Probabilistic Discounting Among Individuals with Current and Past Disordered Gambling: Implications for its Role in the Maintenance of Gambling Disorder

Magdalen Schluter[1] and David Hodgins[1]

1. Department of Psychology, University of Calgary, Calgary AB

Introduction

- Bio-behavioural approaches suggest that dysfunctional decision-making mechanisms involved in reward processing may contribute to addictive disorders.[1]

- Probabilistic Discounting (PD) is a form of risky choice. It reflects the relative preference for larger, uncertain rewards over smaller, certain rewards.

- PD is consistently associated with problem gambling behaviour,[2] though its role in the etiology of the disorder is not yet understood.

- Relative to healthy controls, individuals with gambling disorder (GD) show greater risky choice.[3,4]

- PD shows a moderate-to-strong effect (g = .79) with GD when compared to healthy controls, and a small effect with gambling intensity (g = .28).[2]

Objective: To investigate the potential role of risky choice in the development and/or maintenance of problem gambling behaviour.

- Less risky choice among healthy controls compared to individuals with either a current or past GD would suggest that PD is involved in the development of GD

- Less risky choice among individuals with a past GD compared to individuals currently experiencing GD would suggest that PD is involved in the maintenance of GD.

Methods

Sample and Recruitment

- 431 participants
  - *Current gambling disorder:* 4+ diagnostic criteria in past 12-months
  - *Past gambling disorder:* 4+ lifetime diagnostic criteria with no gambling in past 12-months
  - *Healthy Controls:* No history of gambling problems (0 lifetime diagnostic criteria)
- Participants were recruited through Amazon's Mechanical Turk (MTurk)
  - Participation was limited to MTurk workers with an approval rating of 95%
- Utilized a two-stage recruitment procedure:[6]
  - Stage 1: Participants completed questionnaires that screen for current and GD
  - Stage 2: Eligible participants invited to complete part 2, which included a measure of PD

Measures

- *Gambling Participation Instrument* (GPI): Engagement across types of gambling activities that assesses the frequency, hours and money spent on each activity.

- *NORDC DSM-IV Screen for Gambling Problems (NODS):* Current and lifetime GD symptoms.

- *Probabilistic Discounting Task:* An adapted version of Richards Discounting Task[7]
  - Participants make choices between smaller-certain rewards and larger-uncertain rewards
  - The standard larger reward was increased to $1000
  - Five probabilities: 100%, 90%, 75%, 50%, and 25%
  - For each probability, a random-adjustment algorithm varied the magnitude of the certain reward to estimate indifference points (value at which the certain and uncertain reward is each chosen 50% of the time).

Data Analytic Plan

- The area under the empirical discounting function (AUC) was calculated as an indicator of the rate of discounting. Smaller AUCs indicate steeper discounting and thus, less risky choice

- One-way ANOVA was used to test for a significant difference across groups and linear contrasts with Holm's sequential Bonferroni correction were utilized.

- Correlations between discounting parameters and measures of gambling and substance misuse severity were calculated and tested for significance using t-tests.
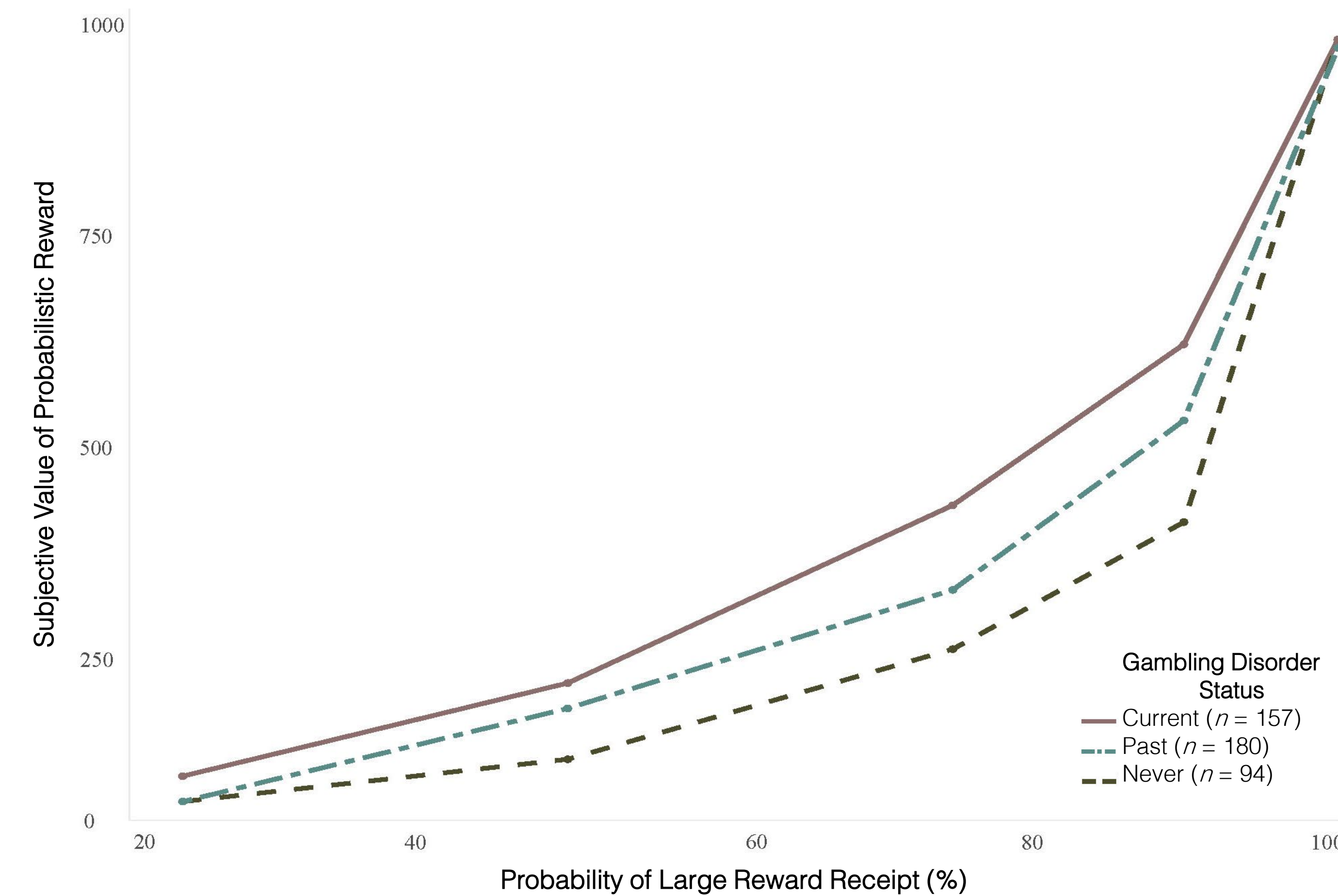
Figures

Figure 1. Probabilistic discounting curves across individuals with current and past gambling disorder, and healthy controls. The curves were created by plotting the average indifference points for each group. Mean AUCs: Current GD: .52(SD=.17); Past GD: .47(SD=.17), Never(healthy controls): .42(SD=.15)
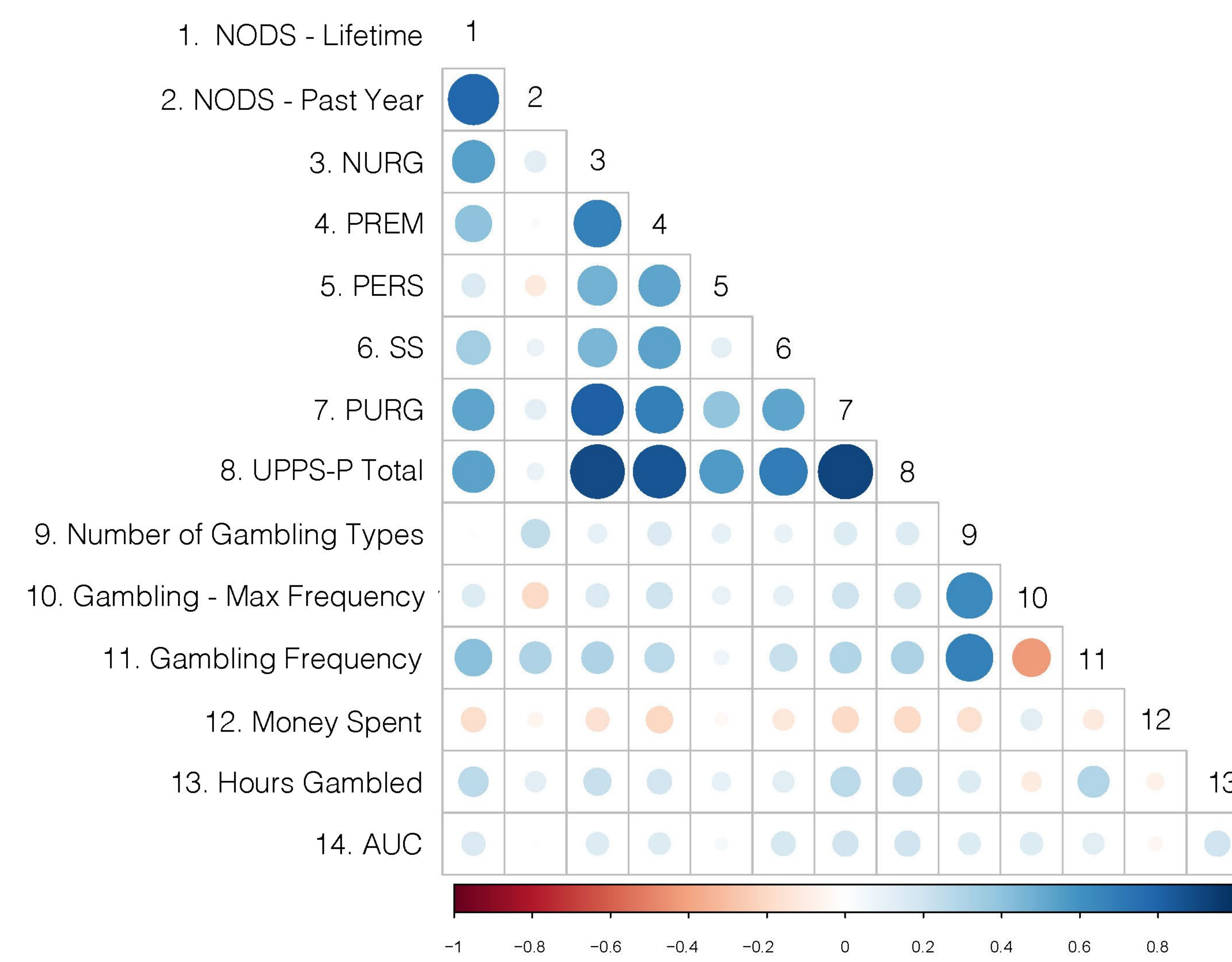

Figure 2. Graphical display of pearson-product moment correlations between measures of gambling activity, gambling diagnostic symptom severity, trait impulsivity, and risky choice. NODS: National Opinion Research Center DSM-IV Screen for Gambling Problems; NURG = UPPS-P negative urgency subscale; PREM = UPPS-P (lack of) premeditation subscale; PERS = UPPS-P (lack of) perseveration subscale; SS = UPPS-P sensation seeking subscale; AUC = Area under the empirical probabilistic discounting curve.

Results

Probabilistic Discounting (Figure 1)

- AUCs ranged from .05 to .84 across the entire sample (M = .48, SD = .17)

- Consistent with PDs involvement in the **development** of GD, individuals with no history of problem gambling showed less risky choice (M = 0.42, SD = .15) than individuals with current GD (M = .52, SD = .17, ; t(428) = 4.68, p < .001), or past GD (M = .47, SD = .17; t(428) = 2.5, p = .02).

- Consistent with PDs involvement in the **maintenance** of GD, individuals with past GD showed less risky choice compared to indiviudals with current GD (t(428) = 2.68, p = .02).

Associations with Other Measures (Figure 2)

- Significant associations with lifetime GD (r = .14), but not past-year symptoms.

- Except for lack of perseveration, it was also associated with all UPPS-P subscale and total scores (rs = .14 to .19)

- On measures of gambling activity, PD was significantly associated with hours spent, variety of gambling types, and the number of times per week they engaged in their most frequent activity (rs = .15 - .19)

Discussion

- Risk preference may be involved in both the development and maintenance of GD.

- Individuals with past GD symptomology were more risk averse than those with current GD. These individuals could have (a) lower risk preference prior to stopping gambling, or (b) risk preference changed as after they stopped gambling.

- Results may compliment the findings by Petry.[5] If individuals who achieve long-term abstinence have greater awareness of their gambling problems when they decide to stop gambling than individuals who continue to gamble, then their decision-making may be more amenable to change → developing greater risk aversion.

Clinical Implications

- Risk preference, appears to be a potentially modifiable mechanism and is strongly affect driven.[8]

- PD was significantly associated with positive urgency, which reflects the tendency to engage in risky behaviour when experiencing intense positive emotion. Thus, the subjective risk preference can be thought of as a response to intense emotion.

- Interventions that target the fusion of these emotional experiences to risk preferences may be more beneficial than education about odds and probabilities.

References

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