ability to successfully control oneself from gambling. For instance, in the context of substance use, cravings have been robustly associated with substance use and moreover this association becomes stronger when cravings are assessed in closer temporal proximity with substance use (Serre et al., 2015). A recent study found similar results in the context of gambling, showing that people who had gambling cravings in the morning were more likely to gamble in the evening (Hawker et al., 2021). Justifications may play a similar role as a proximal variable. In the context of unhealthy eating, Prinsen et al. (2019) found that justifications moderated the association between desire strength and conflict, indicating that using justifications may promote addictive behaviours by reducing the conflict that would otherwise recruit self-control. Thus, in addition to individual differences in using justifications, justifications people experience on a day-to-day basis may also be important to consider for understanding loss of control in problem gambling.

**Current Investigation**

In this thesis, I tested whether gambling justifications were associated with problem gambling severity (Studies 1 and 2) and engagement in gambling (Study 3). In Study 1, I recruited gamblers with prior experience with trying to reduce their gambling. The main goal of Study 1 was to establish which justifications, if any, gamblers endorsed. In Study 2 (preregistered: https://aspredicted.org/7WV_F89), I recruited a more selective sample of
gamblers who were currently trying to reduce their gambling and modified the justification scale. I predicted that justifications would be associated with problem gambling severity, and that this effect would remain after controlling for impulsivity and cognitive distortions. In Study 3, participants completed a 21-day daily diary and reported their justifications, cravings, positive affect, negative affect, and gambling behaviour each day. I examined the degree to which day-to-day fluctuations in justifications were associated with next-day gambling and whether this effect could be explained by changes in cravings, positive affect, and negative affect. The cross-sectional studies coupled with the daily diary approach provided me with the opportunity to examine the relationship between justifications, impulsivity, and cognitive distortions, as well as test the degree to which these psychological factors are related to real-life gambling episodes.

Chapter 2: Cross-Sectional (Studies 1 and 2)

Methods

Participants and Procedure

Participants were recruited from the United States, United Kingdom, Ireland, Australia, and New Zealand using Prolific Academic, an online recruitment platform. In Study 1, data were collected in February 2022. Participants first completed a prescreen asking, “Have you ever tried to reduce your gambling? (n = 794). Those who responded “Yes” were invited to the main study (n = 176) of which most completed (n = 123). Data were then cleaned to exclude participants who a) gave a contradictory response in the main survey regarding their attempt to reduce gambling (n = 19), b) failed at least one of two attention checks (n = 7), and c) completed the study in under 5 minutes (n = 3). In Study 1, the final analytical sample consisted of 101 participants. Demographics are shown on Table 1. Materials are shown on Appendix B. Participants were reimbursed £0.14 for completing the prescreen and £2.65 for completing the
main survey. The present studies were approved by the University of British Columbia’s
Behavioural Research Ethics Board. Informed consent was obtained using a consent form at the
beginning of the prescreen and main survey. The main debriefing form provided participants
with problem gambling resources.

In Study 2, participants were similarly recruited on Prolific Academic. Data were
collected in April 2022. I aimed to recruit 200 participants (preregistered:
https://aspredicted.org/7WV_F89). This would allow me to detect a minimal effect size of \( r = \)
.22 at an alpha level of 0.05 and 80% power (Faul et al., 2007); an effect size that is considered
clinically meaningful (Ferguson, 2016). Participants first completed a prescreen asking, “Are you
currently trying to reduce your gambling? (\( n = 1803 \)). Those who responded “Yes” were invited
to the main study (\( n = 278 \)) of which most completed (\( n = 200 \)). As preregistered
(https://aspredicted.org/7WV_F89), data were then cleaned to exclude participants who a) gave a
contradictory response in the main survey regarding their attempt to reduce gambling (\( n = 45 \)), b)
failed at least one of two attention checks (\( n = 3 \)), and c) completed the study in under 5 minutes
(\( n = 0 \)). The final analytical sample consisted of 154 participants. Demographics are shown on
Table 1. Materials are shown on Appendix C. Participants were reimbursed £0.13 for completing
the prescreen and £2.65 for completing the main survey.

**Table 1**

*Participant Demographics Across All Studies*

<table>
<thead>
<tr>
<th></th>
<th>Study 1</th>
<th>Study 2</th>
<th>Study 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>37.0 (10.0)</td>
<td>38.85 (11.50)</td>
<td>34.8 (11.0%)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Man</td>
<td>50 (49.5%)</td>
<td>53 (40.9%)</td>
<td>100 (78.1%)</td>
</tr>
<tr>
<td>Woman</td>
<td>51 (50.5%)</td>
<td>70 (59.1%)</td>
<td>28 (21.9%)</td>
</tr>
<tr>
<td>Non-Binary</td>
<td>1 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td><strong>Cultural Background</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Study 1</td>
<td>Study 2</td>
<td>Study 3</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>African</td>
<td>3 (3.0%)</td>
<td>9 (5.8%)</td>
<td>10 (7.8%)</td>
</tr>
<tr>
<td>European</td>
<td>78 (77.2%)</td>
<td>121 (78.6%)</td>
<td>55 (43.0%)</td>
</tr>
<tr>
<td>Asian</td>
<td>16 (15.8%)</td>
<td>14 (9.1%)</td>
<td>29 (22.7%)</td>
</tr>
<tr>
<td>First Nations or Indigenous</td>
<td>0 (0.0%)</td>
<td>1 (0.6%)</td>
<td>2 (1.6%)</td>
</tr>
<tr>
<td>Hispanic or Latinx</td>
<td>1 (1.0%)</td>
<td>1 (0.6%)</td>
<td>8 (6.3%)</td>
</tr>
<tr>
<td>Middle Eastern</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>1 (0.8%)</td>
</tr>
<tr>
<td>Multicultural</td>
<td>1 (1.0%)</td>
<td>5 (3.3%)</td>
<td>13 (10.2%)</td>
</tr>
<tr>
<td>Not listed</td>
<td>2 (2.0%)</td>
<td>2 (1.3%)</td>
<td>4 (3.1%)</td>
</tr>
</tbody>
</table>

**Education**

<table>
<thead>
<tr>
<th>Education</th>
<th>Study 1</th>
<th>Study 2</th>
<th>Study 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than High School</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>2 (1.6%)</td>
</tr>
<tr>
<td>High School</td>
<td>12 (11.9%)</td>
<td>23 (14.9%)</td>
<td>12 (9.4%)</td>
</tr>
<tr>
<td>Technical/Trade Training</td>
<td>28 (27.8%)</td>
<td>51 (33.1%)</td>
<td>38 (29.7%)</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>39 (38.6%)</td>
<td>48 (31.2%)</td>
<td>58 (45.3%)</td>
</tr>
<tr>
<td>Above Bachelor’s Degree</td>
<td>22 (21.8%)</td>
<td>25 (16.2%)</td>
<td>18 (14.1%)</td>
</tr>
</tbody>
</table>

**Income**

<table>
<thead>
<tr>
<th>Income</th>
<th>Study 1</th>
<th>Study 2</th>
<th>Study 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>54108.9 (40941.4)</td>
<td>50909.1 (33579.8)</td>
<td>72343.8 (44447.3)</td>
<td></td>
</tr>
</tbody>
</table>

**Employment**

<table>
<thead>
<tr>
<th>Employment</th>
<th>Study 1</th>
<th>Study 2</th>
<th>Study 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed</td>
<td>79 (78.2%)</td>
<td>127 (82.5%)</td>
<td>98 (76.6%)</td>
</tr>
<tr>
<td>Out of work</td>
<td>11 (10.9%)</td>
<td>10 (6.5%)</td>
<td>13 (10.2%)</td>
</tr>
<tr>
<td>Student</td>
<td>8 (7.9%)</td>
<td>4 (2.6%)</td>
<td>13 (10.2%)</td>
</tr>
<tr>
<td>Retired</td>
<td>0 (0.0%)</td>
<td>3 (1.9%)</td>
<td>3 (2.3%)</td>
</tr>
<tr>
<td>Others</td>
<td>3 (3.0%)</td>
<td>10 (6.5%)</td>
<td>1 (0.8%)</td>
</tr>
</tbody>
</table>

**Marital Status**

<table>
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<tr>
<th>Marital Status</th>
<th>Study 1</th>
<th>Study 2</th>
<th>Study 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single, never married</td>
<td>46 (45.5%)</td>
<td>51 (33.1%)</td>
<td>70 (54.7%)</td>
</tr>
<tr>
<td>Married or partnered</td>
<td>45 (44.6%)</td>
<td>91 (59.1%)</td>
<td>51 (39.8%)</td>
</tr>
<tr>
<td>Divorced or separated</td>
<td>10 (9.9%)</td>
<td>12 (7.8%)</td>
<td>7 (5.5%)</td>
</tr>
</tbody>
</table>

**Note.** Participant demographics for Study 1 \( n = 101 \), Study 2 \( n = 154 \), and Study 3 \( n = 128 \).

**Measures**

**Justifications.** Participants were presented with a list of potential justifications adapted from previous work on unhealthy eating (De Witt Huberts et al., 2014a; Prinsen et al., 2019), consumer behaviour (Feuer & Haws, 2022), and qualitative reports on problem gambling (Oakes et al., 2019). In Study 1, participants were presented with 31 justifications to gambling. I asked participants to recall a period in their lives when they were trying to reduce or quit gambling and whether they had used any of the following thoughts to justify gambling. Example items include “I’ve been working hard,” “I have something to celebrate,” and “I’ve completed a payment plan.” Response options were binary, 1 (Yes) and 0 (No). A preliminary version of the scale was presented to problem gambling counsellors at Gambling Support BC
(https://www.gamblingsupportbc.ca/) to confirm that the items were recognized in the context of problem gambling; several improvements were made based on this feedback. In Study 2, I refined the items and modified the scale. Participants were presented with 19 justifications to gamble. They were asked how frequently they used each thought to justify gambling on a scale ranging from 0 (Never) to 3 (Always). Items were summed in Study 1 and averaged in Study 2. Higher scores corresponded to using more justifications in Study 1 and using justifications more frequently in Study 2. Reliability was good (Study 1: $\alpha = .87$; Study 2: $\alpha = .93$).

**Trait Impulsivity.** Trait impulsivity was assessed using the UPPS-P Impulsive Behaviour Scale (Cyder et al., 2014). Responses were made on a scale ranging from 1 (Strongly Agree) to 4 (Strongly Disagree). There are five subscales: Negative Urgency (e.g., “When I am upset I often act without thinking”), Lack of Perseveration (e.g., “I generally like to see things through to the end”), Lack of Premeditation (e.g., “My thinking is usually careful and purposeful”), Sensation Seeking (e.g., “I quite enjoy taking risks”), and Positive Urgency (e.g., “I tend to act without thinking when I am really excited”). Items were averaged within each subscale. Higher scores corresponded to higher impulsivity. Reliability was good (Study 1: $\alpha = .71 – .91$; Study 2: $\alpha = .72 – .85$).

**Cognitive Distortions.** Cognitive distortions were measured using the Gambling-Related Cognitions Scale (GRCS; Raylu & Oei, 2004a). The GRCS consists of 23 items ranging from 1 (Strongly Disagree) to 7 (Strongly Agree) with five subscales: Gambling Expectancies (e.g., “gambling makes things seem better”), Illusion of Control (e.g., “praying helps me win”), Predictive Control (e.g., “losses when gambling are bound to be followed by a series of wins”), Inability to Stop Gambling (e.g., “I can’t function without gambling”), and Interpretive Bias (e.g., “relating my winnings to my skill and ability makes me continue gambling”). Items were
averaged within each subscale. Higher scores corresponded to higher cognitive distortions. Reliability was good (Study 1: $\alpha = .73 – .91$; Study 2: $.75 – .87$).

**Problem Gambling Severity.** The problem gambling severity index (PGSI; Ferris & Wynne, 2001) consists of nine items. Example items include, “Have you bet more than you could really afford to lose?”, “Have you borrowed money or sold anything to gamble?”, and “Has gambling caused you any health problems, including stress or anxiety?” Responses ranged from 0 (*Never*) to 3 (*Almost Always*). Scores were summed. Higher scores corresponded to more severe problem gambling. Reliability was strong (Study 1: $\alpha = .87$; Study 2: $\alpha = .88$).

**Data Analysis**

A series of confirmatory factor analyses were conducted to test for model fit of the justification items. Pearson correlations were used to examine the relationship between justifications, UPPS-P, and GRCS. To test the degree to which justifications were associated with problem gambling severity, I conducted hierarchical multiple regressions with problem gambling severity as the dependent variable and justifications, UPPS-P, and GRCS as the independent variables. In Step 1, I entered demographic factors (age and gender). In Step 2, I added the UPPS-P subscales. In Step 3, I added the GRCS subscales. Lastly, in Step 4, I added the score for gambling justifications. All analyses were conducted using R Studio Version 4.2. Confirmatory factor analyses were conducted using the lavaan package (Rosseel, 2012). Appendix A shows all the departures from my Study 2 preregistration.

**Results**

**Confirmatory Factor Analyses for Justification Models**

Table 2 shows descriptive statistics of all justification items. The comprehensive list of justifications were tested for model fit. First, I tested the fit for a one-factor solution using all
items. In Study 1, loading all 31 items onto a single factor resulted in poor model fit, $\chi^2(434) = 734.69, p < .001$, comparative fit index (CFI) = .603, root mean square error of approximation (RMSEA) = .083, standardized root mean residual (SRMR) = .104. Items that showed face overlap with negative affect (4 items) and cognitive distortions (4 items) as well as had low loadings ($< .35$; 8 items) were excluded and the model was run again. This refined list of items showed good fit for a one-factor solution, $\chi^2(77) = 90.16, p = .145$, CFI = .960, RMSEA = .041, SRMR = .065. Crucially, the reduced survey had a significantly better fit than when all items were included, $\Delta \chi^2(357) = 644.53, p < .001$.

In Study 2, I added two new items related to the future use of self-control as a justification and an item related to social motives. However, these items worsened model fit, $\chi^2(48) = 184.38, p < .001$, so were not included in the following analyses. As with Study 1, after removing items that showed face overlap with negative affect (3 items), the model showed good fit for a one-factor solution, $\chi^2(65) = 133.46, p < .001$, CFI = .927, RMSEA = .083, SRMR = .054, and better than had the negative items been included, $\chi^2(104) = 270.12, p < .001$, CFI = .867, RMSEA = .102, SRMR = .067; $\Delta \chi^2(39) = 136.65, p < .001$. All item loadings were sufficient. For both studies, the main findings reported here are also supported when using the full list of items to compute a score for justifications.
Table 2

Descriptive Statistics for Each Justification Item

<table>
<thead>
<tr>
<th>Study 1 Items</th>
<th>M (SD)</th>
<th>Study 2 Items</th>
<th>M (SD)</th>
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<tbody>
<tr>
<td>I’ve been working hard</td>
<td>.54 (.50)</td>
<td>I’ve been working hard</td>
<td>2.58 (1.06)</td>
</tr>
<tr>
<td>I made an effort</td>
<td>.40 (.49)</td>
<td>I’ve been feeling tired</td>
<td>1.78 (.95)</td>
</tr>
<tr>
<td>I feel tired</td>
<td>.26 (.44)</td>
<td>I’ve made progress on a goal</td>
<td>2.23 (1.15)</td>
</tr>
<tr>
<td>I used self-control</td>
<td>.49 (.50)</td>
<td>I’ve been on top of my responsibilities</td>
<td>2.34 (1.18)</td>
</tr>
<tr>
<td>I made progress on a goal</td>
<td>.34 (.47)</td>
<td>I’ve received positive feedback in my job or home life</td>
<td>1.90 (0.96)</td>
</tr>
<tr>
<td>I completed a task</td>
<td>.33 (.47)</td>
<td>I’ve been feeling down</td>
<td>2.28 (1.11)</td>
</tr>
<tr>
<td>I received positive feedback</td>
<td>.26 (.44)</td>
<td>I’ve been feeling bored</td>
<td>2.89 (1.04)</td>
</tr>
<tr>
<td>I did a good job</td>
<td>.42 (.50)</td>
<td>I’ve been feeling stressed</td>
<td>2.37 (1.07)</td>
</tr>
<tr>
<td>I had a busy period behind me</td>
<td>.28 (.45)</td>
<td>I have something to celebrate</td>
<td>2.42 (1.11)</td>
</tr>
<tr>
<td>I’m feeling stressed</td>
<td>.53 (.50)</td>
<td>I’ve been feeling good about myself</td>
<td>2.47 (1.06)</td>
</tr>
<tr>
<td>I feel bad about myself</td>
<td>.42 (.50)</td>
<td>I had an unexpected windfall</td>
<td>2.72 (1.10)</td>
</tr>
<tr>
<td>I feel bored</td>
<td>.71 (.45)</td>
<td>I’m on holiday</td>
<td>2.15 (1.21)</td>
</tr>
<tr>
<td>I feel sad</td>
<td>.46 (.50)</td>
<td>I’ve already paid my essential bills</td>
<td>2.84 (1.14)</td>
</tr>
<tr>
<td>I find other activities unrewarding</td>
<td>.42 (.50)</td>
<td>I have a surplus of money</td>
<td>2.98 (1.08)</td>
</tr>
<tr>
<td>I feel good about myself</td>
<td>.47 (.50)</td>
<td>I’ve received a gambling tip</td>
<td>2.48 (1.22)</td>
</tr>
<tr>
<td>I have something to celebrate</td>
<td>.47 (.50)</td>
<td>I’ve set a spending limit</td>
<td>2.85 (1.18)</td>
</tr>
<tr>
<td>I had some good luck</td>
<td>.59 (.49)</td>
<td>Because after today, I will not gamble anymore</td>
<td>2.20 (1.16)</td>
</tr>
<tr>
<td>I received good news</td>
<td>.24 (.43)</td>
<td>Because after today, I won’t be able to gamble anymore</td>
<td>2.15 (1.17)</td>
</tr>
<tr>
<td>I was on holiday</td>
<td>.28 (.45)</td>
<td>My friends are going gamble</td>
<td>2.33 (1.28)</td>
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<td>I failed at something</td>
<td>.23 (.42)</td>
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<tr>
<td>I had some bad luck</td>
<td>.39 (.49)</td>
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<tr>
<td>I received bad news</td>
<td>.24 (.43)</td>
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<tr>
<td>I had an unexpected windfall</td>
<td>.32 (.47)</td>
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<tr>
<td>I got a good deal on a purchase</td>
<td>.29 (.45)</td>
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<tr>
<td>I’ve already paid my essential bills for the month</td>
<td>.68 (.47)</td>
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<tr>
<td>I’ve completed a payment plan</td>
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<tr>
<td>I have a surplus of money</td>
<td>.57 (.50)</td>
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<tr>
<td>I received a gambling tip</td>
<td>.41 (.49)</td>
<td></td>
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<tr>
<td>I’ve set a spending limit</td>
<td>.66 (.47)</td>
<td></td>
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<tr>
<td>I feel like my skill is improving</td>
<td>.36 (.48)</td>
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<tr>
<td>I feel like my chances of winning are high</td>
<td>.68 (.47)</td>
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Note. All Study 2 items were followed by “(so I can gamble)”. Bolded items were included in the main analyses.
Table 3
Descriptive Statistics and Bivariate Correlations

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<td>.42***</td>
<td>.45***</td>
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</table>

Note. Values represent r. *p < .05, **p < .01, ***p < .001.
Descriptive Statistics and Correlations

In Study 1, participants reported having used 5.12 (SD = 4.02) justifications from a list of 15. The most endorsed justifications were “I’ve been working hard,” “I feel good about myself,” and “I have something to celebrate,” with around 50% of participants reporting that they use these thoughts to justify gambling. For our frequency scale in Study 2, participants reported experiencing justifications rarely to sometimes on average (M = 2.46, SD = .79). The most frequent justifications were “I’ve received a surplus of money,” “I’ve paid my essential bills,” and “I’ve set a spending limit.” The average PGSI score was 6.63 in Study 1 (SD = 4.58) and 6.85 in Study 2 (SD = 4.57), indicating that our samples had relatively high levels of problem gambling. For both Studies 1 and 2, the most common gambling forms in the past year were purchasing lottery tickets (Study 1: 77%; Study 2: 86%), instant win/scratch cards (Study 1: 66%; Study 2: 69%), and betting on sports events (Study 1: 65%; Study 2: 69%).

Descriptive statistics and bivariate correlations between justifications, UPPS-P, and GRCS are shown on Table 3. Also shown on the heat maps on Figure 1, for UPPS-P, justifications showed significant positive correlations with Negative Urgency and Positive Urgency subscales, but not with the Lack of Premeditation, Lack of Perseverance, or Sensation Seeking subscales. For GRCS, justifications showed significant positive correlations with all five subscales: Illusion of Control, Predictive Control, Interpretative Bias, Gambling Expectancies, and the Inability to Stop Gambling. Similarly, Negative Urgency and Positive Urgency were also correlated with these five GRCS subscales. Conversely, Lack of Premeditation was only consistently correlated with the Inability to Stop Gambling. Lack of Perseverance and Sensation Seeking were not consistently correlated with any of the GRCS subscales.
Figure 1

Bivariate Correlations Among Predictor Variables

Note. Heat map showing bivariate correlations among predictor variables in Study 1 (left) and Study 2 (right). The size of the squares and the color intensity represents the effect size. The color shows the direction: Redder indicates a stronger positive correlation and bluer represents a stronger negative correlation.

Multiple Regressions Predicting Problem Gambling Severity

I was primarily interested in examining the association between justifications and problem gambling severity and whether this could be explained by impulsivity and cognitive distortions. Multiple regressions predicting PGSI is shown on Table 4. In Step 1, I entered age and gender, which did not explain significant variance in PGSI scores. Next, in Step 2, I added UPPS-P subscales, explaining an additional 30% of variance in PGSI. Negative Urgency, $\beta = .35, 95\%$ CI [.13, .57], $p < .002$, and Positive Urgency, $\beta = .36, 95\%$ CI [.14, .58], $p = .002$, were
positively associated with PGSI. In Step 3, I added GRCS subscales which explained an additional 19% of variance in PGSI in which Inability to Stop Gambling was significant, $\beta = .51$, 95% CI [.31 .71], $p < .001$. Lastly, in Step 4, adding justifications significantly explained a further 4% of variance in PGSI. The final model explained 53% of the total variance in PGSI. In the final model, justifications, $\beta = .25$, 95% CI [.07, .43], $p = .007$, Positive Urgency, $\beta = .24$, 95% CI [.04, .44], $p = .021$, (lower) Lack of Premeditation, $\beta = -.21$, 95% CI [-.40, -.02], $p = .027$, Lack of Perseverance, $\beta = .21$, 95% CI [.03, .38], $p = .024$, and Inability to Stop Gambling, $\beta = .54$, 95% CI [.35, .74], $p < .001$, were each associated with PGSI scores.

Table 4

Multiple Linear Regressions Predicting Problem Gambling Severity

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<tr>
<td>Inability to Stop</td>
<td>---</td>
<td>.51***</td>
</tr>
<tr>
<td>Justifications</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>.00</td>
<td>.30</td>
</tr>
<tr>
<td>Change in $R^2$</td>
<td>.00</td>
<td>.30</td>
</tr>
<tr>
<td>F-value</td>
<td>.99</td>
<td>9.42***</td>
</tr>
</tbody>
</table>

Note. Values represent $\beta$. *$p < .05$, **$p < .01$, ***$p < .001$.

The main findings were replicated in Study 2. In Step 1, I added age and gender which did not explain significant variance in PGSI. In Step 2, I entered UPPS-P subscales, explaining an additional 16% of variance in PGSI. Positive Urgency was significantly associated with PGSI,
\( \beta = .26, 95\% \text{ CI } [.03, .49], p = .024 \). In Step 3, I entered GRCS subscales which further explained 30\% of variance in PGSI. Interpretative Bias, \( \beta = .27, 95\% \text{ CI } [.06, .48], p = .011 \), (lower) Gambling Expectancies, \( \beta = -.24, 95\% \text{ CI } [-.43, -.10], p = .012 \), and Inability to Stop Gambling, \( \beta = .49, 95\% \text{ CI } [.32, .66], p < .001 \), were associated with PGSI. Lastly, in Step 4, justifications were added which significantly explained an additional 10\% of variance in PGSI. The final model explained 51\% of the total variance in PGSI in which justifications, \( \beta = .29, 95\% \text{ CI } [.14, .45], p < .001 \), (lower) Gambling Expectancies, \( \beta = -.30, 95\% \text{ CI } [-.45, -.15], p = .003 \), and Inability to Stop Gambling, \( \beta = .49, 95\% \text{ CI } [.34, .63], p < .001 \), were significantly associated with PGSI.

**Discussion**

In Studies 1 and 2, I found that justifications were associated with problem gambling severity; and this relationship remained significant even after controlling for impulsivity and cognitive distortions. There were some slight improvements made moving from Study 1 to Study 2. First, Study 1 comprised of gamblers who had experience with trying to reduce their gambling but not necessarily currently trying to reduce their gambling. This may have created a disconnect between their reported justifications, which could have been from over a year ago, and their PGSI scores as a key dependent variable, which asked about symptoms within the past year. Thus, in Study 2, I recruited a sample of gamblers who were currently trying to reduce their gambling. Second, Study 1 used an exhaustive list of justifications with a binary response option. This was intended to minimize demand characteristics and establish whether there were justifications that were particularly endorsed. However, none of the items were endorsed by most gamblers (i.e., all of them were endorsed by under 50\% of participants), indicating that the use of justifications may be idiosyncratic. In Study 2, I refined the list of justifications and used a
frequency scale instead for increased sensitivity. These findings suggest that, in addition to impulsivity and cognitive distortions, justifications may also contribute to problem gambling.

Although I provide evidence that justifications are associated with problem gambling severity, it remains unclear whether they actually drive engagement in gambling. Justifications should promote choices for vices over virtues. So, they should not only be associated with problem gambling symptoms but also be associated with actual gambling behaviour. Justifications should enable people to go gamble. Thus, in Study 3, I conducted a 21-day daily diary study to test the relationship between daily experiences of justifications and gambling behaviour. Additionally, I examined whether their relationship could be explained by changes in cravings, positive affect, and negative affect, which are established transient correlates of gambling. Using such design not only offered greater ecological validity and reduced recall bias but also allowed me to track changes and patterns over time, giving me the opportunity to test whether justifications are associated with prospective gambling behaviour.

Chapter 3: Ecological Momentary Assessment (Study 3)

Methods

Participants and Procedure

Participants living North America were recruited on Prolific Academic. Data were collected in April 2023. Participants were first invited to a short prescreen survey \((n = 3000)\). Those who indicated that they had gambled in the past week, were currently trying to reduce their gambling, and interested in participating in the daily diary were invited to the baseline study \((n = 220)\) of which most completed and were enrolled in the daily diary study \((n = 182)\). The daily surveys opened every evening between 5 and 8 p.m. and closed on the following day between 3 and 6 a.m. Data were cleaned to exclude participants who a) did not go on to complete
any of the daily surveys \((n = 31)\), b) did not report gambling at least once over the 21 days \((n = 26)\), and c) submitted duplicate daily responses \((n = 25)\). Our final analytical sample consisted of 128 participants. The completion rate was 80% (2144 reports). Table 1 shows participant demographics. Materials are shown on Appendix D. Participants were reimbursed £1.50 for the baseline survey and £0.30 for each daily diary with a bonus of £0.30 for completing at least five daily diaries each week. The study was approved by the University of British Columbia’s Behavioural Research Ethics Board. Informed consent was obtained using a consent form at the beginning of the prescreen and main survey. After the conclusion of the 21-day window, a debriefing form was sent participants that also provided problem gambling resources.

**Measures**

**Daily Justifications.** To measure justifications, I asked participants “We experience numerous thoughts every day. Reflecting on today, how frequently did you have the following thoughts?” I intentionally did not ask about justifications to gamble per se to reduce demand characteristics and to avoid giving participants reasons that may encourage them to gamble. The key assumption here is that these thoughts may be later used to justify gambling. Participants were then presented with 7 justification items that were selected from the survey in Study 2. The items were “I’ve worked hard,” “I’ve made good progress on my goals/tasks,” “I’ve been on top of my responsibilities,” “I’ve been feeling down,” “I’ve been feeling bored,” “I’ve been on top of my bills,” and “I’ve got a surplus of money.” Response options ranged from 0 (Never) to 3 (Almost). Items were averaged. Higher scores corresponded to more frequent justifications. Following standard guidelines (Nezlek, 2017), within-person reliability was acceptable \((\alpha = .58)\) and between-person reliability was high \((\alpha = .94)\).
Daily Cravings. To measure daily gambling cravings, participants were asked, “How strong were your gambling cravings today?” Responses were made on a slider ranging from 0 (None) to 100 (Very Much). Higher scores corresponded to stronger daily cravings.

Daily Affect. The Positive and Negative Affect Schedule (PANAS) was used to assess daily positive affect and daily negative affect (Watson & Clark, 1988). Participants were asked, “Please indicate the extent you have felt these ways over the course of today.” The scale consists of 20 items. Responses were made on slider ranging from 0 (Not at all) to 100 (Extremely). Example items for positive affect include “Excited,” “Proud,” and “Determined.” Example items for negative affect include “Upset,” “Guilty,” and “Afraid.” Responses were made on slider ranging from 1 (Not at all) to 5 (Extremely). Higher scores were summed and averaged where higher scores corresponded to higher positive or negative affect. For positive affect, within-person reliability was good ($\alpha = .78$) and between-person reliability was high ($\alpha = .96$). Similarly, within-person reliability was good ($\alpha = .82$) and between-person reliability was high ($\alpha = .98$) for negative affect.

Daily Gambling Involvement. Given that people often gamble in the evening and night, participants may have gone to gamble after completing the survey. Thus, they were asked to report whether they had gambled on the previous day (Yi et al., 2023). Response options were binary, 1 (Yes) and 0 (No). If participants reported they had gambled, they were then asked how many hours they gambled, how much money (in dollars) they had intended to spend on gambling, and how much they actually spent on gambling yesterday.

Individual Differences. In the baseline survey, participants completed the UPPS-P to assess impulsivity (Cyder et al., 2014), GRCS to assess cognitive distortions (Raylu & Oei, 2004a), and PGSI to assess problem gambling severity (Ferris & Wynne, 2001).
**Data Analysis**

To examine the degree to which justifications were associated with next-day gambling beyond daily cravings, positive affect, and negative affect, I conducted multilevel modelling with two levels. Daily reports (Level 1) were nested within persons (Level 2). Random intercepts were allowed for each person. Level 1 predictors were standardized using person-level means and standard deviations (Wang et al., 2019). Level 2 predictors were standardized using grand means and standard deviations. The averages of daily predictors were included in the main analyses to simultaneously test for within- and between-person effects on gambling. I also included three sets of covariates. First, the outcome variable, gambling, was added as a covariate to control for possible effects of gambling on subsequent gambling. Second, to control for time trends in responses, reporting day (mean-centered on day 11) was added as a covariate. Third, to control for more proximal links with next-day gambling, next-day predictors were added as covariates. Analyses were conducted in R Studio Version 4.2. Multilevel modelling was conducted using the lme4 package (Bates et al., 2015).

**Results**

**Confirmatory Factor Analyses for Justification Models**

As with Studies 1 and 2, I first refined the list of justifications. Items that showed face overlap with negative affect (3 items) or had low loadings (< .35; 1 item) were not included. This whittled our list of justifications from 7 to 4. The remaining items (“I’ve worked hard, “I’ve made good progress on my goals/tasks,” “I’ve been on top of my responsibilities,” and “I’ve been on top of my bills”) showed excellent fit for a one-factor solution, $\chi^2(4) = 30.34, p < .001$, CFI = .988, RMSEA = .055, SRMR (within) = .018, SRMR (between) = .022. Despite having reduced items, it showed better fit than when all the items were included, $\chi^2(28) = 447.71, p <$
.001, CFI = .858, RMSEA = 0.84, SRMR (within) = .062, SRMR (between) = .140; \Delta \chi^2(62) = 212.39, p < .001; \Delta \chi^2(24) = 417.38, p < .001.\footnote{1 In contrast to Studies 1 and 2, the main effect of justifications on gambling in Study 3 changes and no longer remains significant when the full list of items are used to compute a score for justifications.}

**Descriptive Statistics and Correlations**

Across the 21 days, participants reported having justifications sometimes on average (\(M = 3.24, SD = .50\)). As with Studies 1 and 2, most of our participants showed relatively high levels of problem gambling, scoring an average PGSI of 8.31 (\(SD = 5.27\)). Gambling was reported on 36.8% of the days. The most common gambling forms were purchasing a lottery ticket or instant win/scratch card (35%), betting on sports events (37%), and playing slot machines (21%). On average, participants gambled for 1.79 hours (\(SD = .88\)) per gambling day and reported spending 177.7 dollars (\(SD = 196.05\)) on gambling per gambling day, of which 73.36 dollars (\(SD = 139.58\)) were reported to be over budget based on their intended spending. This indicates that our sample of regular gamblers displayed evidence of self-control failure, at least in terms of spendings, over the 3-week duration of the study. Intraclass correlation coefficients (ICC) showed that 29% of the variation in justifications, 60% of the variation in cravings, 32% of the variation in positive affect, 31% of the variation in negative affect, and 74% of the variation in gambling were at the within-person level.

Table 5 shows descriptive statistics and bivariate correlations between justifications, cravings, positive affect, negative affect, and gambling. At the within-person level, justifications was correlated with higher positive affect and lower negative affect. In contrast, cravings was correlated with lower positive affect and higher negative affect. As expected, positive affect was negatively correlated with negative affect at the within-person level. At the between-person
level, justifications was correlated with higher positive affect and lower negative affect, whereas cravings was correlated with higher negative affect. In terms of gambling, even though the only significant correlate at the between-person level was cravings, justifications, cravings, and positive affect were positively correlated with next-day gambling. The only variable that was significantly correlated with the other gambling indices, gambling duration and overspending, was justifications which showed a negative correlation with next-day gambling duration.

Table 5

Descriptive Statistics and Bivariate Correlations Among Daily Variables

<table>
<thead>
<tr>
<th>Descriptives</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>3.24</td>
<td>33.46</td>
<td>42.17</td>
<td>16.21</td>
<td>.38</td>
<td>1.79</td>
<td>73.36</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>.88</td>
<td>19.53</td>
<td>18.76</td>
<td>15.52</td>
<td>.28</td>
<td>1.28</td>
<td>235.38</td>
</tr>
<tr>
<td>Range</td>
<td>1.05-5</td>
<td>.01-86.67</td>
<td>2.87-95.98</td>
<td>0-66.85</td>
<td>0-1</td>
<td>0-9.5</td>
<td>-100-1680</td>
</tr>
<tr>
<td>Reliability (Within)</td>
<td>.58</td>
<td>---</td>
<td>.78</td>
<td>.82</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Reliability (Between)</td>
<td>.94</td>
<td>---</td>
<td>.96</td>
<td>.98</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
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<table>
<thead>
<tr>
<th>Within-Person</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
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<tbody>
<tr>
<td>1. Justifications</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2. Cravings</td>
<td>-.14***</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>3. PA</td>
<td>.38***</td>
<td>-.06**</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>4. NA</td>
<td>-.21***</td>
<td>.26***</td>
<td>-.16***</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>5. Next-Day Gamble</td>
<td>.07**</td>
<td>.05*</td>
<td>.05*</td>
<td>-.03</td>
<td>---</td>
</tr>
<tr>
<td>6. Next-Day Duration</td>
<td>-.10*</td>
<td>.04</td>
<td>-.02</td>
<td>-.03</td>
<td>---</td>
</tr>
<tr>
<td>7. Next-Day Overspend</td>
<td>-.03</td>
<td>.05</td>
<td>-.01</td>
<td>.03</td>
<td>.10*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Between-Person</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Average Justifications</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
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</tr>
<tr>
<td>2. Average Cravings</td>
<td>-.08</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>3. Average PA</td>
<td>.55***</td>
<td>.11</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>4. Average NA</td>
<td>-.25***</td>
<td>.52***</td>
<td>-.06</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>5. Average Gambling</td>
<td>.07</td>
<td>.40***</td>
<td>.04</td>
<td>.12</td>
<td>---</td>
</tr>
<tr>
<td>6. Average Duration</td>
<td>-.14</td>
<td>.29***</td>
<td>.10</td>
<td>.09</td>
<td>.02</td>
</tr>
<tr>
<td>7. Average Overspend</td>
<td>.04</td>
<td>.08</td>
<td>.09</td>
<td>.17</td>
<td>.02</td>
</tr>
</tbody>
</table>

Note. Values represent r. *p < .05, **p < .01, ***p < .001.

Table 6 shows bivariate correlations between trait measures and daily measures. Justifications was negatively correlated with Lack of Perseverance and Lack of Premeditation. Cravings was positively correlated with all GRCS subscales. Positive affect was negatively
correlated with Lack of Premeditation and Lack of Perseverance, as well as some GRCS subscales. Negative affect was positively correlated with Negative Urgency and Positive Urgency as well as most GRCS subscales. As with the averaged daily measures, most trait measures were not closely correlated with gambling aggregated over the 21 days. The only significant predictor of gambling was the GRCS subscale Inability to Stop Gambling which showed a modest correlation with gambling. Similarly, for the other gambling indices, only PGSI and Inability to Stop Gambling was significantly correlated with gambling duration. PGSI was also significantly correlated with overspending.

Table 6

Bivariate Correlations Between Trait and Daily Variables

<table>
<thead>
<tr>
<th></th>
<th>Justification</th>
<th>Craving</th>
<th>PA</th>
<th>NA</th>
<th>Gamble</th>
<th>Duration</th>
<th>Overspend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Gambling</td>
<td>-.10</td>
<td>.41***</td>
<td>-.06</td>
<td>.43</td>
<td>.09</td>
<td>.32***</td>
<td>.19*</td>
</tr>
<tr>
<td>Negative Urgency</td>
<td>-.19*</td>
<td>.15</td>
<td>-.20*</td>
<td>.40***</td>
<td>.06</td>
<td>.10</td>
<td>.09</td>
</tr>
<tr>
<td>Positive Urgency</td>
<td>-.04</td>
<td>.12</td>
<td>-.04</td>
<td>.35***</td>
<td>.03</td>
<td>.09</td>
<td>.17</td>
</tr>
<tr>
<td>Lack Premed</td>
<td>-.31***</td>
<td>.00</td>
<td>-.32***</td>
<td>.20*</td>
<td>-.06</td>
<td>.08</td>
<td>.13</td>
</tr>
<tr>
<td>Lack Pers</td>
<td>-.24**</td>
<td>-.13</td>
<td>-.29***</td>
<td>.02</td>
<td>-.02</td>
<td>-.02</td>
<td>.08</td>
</tr>
<tr>
<td>Sensation Seeking</td>
<td>.09</td>
<td>.02</td>
<td>.17</td>
<td>.05</td>
<td>.05</td>
<td>.02</td>
<td>-.01</td>
</tr>
<tr>
<td>Illusion of Control</td>
<td>.16</td>
<td>.28***</td>
<td>.26**</td>
<td>.25**</td>
<td>.11</td>
<td>.14</td>
<td>-.01</td>
</tr>
<tr>
<td>Predictive Control</td>
<td>.16</td>
<td>.26***</td>
<td>.18*</td>
<td>.25**</td>
<td>.12</td>
<td>.07</td>
<td>-.12</td>
</tr>
<tr>
<td>Interpretative Bias</td>
<td>.06</td>
<td>.31***</td>
<td>.19*</td>
<td>.32***</td>
<td>.05</td>
<td>-.09</td>
<td>-.10</td>
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<tr>
<td>Expectancies</td>
<td>.17</td>
<td>.35***</td>
<td>.28**</td>
<td>.15</td>
<td>.12</td>
<td>.07</td>
<td>-.13</td>
</tr>
<tr>
<td>Inability to Stop</td>
<td>-.17*</td>
<td>.47***</td>
<td>-.10</td>
<td>.38***</td>
<td>.21*</td>
<td>.30***</td>
<td>.12</td>
</tr>
</tbody>
</table>

Note. Values represent $r$. $^* p < .05$, $^** p < .01$, $^*** p < .001$.

Multilevel Logistic Regressions Predicting Next-Day Gambling

I was primarily interested in examining the association between justifications and next-day gambling and whether this relationship would remain when controlling for cravings and affect. Multilevel logistic regression predicting next-day gambling is shown on Table 7. Also shown on Figure 2, justifications was significantly associated with next-day gambling, OR = 1.15, 95% CI [1.01, 1.32], $p = .040$. People with a one standard deviation increase in
justifications on day \( t \) relative to their usual were 15\% more likely to gamble on day \( t + 1 \).

Negative affect was also significantly associated with next-day gambling, though negatively, OR = 0.85, 95\% CI [0.74, 0.97], \( p = .017 \). People with a one standard deviation increase in negative affect on day \( t \) relative to their usual were 15\% less likely to gamble on day \( t + 1 \). In contrast, cravings and positive affect were not significantly associated with next-day gambling. The only significant same-day predictor of gambling was cravings, OR = .37, 95\% CI [1.27, 1.65], \( p < .001 \). People with a one standard deviation increase in cravings on day \( t + 1 \) were 37\% more likely to gamble on day \( t + 1 \). Next-day justifications, next-day positive affect, and next-day negative affect were not significantly associated with next-day gambling.

### Table 7

**Multilevel Logistic Regressions Predicting Next-Day Gambling**

<table>
<thead>
<tr>
<th></th>
<th>( \beta )</th>
<th>OR</th>
<th>95% CI</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Same-Day Predictors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Justifications</td>
<td>0.14</td>
<td>1.15</td>
<td>1.01, 1.32</td>
<td>.040</td>
</tr>
<tr>
<td>Cravings</td>
<td>0.11</td>
<td>1.12</td>
<td>0.98, 1.28</td>
<td>.093</td>
</tr>
<tr>
<td>Positive Affect</td>
<td>0.02</td>
<td>1.02</td>
<td>0.90, 1.17</td>
<td>.739</td>
</tr>
<tr>
<td>Negative Affect</td>
<td>-0.17</td>
<td>0.85</td>
<td>0.74, 0.97</td>
<td>.017</td>
</tr>
<tr>
<td>Gambling</td>
<td>-0.19</td>
<td>0.82</td>
<td>0.60, 1.13</td>
<td>.227</td>
</tr>
<tr>
<td>Reporting Day</td>
<td>-0.03</td>
<td>0.97</td>
<td>0.94, 0.99</td>
<td>.004</td>
</tr>
<tr>
<td><strong>Next-Day Predictors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Justifications</td>
<td>-0.11</td>
<td>0.89</td>
<td>0.78, 1.02</td>
<td>.097</td>
</tr>
<tr>
<td>Cravings</td>
<td>0.39</td>
<td>1.47</td>
<td>1.28, 1.69</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Positive Affect</td>
<td>0.07</td>
<td>1.07</td>
<td>0.94, 1.22</td>
<td>.287</td>
</tr>
<tr>
<td>Negative Affect</td>
<td>0.04</td>
<td>1.05</td>
<td>0.91, 1.20</td>
<td>.518</td>
</tr>
<tr>
<td><strong>Between-Persons</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Justifications</td>
<td>0.32</td>
<td>1.38</td>
<td>0.95, 2.00</td>
<td>.094</td>
</tr>
<tr>
<td>Cravings</td>
<td>0.79</td>
<td>2.20</td>
<td>1.54, 3.15</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Positive Affect</td>
<td>-0.09</td>
<td>0.92</td>
<td>0.64, 1.30</td>
<td>.625</td>
</tr>
<tr>
<td>Negative Affect</td>
<td>-0.15</td>
<td>0.86</td>
<td>0.62, 1.19</td>
<td>.362</td>
</tr>
</tbody>
</table>

*Note.*

**Figure 2**

*Scatterplots Showing Relationships Among Daily Variables*
I also examined whether the relationship between justifications and next-day gambling was moderated by the other variables. As shown on Figure 3, there was a significant interaction between justifications and next-day positive affect on next-day gambling, OR = 0.83, 95% CI [0.73, 0.95], \( p = .007 \). Breaking down this interaction, there was a positive relationship between justifications and next-day gambling when next-day positive affect was low (-1 SD), OR = 1.40, 95% CI [1.15, 1.70], \( p < .001 \), but not when next-day positive affect was high (+1 SD), OR = 0.97, 95% CI [0.80, 1.16], \( p = .712 \). In other words, people with a one standard deviation increase in justifications on day \( t \) were 40% more likely to gamble on day \( t + 1 \) when they also had a one-standard deviation decrease in positive affect on day \( t + 1 \). The relationship between justifications and next-day gambling were not significantly moderated by next-day craving, next-day negative affect, nor PGSI, UPPS-P subscales, and GRCS subscales.
Chapter 4: General Discussion

Problem gambling is often viewed as resulting from heightened impulsivity which conventionally involves action without thinking. However, people may also deliberately and intentionally use justifications to grant themselves permission to gamble. In the present research, across three studies, I recruited gamblers who had experience with or were currently trying to reduce their gambling, to determine whether justifications were associated with problem gambling severity and gambling behaviour. In Studies 1 and 2, I found that justifications to gamble were associated with problem gambling severity even when controlling for impulsivity and cognitive distortions, two well-established cognitive features of problem gambling. Furthermore, gamblers reported gambling justifications related to effort and achievement, in line with previous work in the context of unhealthy eating and consumer behaviour (De Witt Huberts et al., 2014a; Feurer & Haws, 2022), and also justifications related to finances which may be more selective to gambling (Oakes et al., 2019). In Study 3, using a daily diary method, I found
that justifications were associated with gambling on the following day which could not be accounted for by changes in daily cravings and affect. These findings suggest that the use of justifications may be an important cognitive aspect of problem gambling.

From the perspective of dual process models of self-control, my findings suggest that reflective processes can also contribute to problem gambling in addition to the much wider literature on automatic processes. This is in line with recent critique of the dominance of impulsivity as a determining factor in addictions (Strickland & Johnson, 2021). The present findings also extends prior research showing that people use justifications to consume unhealthy foods and other hedonic products (De Witt Huberts et al., 2014a; Feurer & Haws, 202; Kivetz & Zhang, 2002; Rishika et al., 2022), showing that such use may not only acutely increase unhealthy choices but may also be linked with problematic behaviours in the long-run. The function of justifications remains unclear. Justifications may serve to reduce the conflict that emerges from cravings (Prinsen et al., 2019). Another possibility is that they reduce the prospective guilt or regret that is caused by gambling (Lyons et al., 2019, Yi & Kanetkar, 2011). Yet another possibility is that justifications may be driven by negative affect that is associated with foregoing engagement in a desirable activity (Rishika et al., 2022). Future studies are required to answer these open questions, but here I provide initial evidence that justifications are related to problem gambling, hinting that they may play an important role in addictive behaviours and warranting future research.

These results are in line with the cognitive model of substance use which suggest that people use permissive beliefs to allow themselves to engage in addictive behaviours (Beck et al., 1993; Tiffany, 1990). Both justifications and permissive beliefs entail cognitions that promote leniency towards oneself engaging in a desired behaviour, but upon closer inspection the items
used to measure permissive beliefs capture a range of attitudes and beliefs that are distinct from justifications such as “after all there would be no risk” and “I would be able to stop when I want” (e.g., Caselli et al., 2020). Although these permissive beliefs have been associated with substance use (Caselli et al., 2020; Charbol et al., 2004), they are not closely associated with other problematic behaviours such as social network use (Brandtner et al., 2023) or binge eating (Bergin & Wade, 2012) after controlling for similar constructs, indicating that these preliminary studies in the context of behavioural addictions have been inconclusive. I wonder if examining the relationship between justifications and behavioural addictions would lead to more promising findings.

In Studies 1 and 2, I found that justifications were positively associated with increased urgency, or mood-related impulsivity (i.e., propensity to act impulsively when experiencing intense emotions). There is a possibility that the use of justifications and urgency may both be underpinned by strong affective experiences. People with high urgency may gamble when they are feeling particularly positive or negative. When people are not feeling particularly strong emotions, however, they may feel dull and in such cases rely on justifications to gamble. Specifically, they may do so to seek out excitement (Stewart & Zack, 2008). Although I did not measure excitement per se, this is supported by my findings in Study 3 showing that the relationship between justifications and next-day gambling became stronger when positive affect was lower, suggesting that justifications may only be effective when people are not experiencing particularly high positive affect. Though, an alternative possibility is that successfully using justifications to gamble leads people to not feel particularly good. In any case, the use of justifications to gamble coupled with urgency may partly explain why gamblers who tend to act on emotions show higher problem gambling severity than other gamblers (Devos et al., 2020).
In Studies 1 and 2, justifications were related to cognitive distortions. This is in line with the large body of work on motivated cognition which broadly proposes that cognitions are influenced by one’s goals (Kunda, 1990; Zaki & Hughes, 2015). People with strong desires to gamble tend to use both justifications to gamble and accept cognitive distortions as a means to satisfy their gambling desires. This is supported by previous work suggesting that cognitive distortions may be a form of rationalization. Whereas a lack of reflection is relatively easy to reconcile (Frederick, 2005), cognitive distortions are often held with a high degree of conviction and are difficult to rectify (Delfabbro, 2004). Recent research also demonstrates that distortions are not closely related to general cognitive abilities, indicating they may be driven by reasoning processes instead (Muela et al., 2021). My interpretation is that the use of justifications and cognitive distortions may both partly reflect the strong desires to gamble among people with problem gambling.

Given the important role of cravings in triggering justifications (De Witt Huberts et al., 2014b; Beck 1993), it was interesting to observe that in Study 3, justifications were not closely associated with cravings. At the within-person level, people reported less cravings on days when they had more justifications. This seemingly discrepant finding may be due to our design measuring feelings that may have later been used as justifications rather than justifications per se. In Study 3, participants simply reported how frequently they have thought about, for example working hard, rather than how frequently they used those thoughts to justify gambling. People who experience more cravings may construct more justifications to gamble, in line with previous work (De Witt Huberts et al., 2012), even if they do not generally experience these thoughts more often. These findings suggest that cravings may be linked to the metacognitive, reasoning
component of justifications rather than altering feelings that are later used as justifications (Rodriguez & Strange, 2015).

In a clinical context, despite therapy targeting justifications and qualitative work hinting their existence (Oakes et al., 2019), there has been no empirical work to date examining justifications in problem gambling. An interesting possibility is that the occasional use of justifications may benefit problem gambling recovery. Recent work suggests that justifications may be used deliberately as a means to strategically indulge which may even be beneficial (Jia et al., 2019). For instance, in an experience sampling study on unhealthy eating, Prinsen et al. (2019) showed that justifications predicted lower subsequent conflict after engaging in a temptation, suggesting that justifications may support successful self-control after initial failure. Justifications may promote controlled rather than full abstinence which has been shown to be beneficial for treatment (Slutske et al., 2010; Stea et al., 2015). Future studies should examine whether challenging the use of justifications can actually improve gambling outcomes.

There were challenges with trying to capture justifications using self-report. When I asked people to report their gambling justifications in Studies 1 and 2, there was a possibility that they may have reported justifications to reduce cognitive dissonance. Cognitive dissonance refers to the aversiveness of holding conflicting thoughts and behaviours such that thoughts are often adjusted so that they become consistent with behaviour (Festinger, 1962). Participants may have rationalized a past gambling episode. I tried to frame the questions in a way that would reduce this possibility by highlighting that justifications precede actual engagement in gambling. First, I presented participants with a preamble that describes justifications: “It is often difficult to reduce harmful behaviours. When deciding whether to do them, we may find excuses that justify our decisions.” And second, in Study 2, each justification ended with “(so I can gamble).”
Nevertheless, with a cross sectional design, I could not rule out the possibility that reports of justifications resulted from dissonance and post-hoc rationalization. However, in Study 3, I used a different approach in which participants were indirectly asked about justifications. This gave them little opportunity to rationalize gambling, yet justifications were still related to next-day gambling. Although people may rationalize gambling, these results suggest that they probably also use reasons to justify prospective gambling.

There is also a possibility of a direct link between an event (that may be used as a justification) and gambling. For instance, after having a productive day at work, people may be in a positive mood. This positive mood may directly impact gambling regardless of whether people use such productivity as a justification. In Study 3, positive affect was indeed correlated with both justifications and next-day gambling. However, after taking into account other proximal factors, its relationship with next-day gambling did not remain significant. This may have been due to the fact that the impact of positive mood on gambling depends on individual differences in gambling motives. For instance, Goldstein et al. (2013) found that enhancement motives (i.e., gambling for excitement) significantly moderated the association between positive affect and gambling duration. In any case, my results suggest that the relationship between justifications and gambling are not simply a product of lingering positive affect.

I included a few items to try to capture the possibility that negative events may be used to justify indulgent behaviour independent of current negative affect. De Witt Huberts (2015) exposed participants to negative stimuli and found that those who were made more aware of the stimuli compared to those who were not did show increased negative affect but did subsequently consume more food in a taste test. In Studies 1 and 2, even though on face participants would report that they used, for example, feelings of sadness to justify gambling, there was no way of
ruling out the possibility that these responses were conflated with negative affect. Indeed, in the present studies, confirmatory factor analysis showed that a one-factor solution fit the data best without these negative items. And, in Study 3, these items were strongly correlated with negative affect. I suspect that these items did not sufficiently gauge the “justification route” from negative events to gambling, threatening its construct validity. Thus, they were not included when calculating a score for justifications and the present results are unable to speak to the possibility that people use negative events to justify indulgences.

The present studies have several limitations that should be discussed. First, participants were recruited from an online crowdsourcing platform, thus I cannot make claims that they are representative (Pickering & Blaszczynski, 2021; c.f. Russell et al., 2022). Although I entered some demographic variables as covariates, participants lacked diversity on several dimensions including race and ethnicity which are important to consider in the context of problem gambling (Lee & Grubbs, 2023; Raylu & Oei, 2004a), so readers should be cautious when trying to generalize these results to other contexts. Second, my justification items were based on rich work in the context of unhealthy eating and consumer behaviour (De Witt Huberts et al., 2014a; Feurer & Haws, 2022; Kivetz & Zhang, 2002; Rishika et al., 2022) and I used input from problem gambling counsellors to improve this measure, but it still may have not represented a “perfect” list of gambling justifications, as there may be important justifications that were not included. Third, the link between justifications and gambling in Study 3 were exploratory and modest, so replication is needed as always to confirm the robustness of our findings from Study 3.

**Conclusion**

Problem gambling is characterized by a loss of control that is conventionally attributed to heightened trait impulsivity. Drawing from the fields of social and consumer psychology, it is
clear that people also use reasons to allow themselves to relax self-control and engage in desirable activities. The use of justifications has not yet been empirically investigated in the context of problem gambling and behavioural addictions more generally until now. Reasoning processes that underpin problem gambling are complex and much work is needed before we can fully understand their unique roles in the development and maintenance of problem gambling. Here, I highlight one such process, showing that using justifications is associated with problem gambling severity and gambling behaviour, indicating justifications may be an important cognitive aspect in problem gambling.

References


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Appendices

Appendix A: Departures from Preregistration in Study 2

In Study 2, I departed from my preregistered analyses in a few ways. These deviations did not change the main results reported in the present research. First, I proposed to use stepwise regression based on similar work (Michalczuk et al., 2011), but due to the numerous shortcomings of stepwise regressions (e.g., multiple hypothesis testing and reliance on a single best model; see Whittingham et al., 2006), I decided to use hierarchical multiple regression instead, providing us with inferential statistics for model improvement with each of the predictors. Second, I initially created a new variable for cognitive distortions comprised of illusion of control, predictive control, and interpretative bias, given that the inability to stop and gambling expectancies subscales may be considered metacognitive components rather than decision-making biases (see Billieux et al. 2012). Ultimately, this reduced structure did not provide a better model fit compared to using all five subscales, so I kept using the original subscales as a departure from our preregistration. Third, I had planned to sum all the justification items to compute a score for justifications. However, model fit was significantly better with reduced items, which was also true for the other two studies, and thus I used the refined list of items which provided better model fit.
Appendix B: Materials for Study 1

Justifications

Recall a period of time in your past when you were trying to reduce or quit gambling. We would like to know how you felt at that time and how you reacted to the circumstances. Scale: 7-point slider (0—not at all; 7—very much)

1. How strong were your gambling cravings?
2. To what degree did you find your gambling cravings stressful or unpleasant?
3. To what degree did you try to control your gambling cravings?

People often find reasons to do things. Thinking of a time when you were trying to reduce or quit gambling, do you identify with any of the following reasons to gamble?
Response: Yes (1) or No (0)

How likely were these thoughts or reasons to result in you gambling?
Scale: 7-point slider (0—not at all; 7—very much)

1) “I’ve been working hard”
2) “I made an effort”
3) “I used self-control”
4) “I feel tired”
5) “I made progress on a goal”
6) “I completed a task”
7) “I received positive feedback”
8) “I did a good job”
9) “I had a busy period behind me”
10) “I’m feeling stressed”
11) “I feel bad about myself”
12) “I feel bored”
13) “I feel sad”
14) “I find other activities unrewarding”
15) “I feel good about myself”
16) “I have something to celebrate”
17) “I had some good luck”
18) “I received good news”
19) “I was on holiday”
20) “I failed at something”
21) “I had some bad luck”
22) “I received bad news”
23) “I had an unexpected windfall”
24) “I got a good deal on a purchase”
25) “I’ve already paid my essential bills for the month”
26) “I’ve completed a payment plan e.g., car loan”
27) “I have a surplus of money”
28) “I received a gambling tip”
29) “I’ve set a spending limit”
30) “I feel like my skill is improving”
31) “I feel like my chances of winning are high”

Impulsivity (Cyder et al., 2014)

Below are a number of statements that describe ways in which people act and think. For each statement, please indicate how much you agree or disagree with the statement. Please rate yourself as you see yourself at the present time, not as you wish to be in the future. Describe yourself generally or typically.

Scale: 1—strongly agree, 2—slightly agree, 3—slightly disagree, 4—strongly disagree

a) **Negative urgency**
1) When I feel bad, I will often do things I later regret in order to make myself feel better now (R)
2) Sometimes when I feel bad, I can’t seem to stop what I am doing even though it is making me feel worse (R)
3) When I am upset, I often act without thinking (R)
4) When I feel rejected, I will often say things that I later regret (R)

b) **Lack of perseverance**
5) I generally like to see things through to the end
6) Unfinished tasks really bother me
7) Once I get going on something I hate to stop
8) I finish what I start

c) **Lack of premeditation**
9) My thinking is usually careful and purposeful
10) I like to stop and think things over before I do them
11) I tend to value and follow a rational, “sensible” approach to things
12) I usually think carefully before doing anything

d) **Sensation seeking**
13) I quite enjoy taking risks (R)
14) I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional (R)
15) I would like to learn to fly an airplane (R)
16) I would enjoy the sensation of skiing very fast down a high mountain slope (R)

e) **Positive urgency**
17) When I am in great mood, I tend to get into situations that could cause me problems (R)
18) I tend to lose control when I am in a great mood (R)
19) Others are shocked or worried about the things I do when I am feeling very excited (R)
20) I tend to act without thinking when I am really excited (R)

Gambling Related Cognitions Scale (Raylu & Oei, 2004)

Please indicate the extent to which you agree with the statements. For each statement, please indicate how much you agree or disagree with the statement. Please rate yourself as you see
yourself at the present time, not as you wish to be in the future. Describe yourself generally or typically.
Scale: 7-point (1-strongly disagree; 7-strongly agree)

a) Gambling expectancies
1) Gambling makes me happier
2) Gambling makes things seem better
3) Gambling makes the future brighter
4) Having a gamble helps reduce tension and stress

b) Illusion of control
5) Praying helps me win
6) Specific numbers and colours can help increase my chances of winning
7) I collect specific objects that help increase my chances of winning
8) I have specific rituals and behaviours that increase my chances of winning

c) Predictive control
9) Losses when gambling are bound to be followed by a series of wins
10) A series of losses will provide me with a learning experience that will help me win later
11) When I have a win once, I will definitely win again
12) There are times that I feel lucky and thus gamble those times only
13) I have some control over predicting my gambling wins
14) If I keep changing my numbers, I have less chances of winning than if I keep the same numbers every time

d) Inability to stop gambling
15) I can’t function without gambling
16) It is difficult to stop gambling as I am so out of control
17) My desire to gamble is so overpowering
18) I’m not strong enough to stop gambling
19) I will never be able to stop gambling

e) Interpretive bias
20) Relating my winnings to my skill and ability makes me continue gambling
21) Relating my losses to bad luck and bad circumstances makes me continue gambling
22) Relating my losses to probability makes me continue gambling
23) Remembering how much money I won last time makes me continue gambling

Problem Gambling (Ferris & Wynne, 2001)

Some of the next questions may not apply to you, but please try to be as accurate as possible.
Thinking about the last 12 months...
Scale: 1-never, 2-sometimes, 3-most of the time, 4-almost always

1. Have you bet more than you could really afford?
2. Still thinking about the last 12 months, have you needed to gamble with larger amounts of money to get the same feeling of excitement?
3. When you gambled, did you go back another day to try to win back the money you lost?
4. Have you borrowed money or sold anything to get money to gamble?
5. Have you felt that you might have a problem with gambling?
6. Has gambling caused you any health problems, including stress or anxiety?
7. Have people criticized your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?
8. Has your gambling caused any financial problems for you or your household?
9. Have you felt guilty about the way you gamble or what happens when you gamble?

Monetary-Choice Questionnaire (Kirby et al., 1999)

For each of the next 27 choices, please indicate which reward you prefer: the smaller reward today or the larger reward in a specific number of days. Would you prefer...

1. $54 today or $55 in 117 days?
2. $55 today or $75 in 61 days?
3. $19 today or $25 in 53 days?
4. $31 today or $85 in 7 days?
5. $14 today or $25 in 19 days?
6. $47 today or $50 in 160 days?
7. $15 today or $35 in 13 days?
8. $25 today or $60 in 14 days?
9. $78 today or $80 in 162 days?
10. $40 today or $55 in 62 days?
11. $11 today or $30 in 7 days?
12. $67 today or $75 in 119 days?
13. $34 today or $35 in 186 days?
14. $27 today, or $50 in 21 days?
15. $69 today or $85 in 91 days?
16. $49 today or $60 in 89 days?
17. $80 today or $85 in 157 days?
18. $24 today or $35 in 29 days?
19. $33 today or $80 in 14 days?
20. $28 today or $30 in 179 days?
21. $34 today or $50 in 30 days?
22. $25 today or $30 in 80 days?
23. $41 today or $75 in 20 days?
24. $54 today or $60 in 111 days?
25. $54 today or $80 in 30 days?
26. $22 today or $25 in 136 days?
27. $20 today or $55 in 7 days?

Motives for Gambling (Dechant, 2014)

Please rate these different reasons for why you might. I gamble...
Scale: 4-point (1-never to almost never, 2-sometimes, 3-often, 4-almost always to always)

a) Enhancement motives
1. because it’s exciting
2. because I like the feeling
3. because it makes me feel good
4. because it’s fun

b) Social motives
5) because it makes a social gathering more enjoyable
6) to be sociable
7) because it’s what most of my friends to when we get together
8) because it’s something I do on special occasions

c) Coping motives
9) to forget my worries
10) to help when I’m feeling nervous or depressed
11) to cheer myself up when I’m in a bad mood
12) to make myself feel more self-confident or sure of myself

d) Financial motives
13) because I enjoy thinking about what I would do if I won
14) because winning could change my life
15) to win money
16) to earn money

Gambling Involvement (Zendle, 2020)

In the past 12 months, how frequently have you...
Scale: I have never done this (1); Not at all in the past 12 month, but I have done this before then (2); Less than 10 times in total (3); Once a month (4); 2–3 times a month (5); Once a week (6); 2–3 times a week (7); 4 or more times a week (8)
1. Purchased a lottery ticket
2. Purchased instant win/scratch cards
3. Bet on sports events (not including Esports)
4. Bet on Esports
5. Bet on horse or dog racing (or other animal competitions)
6. Played bingo for money
7. Played games of skill for money against other people
8. Played slot machines
9. Played casino table games
10. Played realistic gambling games within a video game
11. Spent money on social casino games
12. Spent money on loot boxes
13. Others: (Open Response)

Where did you engage in this activity?
- Online
- In-person
- Both
Appendix C: Materials for Study 2

Measures from Study 1

Participants also completed the following measures from Study 1 (see Appendix A):
- Impulsivity (Cyder et al., 2014)
- Gambling Related Cognitions Scale (Raylu & Oei, 2004)
- Problem Gambling (Ferris & Wynne, 2001)
- Monetary-Choice Questionnaire (Kirby et al., 1999)
- Motives for Gambling (Dechant, 2014)
- Gambling Involvement (Zendle, 2020)

Justifications

*It is often difficult to reduce harmful behaviours. When deciding whether to do them, we may find excuses that justify our decisions. When you think about gambling, how frequently did you have the following reasons to justify gambling?*

Scale: 5-point (0-never; 5-very often)

1. I’ve been working hard (so I can gamble)
2. I’ve been feeling tired (so I can gamble)
3. I’ve made progress on a goal (so I can gamble)
4. I’ve been on top of my responsibilities (so I can gamble)
5. I’ve received positive feedback in my job or home life (so I can gamble)
6. I’ve been feeling down (so I can gamble)
7. I’ve been feeling bored (so I can gamble)
8. I’ve been feeling stressed (so I can gamble)
9. I have something to celebrate (so I can gamble)
10. I’ve been feeling good about myself (so I can gamble)
11. I had an unexpected windfall (so I can gamble)
12. I’m on holiday (so I can gamble)
13. I’ve already paid by essential bills (so I can gamble)
14. I have a surplus of money (so I can gamble)
15. I’ve received a gambling tip (so I can gamble)
16. I’ve set a spending limit (so I can gamble)
17. Because after today, I will not gamble anymore (so I can gamble)
18. Because after today, I won’t be able to gamble (so I can gamble)
19. My friends are going gambling (so I can gamble)

Gambling Cravings

*Thinking about a recent time when you were deciding whether to gamble, we would like to know how you felt at that time and how you reacted to the circumstances.*

Scale: 7-point slider (0-not at all; 7-very much)

1. How strong were your gambling cravings?
2. To what degree did you find your gambling cravings stressful or unpleasant?
3. To what degree did you try to control your gambling cravings?

Gambling Urges (Raylu & Oei, 2004)

*Please rate how much you agree with each of the following sentences.*
Scale: 7-point (1-strongly disagree; 7-strongly agree)

1. All I want to do is gamble
2. I find it difficult to turn down a gamble
3. Having a gamble make things seem just perfect for me
4. I often want to gamble so bad that I can almost feel it
5. I don’t think there is anything better than having a gamble
6. I often crave a gamble
Appendix D: Materials for Study 3

Baseline: Measures from Studies 1 and 2

Participants also completed the following measures from Studies 1 and 2 (see Appendix A):
- Impulsivity (Cyder et al., 2014)
- Gambling Related Cognitions Scale (Raylu & Oei, 2004)
- Problem Gambling (Ferris & Wynne, 2001)

Baseline: Trait Self-Control (Tangney et al., 2004)

*Please indicate how much each of the following statements reflects how you typically are.*
Scale: 4-point (4: Not at all; 5-Very much)

1. I am good at resisting temptations
2. I have a hard time breaking bad habits (R)
3. I am lazy (R)
4. I say inappropriate things (R)
5. I do certain things that are bad for me if they are fun (R)
6. I refuse things that are bad for me (R)
7. I wish I had more self-discipline (R)
8. People would say that I have iron self-discipline
9. Pleasure and fun sometimes keep me from getting work done (R)
10. I have trouble concentrating (R)
11. I am able to work effectively towards long-term goals
12. Sometimes I can’t stop myself from doing something, even if I know it is wrong (R)
13. I often act without thinking through all the alternatives (R)

Baseline: Gambling Involvement

*In the past 12 months, how frequently have you...*
Scale: I have never done this (1); Not at all in the past 12 month, but I have done this before then (2); Less than 10 times in total (3); Once a month (4); 2–3 times a month (5); Once a week (6); 2–3 times a week (7); 4 or more times a week (8)

- Purchasing a lottery ticket or instant win/scratch cards
- Betting on sports
- Investing in stocks or commodity markets
- Slot machines
- Casino table games

For each question above when score > 1: *Where did you engage this activity?*
- Online
- In-person
- Both
Baseline: Open Response Justifications

When you are trying to reduce or quit your gambling but start thinking about whether to go gamble, do you have reasons or excuses for going to gamble? If so, please list them out. Feel free to report as many or as little reasons or excuses as possible. As long as you carefully think about it and provide the most accurate response, it will provide us with valuable data, be perfectly valid, and you should not feel that we expect you to report a certain number of responses.
Scale: Open Response

Daily Diary: Justifications

How frequently did you have any of the following thoughtss?  
Scale: 1 (Never) – 5 (Always)

1. I worked hard so I can gamble
2. I made progress on a goal so I can gamble
3. I was on top of my responsibilities so I can gamble
4. I felt down so I can gamble
5. I felt bored so I can gamble
6. I have paid some of my bills so I can gamble
7. I have a surplus of money so I can gamble
8. Filler: I need to prepare a meal or snack
9. Filler: I’ve been enjoying ________ (Please insert a hobby you were enjoying)

Daily Diary: Gambling Episodes

Thinking about yesterday, how frequently did you think about gambling (e.g., going to buy lottery tickets, betting on sports, playing on slot machines)?  
Scale: 1 (Never) – 5 (Always)

Still thinking about yesterday, did you go gamble?  
Response options: Yes/No

What form(s) of gambling did you engage in yesterday?  
- Purchasing a lottery ticket or instant win/scratch cards
- Betting on sports
- Investing in stocks or commodity markets
- Slot machines
- Casino table games
- Not listed: ________

If selected: Where did you engage in this activity?  
- Online
- In-person
- Both
Still thinking about yesterday, around when did you go gamble? Please check all that apply.
- Morning
- Afternoon
- Evening
- Night

How many hours in total did you gamble yesterday? Please report your response in hours.
Scale: Open Response

How much did you intend to spend on gambling yesterday? Please report your response in dollars.
Scale: Open Response

How much did you actually spend yesterday? Please report your response in dollars.
Scale: Open Response

Daily Diary: Gambling Cravings

How strong were your cravings to gamble today?
Scale: 0 (None) to 100 (Very Much)

To what degree did you find your gambling cravings stressful or unpleasant today?
Scale: 0 (None) to 100 (Very Much)

To what degree did you try to resist or suppress your gambling cravings today?
Scale: 0 (None) to 100 (Very Much)

Daily Diary: The Positive and Negative Affect Schedule (Watson & Clark, 1988).

Please indicate the extent you have felt these ways over the course of today.
Scale: 1 (Not at all) to 100 (Extremely)

1) Interested
2) Distressed
3) Excited
4) Upset
5) Strong
6) Guilty
7) Scared
8) Hostile
9) Enthusiastic
10) Proud
11) Irritable
12) Alert
13) Ashamed
14) Inspired
15) Nervous
16) Determined
17) Attentive
18) Jittery
19) Active
20) Afraid