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SOGS SCORES CORRELATE WITH RATES OF DELAY DISCOUNTING OF HYPOTHETICAL MONETARY AMOUNTS, BUT NOT NON-MONETARY OUTCOMES

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Although several studies have reported that gamblers display steeper rates of delay discounting than non-gamblers, other research has failed to find a systematic relationship between self-reported frequency of gambling and discounting of different outcomes. One hundred fifty six college students self-reported their frequency of gambling, completed the South Oaks Gambling Screen (SOGS), and then completed a delay-discounting task involving five different outcomes. Self-reported frequency of gambling was correlated with discounting of one outcome (finding an ideal dating partner) and the correlation was in the opposite direction of what would be expected from the literature. SOGS scores were significantly and positively correlated with rates of discounting monetary outcomes, but not non-monetary outcomes. The present results cast doubt on the usefulness of self-reports of gambling frequency. They also suggest that although gamblers may display steeper rates of delay discounting than non-gamblers, this result may only apply to certain outcomes (e.g., money) and not others (e.g., finding the ideal dating partner, obtaining the ideal body image).

Keywords: delay discounting, gambling frequency, college students

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Of late, there has been a good deal of interest in the connection between the rate at which people discount delayed outcomes and their gambling behavior, especially as it pertains to problem gambling (see Petry & Madden, 2010, for a recent review). A number of studies have reported finding that different rates of delay discounting are observed between gamblers and non-gamblers (e.g., Dixon, Jacobs, & Sanders, 2006; Dixon, Marley, & Jacobs, 2003; cf., Holt, Green, & Myerson, 2003). This connection has also assumed a key position in behavioral explanations for why pathological gambling may develop (Weatherly & Dixon, 2007). However, there is also a growing literature that questions whether or not the connection between delay discounting and problem gambling is as strong (Weatherly, Derenne, & Chase, 2008) or as important (Weatherly, 2010) as is sometimes supposed.

Recently, Weatherly, Terrell, and Derenne (2009) examined whether college students' reported frequency of gambling was related to how they discounted different delayed outcomes (unlike the more typical comparison of rates of gambling to discounting of money only; see Petry & Madden, 2010). Participants completed a delay-discounting task involving five hypothetical outcomes: being owed $1,000, being owed $100,000, annual retirement income, receiving treatment for a serious medical condition, and federal education legislation. Results showed that participants' reported rate of gambling frequency (i.e., never, seldom, frequently) was rarely cor-

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related with how they discounted the above outcomes. Further, when significant correlations were observed, they were sometimes in the opposite direction as one would expect from the literature.

One of the limitations of the comparisons made by Weatherly et al. (2009), however, was that their measure of gambling frequency was not extremely sensitive. That is, only three levels of gambling frequency were assessed. Further, their measure did not allow one to identify respondents who might have potentially qualified as pathological gamblers. The present study was designed to rectify these limitations.

In the present study, college students were asked to complete a delay-discounting task involving five different hypothetical outcomes: winning a certain amount of money, being owed the same amount of money, getting free cigarettes, obtaining one's ideal body image, and finding one's ideal dating partner. The winning vs. being owed money outcomes were investigated because although research has shown that less discounting is observed for an owed amount of money vs. a won amount (Weatherly, Derenne, & Terrell, 2010; Weatherly & Terrell, 2011), it is not yet known whether this finding would be influenced by the participants' gambling history. The commodity of cigarettes was chosen because the discounting rates between the two commodities are correlated (Weatherly, Terrell, & Derenne, 2010; Weatherly & Terrell, in press). Thus, if a relationship between gambling behavior and the rate of discounting money was observed, one might expect to see a similar relationship with the rate of discounting cigarettes. The other two outcomes were chosen because they represented outcomes that could be gained by the participant, but that did not inherently involve a monetary component. Rates of discounting these commodities were then correlated with the self-report measure of gambling frequency used by Weatherly et al. (2009) and also with respondents' scores on the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987), which is the most widely used diagnostic screening measure used to assess for the potential presence of pathological gambling (see Petry, 2005).

METHOD

Participants

The participants were 156 (128 females; 27 males; 1 declined to answer) undergraduate students enrolled in a psychology course at the University of North Dakota. The mean age of the participants was 21.24 years (SD = 4.87 years) and the mean reported grade point average was 3.40 out of 4.00 (SD = 0.47). The sample was composed of primarily Caucasians (94.9%) who were unmarried (89.1%) and had an annual income of $25,000 or less (87.8%). The participants received extra course credit in return for their participation.

Materials and Procedure

Participants completed the materials online, which were available to them through their psychology course via the Sona Systems, Ltd (Version 2.72; Tallinn, Estonia) experiment management system. The first item viewed by the participant was a description of the study and its benefits/risks as approved by the Institutional Review Board at the University of North Dakota. The participant's continuation in the study after reading this item constituted informed consent.

The second item was a demographics questionnaire. The participant provided information on the factors listed above. The questionnaire also contained a question on how frequently the participant

gambled, with the options being never, seldom, or frequently.

The third item completed by the participants was the SOGS (Lesieur & Blume, 1987). The SOGS is a 20-item questionnaire that asks questions about the participant's gambling history. A score of 5 or more on the SOGS is indicative of the potential presence of pathological gambling. The SOGS is the most widely used diagnostic screen for pathological gambling (Petry, 2005) and has been shown to have good internal consistency and test-retest reliability (Lesieur & Blume, 1987; Stinchfield, 2002).

The final item was a delay-discounting task that involved five outcomes: winning $100,000, being owed $100,000, getting 100 free packs of cigarettes, obtaining one's ideal body image, and finding an ideal dating partner. The participant was asked to identify/choose the smallest amount of that particular outcome s/he would accept rather than waiting a certain period of time for the full amount. Five delays were used: 6 months, 1 year, 3 years, 5 years, and 10 years. Thus, each question was asked a total of five times. The participant answered all five questions about a particular outcome before being asked about another outcome. The order of presentation of the five outcomes varied randomly across participants. Question order (i.e., the different delays) for each outcome also varied randomly across participants.

Two different techniques for collecting delay-discounting data were employed. One was the fill-in-the-blank method (e.g., Chapman, 1996) in which the participant was asked to generate the indifference point (i.e., the smallest amount s/he would accept) at each particular delay. This technique was employed for 84 of the participants. The second technique was a multiple-choice method (e.g., Beck & Triplett, 2009) in which the participant chose the indifference point at each particular delay from a finite number of choices. This technique was employed for 72 participants.

Two different techniques were employed because different techniques can potentially produce different rates of delay discounting (e.g., Smith & Hantula, 2008). However, in the present study, outcomes did not vary as a function of measurement technique, and the data were combined for the analyses reported below. The exact wording for each outcome with each technique can be found in the Appendix.

Data Analysis

Rates of delay discounting were determined in two different ways. The first was to fit the indifference points at each different delay with a hyperbolic function (Mazur, 1987):

$$V = A / (1 + kD) \quad \text{(Equation 1)}$$

In Equation 1, V represents the subjective value of the delayed outcome, A represents the amount of the outcome, D represents the delay period, and k is a free parameter. The k parameter describes the rate of delay discounting and serves as the dependent variable. High values of k indicate steep rates of discounting. Low values indicate low rates of discounting.

The second method was to calculate the area under the curve (AUC) created by the indifference points across the different delays (Myerson, Green, & Warusawitharana, 2001) using the following equation:

$$\sum(x_{n+1} - x_n) \times [(y_n + y_{n+1})/2] \quad \text{(Equation 2)}$$

With Equation 2, AUC can vary between 0.0 and 1.0 and the rate of delay dis-

Table 1. The mean delay-discounting values for Equation 1 and 2.

Outcome	*k* (SD)	R^2 (SD)	AUC (SD)
Winning $100,000	0.1636 (0.9538)	0.5750 (0.2887)	0.7349 (0.2456)
Owed $100,000	0.0129(0.0296)	0.5847 (0.3522)	0.7811 (0.2220)
Cigarettes	0.0241 (0.0348)	0.4852 (0.3377)	0.5977 (0.2685)
Body Image	0.0111 (0.0210)	0.5598 (0.3317)	0.7256 (0.2074)
Dating Partner	0.0043 (0.0101)	0.6180 (0.3090)	0.8333 (0.1765)

counting is inversely related to the AUC. Low AUC values indicate steep rates of delay discounting and high values represent little to no discounting.

RESULTS AND DISCUSSION

Of the 156 participants, 74 reported that they never gambled and 81 reported that they seldom gambled. Only one participant reported gambling frequently. The mean score on the SOGS was 0.78 (SD = 1.53). Four participants scored 5 or more on the SOGS (high score = 14).

Table 1 presents the results from applying Equations 1 and 2 to the delay-discounting data. When employing Equation 1, the steepest discounting was observed for winning $100,000. However, the mean k value for that outcome was influenced by extreme scores of two participants. Furthermore, the R2 values for each outcome were low, suggesting that Equation 1 did not provide a good fit to the present data. When employing Equation 2, the lowest AUC values were observed for cigarettes and the highest values were observed for finding a dating partner, which replicates previous research that has investigated delay discounting of these outcomes (Weatherly, Terrell, & Derenne, 2010). Participants discounted winning $100,000 significantly more than they discounted being owed $100,000, $F(1, 155) = 20.27$, $p<.001$, $\eta = .116$, also replicating previous results (Weatherly, Derenne, & Terrell, 2010; Weatherly & Terrell, 2011).

Prior to conducting statistical analyses on the data from Equation 1, participants' k values underwent a logarithmic transformation to control for a positive skew in the data. Table 2 presents the bivariate correlations that were observed between the two measures of gambling and rates of delay discounting as measured by Equations 1 (after the logarithmic transformation) and 2. When employing Equation 1, the only significant correlation was observed for participants reported frequency of gambling and their rate of discounting of finding a dating partner. Specifically, the more frequently participants reported gambling, the less they discounted finding a dating partner. When employing Equation 2, no significant correlations were observed between reported frequency of gambling and discounting of any outcome. Significant correlations were, however, observed between scores on the SOGS and the rate of discounting of both monetary outcomes. Consistent with previous research (e.g.,

Table 2. The bivariate correlations between reported gambling frequency or the SOGS and the participants' *k* and AUC values for each outcome.

	Winning $	Owed $	Cigarettes	Body Image	Dating Partner
		k			
Frequency	0.041	0.103	0.042	0.045	-0.164*
SOGS	0.061	0.034	0.084	-0.010	0.115
		AUC			
Frequency	0.001	0.003	-0.115	-0.022	-0.046
SOGS	-0.232**	-0.198*	-0.129	-0.095	-0.149

* $p < .05$
** $p < .01$

Dixon et al., 2003, 2006), as scores on the SOGS increased, so too did rates of discounting of the monetary outcomes.

The present results replicate those of Weatherly et al. (2009), who reported that self-reported rates of gambling seldom correlated with rates of discounting and, when they did, the direction of the association was opposite of that expected from the research literature. In the present study, the only significant correlation between self-reported frequency of gambling and delay discounting was observed for the outcome of finding the ideal dating partner. That correlation indicates that the more people report gambling, the longer they are willing to wait to find the ideal dating partner, which runs counter to the idea that gamblers might tend to be more impulsive than non-gamblers.

The reason for this counter-intuitive finding may be that self-reports of gambling frequency (i.e., never, seldom, frequently) are poor measures. Other aspects of the present data would seem to support this conclusion. Specifically, although only one participant reported gambling frequently, four participants scored 5 or more on the SOGS, the score which suggests the potential presence of pathological gambling. Because the SOGS measures occurrences across the respondent's lifetime, it is possible that a prior pathological gambler could accurately report that s/he presently never gambles. Given that the average participant was only 21 years old, however, the likelihood of this possibility is likely not high. An alternative possibility is that although participants may have reported seldom gambling, they were actually gambling pathologically. In the present case, all four participants who scored 5 or more on the SOGS reported that they seldom gambled.

The SOGS may be a more comprehensive measure of gambling and gambling behavior than a single self-report of frequency of gambling. The fact that SOGS scores correlated significantly with rates of discounting (as measured by Equation 2) for two outcomes supports this idea. Perhaps the most interesting aspect of this particular finding was which two outcomes correlated with SOGS scores – both monetary outcomes. This finding has significance for several reasons. First, research that has reported finding a relationship between gambling and delay discounting (e.g., Dixon et al., 2003, 2006) has reported such a relationship when studying discounting of hypothetical monetary rewards. Studying discounting of that particular consequence

was more likely the outcome of following standard practice in the study of delay discounting (e.g., see Yi, Mitchell, & Bickel, 2010) than it was a theoretical decision. Regardless, the present results suggest it was indeed a good choice.

Second, the present results suggest that although increasing scores on the SOGS are indicative of greater rates of discounting of monetary outcomes, they are not indicative of a general tendency to discount all outcomes steeply. This point has both practical and theoretical importance. From a practical standpoint, some researchers (e.g., Yi et al., 2010) have suggested that studying discounting of one particular commodity may be sufficient when comparing certain populations (e.g., drug users vs. nonusers) because differences in discounting between populations will be general. Researchers should thus be warned that such an assumption is perhaps incorrect. From a theoretical standpoint, Weatherly (2010) argued that the relationship between gambling and delay discounting may not be a direct one. Rather, the steeper rates of discounting observed for gamblers relative to non-gamblers may occur because of differences between these populations in the value of the commodity (money) being gambled. Weatherly (2010) suggested that, if this idea was correct, then you would not expect find that gamblers always discount delayed outcomes more steeply than non-gamblers. The present results support that suggestion.

It is worth noting that the present data were not well fit by Equation 1, which is commonly used to study delay discounting. The exact reason for the poor fit is not known and it may be the outcome of the techniques used for collecting the delay-discounting data in the present study. With that said, finding that Equation 1 does not adequately fit a data set is not uncommon (e.g., Weatherly, Terrell, & Derenne, 2010). Further, Equation 1 tended to account for a greater amount of the variance in the present study than in the study on which the present study was based (i.e., Weatherly et al., 2009).

Because the present study employed only a limited number of outcomes, it is not possible to determine whether SOGS scores will always only correlate with rates of discounting of money and not other outcomes. It is also the case that, although the present sample did have some respondents who scored 5 or more on the SOGS, a greater variation in SOGS scores across participants may have resulted in significant correlations with the discounting of the other outcomes. Finally, as has previous research (Weatherly, Derenne, & Terrell, 2010; Weatherly & Terrell, 2011), the present results indicated that participants discounted money won more than money owed, suggesting that they placed less value on the former than the latter. Finding that SOGS scores more strongly correlated with rates of discounting of winning $100,000 than with being owed the same amount suggests that this subjective valuation was similar for gamblers and non-gamblers. Future research on how the context of the decision may differentially affect rates of discounting for gamblers and non-gamblers would seem a potentially worthy and fruitful pursuit.

REFERENCES

Beck, R.C., & Triplett, M.F. (2009). Test-retest reliability of a group-administered paper-pencil measure of delay discounting. *Experimental and Clinical Psychopharmacology, 17*, 345-355.

Chapman, G.B. (1996). Temporal discounting and utility for health and money. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 22*, 771-791.

Dixon, M.R., Jacobs, E.A., Sanders, S. (2006). Contextual control of delay discounting by pathological gamblers. *Journal of Applied Behavior Analysis, 39*, 413-422.

Dixon, M.R., Marley, J., & Jacobs, E.A. (2003). Delay discounting by pathological gamblers. *Journal of Applied Behavior Analysis, 36*, 449-458.

Holt, D.D., Green, L., & Myerson, J. (2003). Is discounting impulsive? Evidence fromtemporal and probability discounting in gambling and non-gambling college students. *Behavioural Processes, 64*, 355-367.

Lesieur, H.R., & Blume, S.B. (1987). The South Oaks Gambling Screen (SOGS): a new instrument for the identification of pathological gamblers. *American Journal of_Psychiatry, 144*, 1184-1188.

Mazur, J.E. (1987). An adjusting procedure for studying delayed reinforcement. In M.L. Commons, J.E. Mazur, J.A. Nevin, & H. Rachlin (Eds.), *Quantitative Analyses of Behavior: Vol. 5. The Effect of Delay and Intervening Events on Reinforcement Value* (p. 55-73. Hillsdale, NJ: Erlbaum.

Myerson, J., Green, L., & Warusawitharana, M. (2001). Area under the curve as a measure of discounting. *Journal of the Experimental Analysis of Behavior, 76*, 235-243.

Petry, N.M. (2005). *Pathological Gambling: Etiology, Comorbidity, and Treatment*. Washington, D.C.: American Psychological Association.

Petry, N.M., & Madden, G.J. (2010). Discounting and pathological gambling. In G.J.Madden and W.K. Bickel (Eds.) *Impulsivity: The Behavioral and Neurological Science of Discounting* (pp. 273-294). Washington, D.C.: American Psychological Association.

Smith, C.L., & Hantula, D.A. (2008). Methodological considerations in the study of delay discounting in intertemporal choice: A comparison of tasks and modes. *Behavior Research Methods, 40*, 940-953.

Stinchfield, R. (2002). Reliability, validity, and classification accuracy of the South Oaks Gambling Screen (SOGS). *Addictive Behaviors, 27*, 1-19.

Weatherly, J.N. (2010). Temporal discounting and gambling: A meaningful relationship? *Analysis of Gambling Behavior, 4*, 27-37.

Weatherly, J.N., Derenne, A., & Chase, S. (2008). Do the risk factors for pathological gambling predict temporal discounting? *Analysis of Gambling Behavior, 2*, 25-34.

Weatherly, J.N., Derenne, A., & Terrell, H.K. (2010). College students discount money "won" more than money "owed." *The Psychological Record, 60*, 463-472.

Weatherly, J.N., & Dixon, M.R. (2007). Toward an integrative behavioral model of gambling. *Analysis of Gambling Behavior, 1*, 4-18.

Weatherly, J.N., Terrell, H.K., Derenne, A. (2009). The relationship between reported frequency of gambling and rate of discounting different commodities use a fill-in-the-blank procedure. *Analysis of Gambling Behavior, 3*, 62-67.

Weatherly, J.N., Terrell, H.K., & Derenne, A. (2010). Delay discounting of different commodities. *Journal of General Psychology, 137*, 273-286.

Weatherly, J.N., & Terrell, H.K. (2011). Delay discounting of different commodities II: Confirmatory analyses. *Journal of General Psychology, 138*, 35-48.

Yi, R., Mitchell, S.H., & Bickel, W.K. (2010). Delay discounting and substance abuse-dependence. In G.J. Madden and W.K. Bickel (eds.) *Impulsivity: The Behavioral and Neurological Science of Discounting* (p. 191-211). Washington, D.C.: American Psychological Association.

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