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White Problem Gamblers Discount Delayed Rewards Less Steeply than their African American and Hispanic Counterparts

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Abstract

Impulsivity is a core process underlying addictive behaviors, including non-pharmacological addictive behaviors such as problem gambling. Although considerable attention has been given to the investigation of delay discounting within the context of addiction-related behaviors, relatively little research has examined the relationship between discounting and individual variables, such as race/ethnicity. The purpose of this study was to compare discounting rates in the three most prevalent racial/ethnic groups in the US: Whites, African Americans, and Hispanics. The study was conducted in 315 individuals with problem gambling. Participants completed a delay-discounting questionnaire involving choices between a smaller amount of money delivered immediately and a larger amount delivered later. A hyperbolic discounting function estimated delay discounting rates based on participants' indifference points obtained via the questionnaires. Results showed significant effects of race/ethnicity on delay discounting. White gamblers discounted delayed money at lower rates than African Americans and Hispanics, even after controlling for confounding variables. These data suggest that among individuals who develop problem gambling, Whites are less impulsive than African Americans and Hispanics, at least in terms of choosing between delayed and immediate reinforcers. These results have implications for evaluating the onset and treatment of addictive disorders from a health disparities perspective.

Keywords

Delay discounting; impulsivity; gambling; Whites; African Americans; Hispanics

Impulsivity is a core process that underlies behavioral patterns that are commonly thought of as addictive, such as substance use and problem gambling. Impulsivity is a multifaceted construct that has been defined in a variety of different ways (e.g., see Evenden, 1999). One operational definition of impulsivity relates to choices for smaller sooner rewards over larger more delayed ones, or delay discounting (e.g., Logue, 1988).

The term discounting refers to the process by which an individual subjectively devalues outcomes over time. Numerous studies have shown that delay discounting is characterized by a hyperbolic function such as the one below (Mazur, 1984):

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$$V = \frac{A}{1+kD} \quad (1)$$

In this equation, V represents the current subjective value of an outcome, A the amount, D the delay until the outcome is received, and k is a free parameter reflecting how fast the value of an outcome decays with the passage of time (i.e., the discounting rate). Delay discounting is a reliable and valid measurement of the subjective value of immediate outcomes in relation to delayed outcomes (e.g., Ainslie, 1975; Rachlin & Green, 1972), and the k value derived from this equation is an estimate of an individual's tendency to choose the former over the latter (see Green & Myerson, 2004 for a review).

All individuals discount delayed consequences. Some individuals, however, discount substantially more than others. A vast and well-established literature shows that individuals with addiction-related problems, such as substance abuse or gambling problems, discount delayed monetary outcomes at substantially higher rates than non-substance abusing or non-problem gambling controls (see Bickel & Marsch, 2001, MacKillop et al., 2011; and Reynolds, 2006, for reviews).

Although considerable attention has been given to the investigation of delay discounting within the context of addiction-related behaviors, relatively little research has examined the relationship between discounting and individual variables. Evidence is strong that younger individuals discount delayed rewards more steeply than older individuals (Green, Fry, & Myerson, 1994; Steinberg et al., 2009; Yoon et al., 2007), and IQ, income, and education are inversely associated with discounting rates (de Witt, Flory, Acheson, McCloskey, & Manuck, 2007; Green, Myerson, Lichtman, Rosen, & Fry, 1996; Jaroni, Wright, Lerman, & Epstein, 2004). Younger age, and lower intelligence, income, and educational attainment are also risk factors for developing some substance use disorders (e.g., Batty, Deary, & Macintyre, 2007; Grant, 1997; Grant & Dawson, 1997, 1998; Von Sydow, Lieb, Pfister, Hofler, & Wittchen, 2002) and gambling problems (e.g., Kessler, et al., 2008; Ledgerwood et al., 2012; Petry, Stinson, & Grant, 2005; Wong & So, 2003).

Another individual variable of potential relevance to impulsivity and addictive disorders is race/ethnicity. Decision-making studies show that individuals from different cultural backgrounds differ in terms of perception of risk (e.g., Hsee & Weber, 1999; Weber & Hsee, 1998). Likewise, cultural experiences may also affect the degree to which delay to rewards is perceived, a factor that could potentially impact delay discounting rates (Du, Green, & Myerson, 2002). To date, however, only limited research has directly compared discounting rates across different racial or ethnic groups. Du et al. (2002) compared discounting rates among Japanese, Chinese, and White graduate students, and found that Japanese students discounted less steeply than Chinese and White students. In a sample of middle aged adults, de Witt et al. (2007) observed that Whites discounted less steeply than African Americans. Only one known study has evaluated differences in discounting between racial/ethnic groups in individuals with risky or potentially addictive behavior patterns. Dennhardt and Murphy (2011) compared k values between White and African American undergraduates who

reported heavy drinking. As in the other study (de Witt et al., 2007), the White students discounted at lower rates than African Americans.

Thus, some data suggest that discounting rates vary across racial/ethnic groups, although the research to date is quite limited. The purpose of this study was to compare discounting rates in the three most prevalent racial/ethnic groups in the US: Whites, African Americans, and Hispanics. The sample consisted of adults who had already developed addiction problems so that the impact of race could be examined in a group with high rates of discounting. Individuals with a wide range of gambling problems were the target population because gambling is a non-substance addiction, in which discounting would not be impacted by direct effects of drugs. Based on the existing literature, the hypothesis was that Whites would have lower discounting rates than the other racial/ethnic groups.

Methods

Participants

This retrospective study analyzed baseline data collected as part of clinical trials of brief interventions for problem and pathological gamblers (Petry, Weinstock, Ledgerwood, & Morasco, 2008; Petry, unpublished data). Data from all 317 participants who provided information about race/ethnicity and discounting were drawn from the primary study, and only 2 participants were excluded because they endorsed a race different than White, African American, or Hispanic (see categorization by race below). The Petry et al. (2008) study included 180 participants, and the remaining 135 participants' data have not been published; main results from either trial did not, and will not, involve analyses of discounting rates.

Participants were recruited via advertisements, and at low-income medical and substance abuse treatment clinics. A brief screening questionnaire containing information about recent gambling activities, demographics, and the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) was administered to potential participants. Inclusion criteria were that individuals: (1) endorsed three or more items on the SOGS; (2) had gambled on at least four occasions and spent \$100 or more on gambling in the last 2 months; and (3) were 18 years or older. Exclusionary criteria were (1) past month suicidal intention or psychotic symptoms; (2) reading level below 5th grade; or (3) interest in obtaining more intense gambling treatment than that offered in the study. Individuals provided written informed consent approved by the University's Institutional Review Board prior to the study initiation.

Assessments

Before randomization to treatment conditions, participants completed questionnaires in which data regarding demographics, substance use problems, gambling, and delay discounting were collected. The SOGS evaluated the severity of gambling problems in the past month. The scoring scheme ranges from 0 to 20, with scores of 5 or higher indicating probable pathological gambling. The SOGS has satisfactory psychometric properties (Lesieur & Blume, 1987; Stinchfield, 2002). The Addiction Severity Index (ASI, McLellan

et al., 1985), with an additional gambling section (ASI-G) embedded, evaluated the severity of problems across several dimensions, including medical, employment, alcohol, drug, legal, family, psychiatric, and gambling. Scores range from 0 to 1.0, with higher scores reflecting greater severity. Both the ASI and ASI-G have good reliability and validity (Leonhard, Mulvey, Gastfriend, & Shwartz, 2000; Lesieur & Blume, 1991; McLellan et al., 1985; Petry, 2003, 2007).

Delay discounting questionnaire and estimation procedure

Participants also completed the delay-discounting questionnaire developed by Kirby and colleagues (Kirby & Marakovic, 1996; Kirby, Petry, & Bickel, 1999). This questionnaire is comprised of 27 choices between a smaller monetary amount delivered now and a larger amount delivered after x number of days, with x ranging from 7 to 186 days across questions. The questionnaire is divided in three parts, each containing the same number of questions (nine) but different ranges of monetary values for the larger more delayed alternative (\$25–35, \$50–60, and \$75–85). Discounting rates were estimated within each of the three monetary ranges of values first, and then the geometric mean of these values was used to obtain one overall value per participant.

The delay discounting estimation procedure is based on the indifference point (that is, the point in which the subjective value between the two alternatives is deemed equal) obtained throughout the questionnaire, and it is described by the hyperbolic function (Eq.1). By solving for k in the model and using the delay and magnitude values of each pair of choice alternatives, it is possible to estimate the discounting rate yielding indifference between the choice alternatives. Based on the parameters used across the questions, this procedure leads to nine indifference k values: 0.25, 0.1, 0.041, 0.016, 0.0060, 0.0025, 0.0010, 0.00040, and 0.00016. These nine values are associated with each part of the questionnaire and are used to define the bounded ranges of values from which discounting is estimated. Whenever a participant chooses the smaller sooner alternative in a given question, it is assumed that his/her k value is greater than the indifference k associated with that pair of alternatives, whereas choices for the larger delayed alternative indicate the reverse. The point at which a participant switches from choosing one alternative to the other (i.e., the two questions across which the participant reverses his or her preference) defines the range of values (the boundaries) from which his/her discounting rate is assumed. The geometric mean of these two values is used as an estimate of the participant's discounting rate. We assigned the k value that was most consistent with the participant's choice pattern across the questionnaire, and in cases in which a participant selected the immediate or delayed alternative exclusively, we assigned the highest or lowest indifference k endpoint values, respectively—0.25 or 0.00016. For a more thorough description of the delay discounting questionnaire and the discounting estimation procedure, see Kirby and Marakovic (1996) and Kirby et al. (1999).

Categorization by race/ethnicity

Participants were classified as White, African American, or Hispanic based on self-report provided at the baseline interview. Participants who endorsed Hispanic ethnicity alone ($n = 55$) or in combination with another race/ethnicity ($n = 2$) were categorized as Hispanic ($n = 57$ in total). Those who endorsed being African American alone ($n = 113$) or in combination

with any other race/ethnicity except Hispanic ($n = 10$), were categorized as African Americans ($n = 123$ in total). Participants who reported themselves as White/Caucasian with no other race or ethnicity were classified as White ($n = 135$). Participants who endorsed a race different than White, African American, or Hispanic (e.g., Asian, Native American) were excluded from the analysis ($n = 2$). Therefore, this study analyzed data from a total of 315 subjects.

Data analysis

Demographics and baseline characteristics were evaluated using chi-square tests for categorical data and analysis of variance (ANOVA) for continuous variables. When statistical tests revealed overall group differences, post-hoc tests (Least significant difference) were used to evaluate differences between each specific racial/ethnic group with respect to the others. Pearson coefficient correlations evaluated associations between baseline variables. Variables that did not follow a Gaussian distribution (income and ASI scores) were log-transformed (using logarithm base 10) prior to the analysis. All statistics were conducted using SPSS 15.0 for Windows.

The main analysis of discounting rates among White, African American, and Hispanic participants was evaluated using analysis of covariance (ANCOVA). Delay discounting rates were not normally distributed and thus were log-transformed (again using logarithm base 10) before the analysis. Years of education, and ASI employment, drug, and gambling scales scores were included as covariates in the analysis because they were independently correlated with discounting rates and differed significantly across the racial/ethnic groups. Although yearly income was not associated with discounting in this sample, this variable was included in the model because some studies show an association of income with delay discounting (e.g., de Witt, et al., 2007; Green et al., 1996). Age and ASI legal and psychiatric scores were not correlated with discounting rates and therefore were not included in the model. SOGS was excluded from the model because it was highly correlated with ASI gambling. Partial eta squares ($\eta^2_{partial}$) were calculated to determine the effect sizes for race and the other covariates included the model (education, and ASI employment, income, drug, and gambling) on logged delay discounting rates.

Results

As shown in Table 1, groups differed in terms of age, years of education, income, SOGS scores, and scores on five domains of the ASI. More specifically, post-hoc tests found that Hispanics were younger than Whites and African Americans. Whites had more years of education and higher incomes than African Americans and Hispanics. Whites also scored lower than the other two races on the SOGS. In regards to ASI domains, Whites had less severe employment and gambling problems than the other groups. Hispanics scored higher than Whites on the ASI legal scale, and they scored higher than both the other racial groups on the psychiatric scales of the ASI. In relation to the ASI drug scale, Whites scored lower than African Americans, who in turn scored lower than Hispanics.

Table 2 shows intercorrelations among the variables that differed across groups. Education was inversely correlated with k values, and k values were significantly and positively

associated with ASI-drug scores, ASI-gambling scores, and SOGS scores. The correlations between k values and ASI-gambling scores were similar across the three racial ethnic groups, with r s of .20, .15, and .22 (p s > .05) for Whites, African Americans, and Hispanics, respectively.

The ANCOVA revealed statistically significant effects of race/ethnicity on logged delay discounting rates, $F(2, 304) = 3.73, p = .025$, after controlling for other variables. ASI-G scores were also associated with discounting rates in the ANCOVA, $F(1, 304) = 7.23, p = .008$, but no other variables were significantly related to discounting in the model (Table 3). Post-hoc tests revealed that Whites discounted at significantly lower rates than African Americans and Hispanics (p s < .05). No difference between African American and Hispanics were observed ($p = .95$). The delay discounting rates across groups is exhibited in Figure 1. The average k (SE) values for Whites, African Americans, and Hispanics were 0.027 (0.008), 0.044 (0.008), 0.045 (0.011), respectively.

Race/ethnicity remained significantly associated with logged discounting rates whether baseline variables that differed across groups were included as covariates in the model as described above, or if covariates were excluded, $F(2, 312) = 7.24, p = .001$. We also analyzed the data excluding the 12 participants who endorsed two or more races from the main analysis, and the effect of race remained significant ($p < .05$) (data not shown; available from authors).

Discussion

White problem gamblers discounted delayed monetary outcomes more slowly than their African American and Hispanic problem gambling counterparts. These results are in line with previous studies conducted in non clinical populations (de Witt et al., 2007; Denhard & Murphy, 2011; Du et al., 2002), and they extend the association between discounting and race/ethnicity in a large and diverse sample with addiction-related problems.

Numerous studies have shown that problem gamblers exhibit higher rates of discounting than non-problem gambling controls (Alessi & Petry, 2003; Dixon, Marley, & Jacobs, 2003; Ledgerwood, Alessi, Phoenix, & Petry, 2009; Petry, 2001; Petry & Cassarella, 1999; Reynolds, 2006). The current study finds that within this impulsive group, differences exist between individuals from distinct racial/ethnic backgrounds. More specifically, the higher discounting rates observed here among African American and Hispanic problem gamblers suggest that these sub-groups are more impulsive—at least in regards to temporal decision-making—than Whites with gambling problems. A better understanding of the role of impulsivity and racial/ethnic differences may shed light on the development of addictive behavioral patterns. Epidemiological data, for instance, indicate that although African Americans are less likely to gamble in their lifetimes than Whites, African Americans have a greater likelihood of developing gambling problems once they start gambling (Kessler et al., 2008; Petry et al., 2005). Given our findings that African American problem gamblers are more impulsive than White problem gamblers, it is possible that African Americans with greater temporal discounting are the ones who are more likely to engage in gambling and subsequently develop gambling problems. Although theoretically plausible, data relating

discounting as a marker for developing addictive behaviors is scant. Non-human studies provide some evidence that higher discounting rates precedes the development of drug seeking behavior (Perry, Larson, German, Madden, & Carroll, 2005; Perry, Nelson, & Carroll, 2008; Poulos, Le, & Parker, 1995), but longitudinal studies with human subjects are needed to test the generality of these findings and examine whether delay discounting is a reliable and valid marker of the development of addictive related behaviors, such as substance abuse and gambling.

A greater understanding of delay discounting, and racial/ethnic differences in discounting, might also elucidate important avenues to explore in terms of developing and refining treatments. Several studies among substance abusers show that delay discounting predicts response to treatment (e.g., MacKillop & Kahler, 2009; Yoon et al., 2007; Washio et al., 2011). In a sample of cocaine-dependent patients, for example, Washio et al. (2011) found that higher discounting rates predicted shorter durations of in-treatment and post-treatment abstinence. Therefore, a clinical repercussion of the current findings is that African American and Hispanic problem gamblers might be expected to respond more poorly to treatment than White problem gamblers. We are unaware of any study comparing gambling treatment outcomes among individuals from different races/ethnicities. Substance abuse treatment studies, however, show that being Hispanic can be a significant predictor of time to relapse to methamphetamine use following treatment (Brecht, Mayrhofer, & Anglin, 2000). Studies also show that African Americans are less likely to be retained in substance use treatment relative to Whites (Magruder, Ouyang, Miller, & Tilley, 2009; Milligan et al., 2004; Montgomery, Petry, & Carroll, 2012; Substance Abuse and Mental Health Services Administration, 2009). Furthermore, because steeper discounting reflects greater incapacity to wait for delayed rewards (or greater devaluation of delayed outcomes), the current results also suggest that African American and Hispanic problem gamblers might be in greater need of interventions that deliver more immediate and/or higher magnitude reinforcers. Montgomery et al. (2012) found that a low-cost contingency management intervention—a behavioral treatment that delivers reinforcement contingent on the direct observation of target behavior—was more effective in reducing marijuana use in Whites than African Americans. Although this study did not report data on discounting, this finding could—at least in theory and in part—be accounted by African Americans' higher rates of discounting.

Choosing to wait for a reward, whether in the context of contingency management treatments or in the natural environment, is associated with an implicit risk (Mischel & Grusec, 1967; Stevenson, 1986), because longer delays involve greater chances that something could happen to prevent the individual from obtaining the reinforcement (Myerson, Green, Hanson, Holt, & Estle, 2003). The probability of risk can make greater delay discounting more or less adaptive from an evolutionary standpoint (Fehr, 2002). For example, one would expect that those who live under harsher ecological, economical, and/or socio-political conditions would discount more steeply over time than those living under more stable and less risky situations. Empirical evidence is beginning to emerge that individuals who live in some parts of Africa (i.e., countries that often face conditions such as draughts, enemy raids, and epidemic diseases) and some developing Hispanic/Latin nations (i.e., countries that often face unstable governments and high rates of inflation and unemployment) discount more steeply than individuals living in more stable and developed

societies, such as Germany and United States (Boyer, Lienard, & Xu, 2012; Wang, Rieger, & Hens, 2010). Repeated adverse and unpredictable experiences might lead to a potentially adaptive tendency to overweight immediate events. These tendencies may be shared by members of a group and passed down to subsequent generations, who may or may not have necessarily lived under the conditions of risk themselves. The finding that members of racial/ethnic minority groups discount at higher rates than Whites is in line with the interpretation that cultural backgrounds may have affected how delay is perceived and therefore impacted discounting (Du et al., 2002).

A somewhat related factor that could potentially account for the differences in discounting rates observed across racial/ethnic groups is the perception of justice. According to the just world theory (Lerner, 1980), individuals learn and are encouraged to delay gratification because they believe the world is fair and that their long-term investments will be received. Without this belief, long-term investments become frivolous, and choices for the immediate smaller rewards more compelling (Hafer, 2000). Callan, Shead, and Olson (2009) tested this hypothesis by exposing a group of participants to scenes that threatened their sense of justice—e.g., witnessing the suffering of innocent victims—and found that participants witnessing these scenes exhibited greater discounting rates compared to participants who were not exposed to such scenes. Thus, because many African Americans and Hispanics are often victims of social injustices (e.g., racism), these experiences may impact their discounting rates.

An alternative, although not mutually exclusive, explanation for the between-group differences in this study relates to genetics (heritability). To date, however, very few studies have investigated the relationship between delay discounting and genetics, and most of these studies have not been conducted with human subjects (see Mitchell, 2011, for a review). Thus, whether the racial/ethnic differences observed in discounting in this and other studies (e.g., de Witt et al., 2007; Denhard & Murphy, 2011; Du et al., 2002) is better accounted for by genetic or environmental factors, or their combination, remains to be determined.

Limitations of the current study include a reliance on self reports for classifying race/ethnicity and a lack of information regarding specific ethnic heritage. This issue is especially important because the term “Hispanic” is often defined and interpreted in different ways. In addition, differences may exist with respect to discounting within these broad racial/ethnic classifications. Furthermore, twelve participants self-identified with two or more race/ethnicities. Although the main results are not impacted when these participants are excluded from the analysis ($p < .05$), these participants may have been misclassified. Another limitation relates to the lack of a control group without gambling problems, which would allow for comparisons of discounting across racial/ethnic groups among those who have developed problems with gambling versus those who have not.

Despite these limitations, this study is one of the first to examine explicitly the impact of race/ethnicity on discounting in a sample of individuals with addictive behavior problems. Strengths of this study include the broad inclusion criteria and the large sample size. The target population was individuals with gambling problems, an addictive behavior that shares overlap with substance use disorders (Petry, 2006), but does not involve direct ingestion of

substances, which could impact discounting rates (de Wit & Mitchell, 2010; Reynolds, 2006; Yi et al., 2010). Participants were not limited to individuals who were seeking treatment for gambling, but instead involved those who screened positive for problem gambling; this recruitment procedure increases generalization of the findings to problem gamblers more globally, as very few individuals seek treatment for gambling (Slutske, 2006).

In sum, the current results indicate that White problem gamblers are less impulsive than their African American and Hispanic counterparts at least in terms of delay discounting. These results add to the list of individual variables associated with delay discounting and suggest that race and ethnicity should be considered more closely in examining differences in delay discounting, and possibly when evaluating impulsivity more globally.

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Figure 1.

Delay (k value) discounting parameters. Mean values obtained by Whites, African Americans, and Hispanics. Error bars depict standard errors. To enhance interpretability of the results, values are shown in their natural form.

Table 1

Demographic and baseline characteristics

	Whites (n = 135)	African Americans (n = 123)	Hispanics (n = 57)	Statistic (df)	p
Age	42.4 ± 12.4 ^a	42.8 ± 8.3 ^a	37.3 ± 9.8 ^b	$F(2, 312) = 5.92$	.003
Male, % (n)	62.2 (84)	53.7 (66)	56.1 (32)	$\chi^2(2) = 2.01$	.366
Employed full time, % (n)	46.7 (63)	35.0 (43)	38.6 (22)	$\chi^2(2) = 3.77$	.151
Years of education	13.3 ± 2.4 ^a	12.1 ± 1.9 ^b	11.6 ± 2.1 ^b	$F(2, 312) = 16.57$	<.001
Yearly income	\$31,148 ± 37,694 ^a	\$13,460 ± 14,242 ^b	\$10,627 ± 11,833 ^b	$F(2, 309) = 9.07$	<.001
ASI score					
Medical	0.37 ± 0.34	0.34 ± 0.35	0.35 ± 0.36	$F(2, 312) = .28$	.76
Employment	0.44 ± 0.33 ^a	0.76 ± 0.32 ^b	0.69 ± 0.31 ^b	$F(2, 312) = 31.25$	<.001
Gambling	0.42 ± 0.21 ^a	0.51 ± 0.22 ^b	0.51 ± 0.21 ^b	$F(2, 312) = 6.27$	.002
Alcohol	0.10 ± 0.12	0.08 ± 0.15	0.08 ± 0.11	$F(2, 312) = 1.07$	.34
Drug	0.06 ± 0.09 ^a	0.08 ± 0.09 ^b	0.11 ± 0.10 ^c	$F(2, 312) = 7.17$	.001
Legal	0.08 ± 0.17 ^a	0.11 ± 0.19 ^{ab}	0.15 ± 0.20 ^b	$F(2, 312) = 4.16$	.016
Family	0.22 ± 0.19	0.18 ± 0.20	0.26 ± 0.23	$F(2, 312) = 2.88$	.06
Psychiatric	0.19 ± 0.21 ^a	0.16 ± 0.20 ^a	0.30 ± 0.24 ^b	$F(2, 311) = 7.80$	<.001
SOGS score	9.68 ± 4.48 ^a	11.38 ± 4.18 ^b	11.53 ± 3.89 ^b	$F(2, 311) = 6.46$	.002

ASI = Addiction Severity Index. SOGS = South Oaks Gambling Screen. All values are means and standard deviations, unless otherwise noted. Income and ASI scores were log transformed prior to analyses. Groups with different superscripts differ significantly from one another in post-hoc tests; groups with similar subscripts did not differ from one another.

Table 2

Intercorrelations among baseline variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Age		.15**	.09	.14*	.03	-.11*	-.07	-.27**	-.12*	-.11*	-.02	-.04	-.06
2. Income	.15**		.35**	.01	-.40**	.07	-.23**	-.21**	.05	-.08	-.07	-.13*	-.10
3. Education	.09	.35**		-.11	-.52**	.11*	-.28**	-.09	-.06	-.11	-.25**	-.21**	-.18**
4. ASI medical	.14*	.01	-.11		.19**	.03	.07	-.10	.11	.44**	.08	.09	-.08
5. ASI employment	.03	-.40**	-.52**	.19**		-.01	.34**	.11*	.001	.19**	.20**	.23**	.11
6. ASI alcohol	-.11*	.07	.11*	.03	-.01		.09	.15**	.10	.07	.04	.05	.01
7. ASI drug	-.07	-.23**	-.28**	.07	.34**	.09		.30**	.10	.22**	.16	.32**	.16**
8. ASI legal	-.27**	-.21**	-.09	-.09	.11*	.15**	.30**		.21**	.11	.18**	.25**	.09
9. ASI family	-.12*	.05	-.06	.11	.00	.10	.10	.21**		.40**	.14*	.15**	-.04
10. ASI Psychiatric	-.11*	-.08	-.11	.44**	.19**	.07	.22**	.11	.40**		.26**	.21**	-.03
11. ASI Gambling	-.02	-.07	-.25**	.08	.20**	.04	.16**	.19**	.14*	.26**		.41**	.22**
12. SOGS score	-.04	-.13*	-.21**	.09	.23**	.05	.32**	.25**	.15**	.21**	.41**		.18**
13. <i>k</i> value	-.06	-.10	-.18**	-.08	.11	.01	.16**	.09	-.04	-.03	.22**	.18**	

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed). ASI = Addiction Severity Index. SOGS = South Oaks Gambling Screen.

Table 3

Analysis of covariance of delay discounting rates

Variable	<i>F</i>	<i>df</i>	<i>p</i>	$\eta^2_{partial}$
Income	.17	1, 304	.68	.001
Years of education	2.19	1, 304	.14	.007
ASI employment	1.31	1, 304	.25	.004
ASI gambling	7.23	1, 304	.008	.023
ASI drug	2.92	1, 304	.09	.010
Race	3.73	2, 304	.025	.024

ASI = Addiction Severity Index