

**AMERICAN INDIANS AND NON-INDIANS  
PLAYING A SLOT-MACHINE SIMULATION:  
EFFECT OF SENSATION SEEKING AND PAYBACK PERCENTAGE**

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*Abstract: The research literature on gambling behavior indicates that American Indians (AIs) suffer from pathological gambling at a greater rate than the majority population. The literature also suggests that dispositional factors, such as sensation seeking, can influence gambling. However, situational factors, such as the payback percentage of a slot machine, may not. The present study recruited 12 AI and 12 non-AI participants to play a simulated slot machine in three different sessions. Half of the participants in each group were high sensation seekers. The other half were low sensation seekers. Across the three gambling sessions, the simulation was programmed to pay back at a rate of 85, 95, or 105%. Results showed non-significant differences in gambling behavior between AIs and non-AIs and between high and low sensation seekers. Participants were, however, sensitive to percentage payback, playing more trials and betting more credits when the percentage was 105% than when it was 85 or 95%. The present results question whether ethnicity or certain personality characteristics, in and of themselves, are predictive of differences in individuals' gambling behavior. Results also suggest that people's gambling behavior is sensitive to winning and losing, but not to losing and losing even more. Implications for the study of gambling are discussed.*

Pathological gambling is a maladaptive pattern of gambling behavior that persists despite significant negative consequences. In the *DSM-IV-TR* (American Psychiatric Association, 2000), pathological gambling is found under impulse-control disorders not otherwise specified and requires the individual to display at least five cognitive and/or behavioral symptoms to be diagnosed. Research suggests that the overall prevalence rate of pathological gambling ranges from 1% to 2% (see Petry, 2005 for a recent review), with some speculation that the growing availability of gambling opportunities may lead to an increase in the prevalence of pathological gambling.

Not all populations suffer from pathological gambling equally. For instance, it is estimated that American Indians (AIs) suffer from pathological gambling at up to 15 times the frequency of the majority population (Wardman, el-Guebaly, & Hodgins, 2001). Such differences are not isolated to pathological gambling; AIs also display increased frequencies of other disorders, such as alcohol and drug abuse, relative to the general population (e.g., Young, 1994). Comorbidity issues aside, Petry (2005) suggested minority-group membership (e.g., AI) as one of the six known risk factors for pathological gambling. Other risk factors include age, gender, substance use and abuse, marital status, and socio-economic status.<sup>1</sup>

Although the data indicate ethnic minority groups suffer from pathological gambling at a greater frequency than the majority population, the underlying reasons for this difference are neither simple nor straightforward. Increased prevalence rates may exist because there are inherent differences across ethnicities in terms of underlying causes of behavior (e.g., genetics). However, populations such as AIs differ from the majority population in other important aspects (e.g., socio-economic status, rates of substance abuse and psychopathology, etc. McDonald & Chaney, 2003; Zitzow, 1996; and see Petry, 2005). It is therefore possible that these other factors, and not ethnicity *per se*, contribute to heightened rates of pathological gambling in AIs. Yet another possibility is that the differences in gambling are cultural (e.g., how the different populations view gambling and/or what constitutes a gambling problem; see Raylu & Oei, 2004).

Some researchers have postulated that certain personality characteristics or dispositional factors contribute to gambling behavior and gambling problems. One such characteristic is the sensation-seeking personality (Zuckerman, 1979). Zuckerman suggested that one's arousal level plays an important role in maintaining gambling activity, in that high sensation seekers require higher levels of stimulation to maintain

an optimal level of arousal than do low sensation seekers. Zuckerman suggested that gambling is a form of sensation seeking "in which individuals risk loss of money for the positive reinforcement produced by states of high arousal during the period of uncertainty, as well as the positive arousal by winning" (p. 69). High sensation seekers would therefore be prone to develop into pathological gamblers due to their need for high levels of arousal and the reinforcing properties associated with large risks.

Sensation seeking among AIs appears to be associated with problem behavior. For instance, research has suggested that high sensation seeking among AI youths is related to their drug use (Howard, Walker, Walker, Cottler, & Compton, 1999). Zuckerman (2003) argued that existing evidence does not support the view that the trait of sensation seeking varies as a function of ethnic group. Regardless, if ethnic minority status is associated with heightened rates of gambling, then one could predict that high sensation-seeking ethnic minorities would display even higher rates of gambling than low sensation-seeking minorities (or perhaps even higher rates than high sensation-seeking individuals from the majority population).

Research on gambling has also investigated how environmental or situational factors can influence gambling behavior. For example, Weatherly and Brandt (2004) recruited non-pathological participants to play a simulated slot machine. Across groups (Experiment 1) or conditions (Experiment 2), the payback percentage (i.e., how well the simulation paid off) was varied across three different values (i.e., 75, 83, and 95%). The researchers also manipulated the value of the credits that participants bet (i.e., \$0.00, 0.01, or 0.10 each). Results showed that participants' gambling varied systematically at the different credit values. Specifically, participants bet less as the value of the credits increased. However, their gambling behavior did not vary as a function of percentage payback, suggesting that behavior was insensitive to how well the simulation was paying off. Subsequent research (e.g., Weatherly, McDougall, & Gillis, 2006) has replicated the finding that increasing the salience of the money for which participants are gambling inhibits gambling behavior. However, additional research on participants' sensitivity to percentage payback rates has yet to be conducted.

The present experiment was designed to address the above issues. High and low sensation-seeking AI and non-AI participants were recruited to play a slot-machine simulation three separate times. Across these sessions, the percentage payback rate of the simulation was varied from 85 to 105%. The AI participants were also administered the

Northern Plains Bicultural Inventory (NPBI; Allen & French, 1993), which is designed to assess AIs' degrees of cultural identity with both their Native culture and the majority culture.

Given past research, several hypotheses were proposed. First, we predicted that the gambling behavior of the AI participants would exceed that of the non-AI participants. We also hypothesized that rates of gambling by the AI participants would be associated with their cultural identification. Specifically, we did not expect differences in gambling behavior for AI participants who identified more highly with the majority culture. We further hypothesized that participants who were high sensation seekers would gamble more than their low sensation-seeking counterparts. Finally, to be consistent with previous research, we predicted that participants' gambling behavior would not vary as a function of payback percentage when the percentages were less than 100% (i.e., losing percentages). However, we predicted that participants' behavior would be sensitive to payback percentage when the percentage was greater than 100% (i.e., a winning percentage).

## Method

### Participants and Materials

All phases of the present study, as well as the materials that were used, were approved by the University of North Dakota's institutional review board. Participants were recruited through the psychology department subject pool at the University of North Dakota and by circulating advertisements across campus specifically targeting AI students. Participants were required to be at least 21 years of age. A total of 63 individuals were originally screened for potential participation in the gambling sessions, using inclusion criteria that included age, score on the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987), and score on the Zuckerman (1994) Sensation-Seeking Scale, form V (SSS).

During the initial screening, all participants were given a packet of materials including informed consent documents, a demographic questionnaire, the SOGS (Lesieur & Blume, 1987), and the SSS (Zuckerman, 1994). Participants identified as AIs and who were invited to participate in the gambling sessions were administered the NPBI (Allen & French, 1993) prior to the first gambling session.

The demographic questionnaire was designed to ascertain basic information about the sample. Participants were asked to provide their age, gender, year in school, and tribal affiliation, if applicable.

The SOGS (Lesieur & Blume, 1987) is a 20-item scale derived from the psychiatric criteria for pathological gambling that asks participants about their gambling history. It is the most widely used screening tool for gambling behavior and gambling problems (see Petry, 2005), with a score of 5 or more indicating the potential presence of pathological gambling. Individuals scoring 5 or more on the SOGS were not asked to participate in gambling sessions.

The SSS (Zuckerman, 1994) is a 40-item, forced-choice questionnaire that assesses thrill and adventure seeking. Items address the tendency to engage in sports or physically dangerous pursuits, experience seeking that involves changes in lifestyle and stimulation of the mind, disinhibition marked by outgoing social behaviors, and boredom susceptibility characterized by an inability to tolerate repeated experiences and monotony.

The NPBI (Allen & French, 1993) is a 30-item scale that was developed based on the Orthogonal Theory of Biculturalism (Oetting & Beauvais, 1990). The NPBI assesses cultural competence on two distinct cultural dimensions: American Indian Cultural Identification (AICI) and European American Cultural Identification (EACI). Those scoring high (above the median) on both subscales are considered Bicultural. Participants scoring high on AICI but low (below the median) on EACI are Traditional. Low scores on both subscales are considered Marginal, and high EACI and low AICI individuals are labeled Assimilated.

Of the 63 individuals who were initially screened, 35 were AI. Eight of these individuals did not qualify for participation due to their SOGS score (i.e.,  $\geq 5$ ). Twenty-eight of the 63 individuals initially screened were non-AI. Of these individuals, 4 did not qualify for participation due to their SOGS score.

Excluding individuals who scored above 5 on the SOGS help ensure that pathological individuals were not allowed to engage in their pathology. To identify high and low sensation seekers, basic statistics were calculated on the SSS using the entire sample. An individual was deemed a high sensation seeker if that individual obtained a z score of +0.5 or higher. An individual was deemed a low sensation seeker if that individual obtained a z score of -0.5 or lower. These inclusion criteria guaranteed that high and low sensation seekers differed from each other by at least one standard deviation on the SSS. In terms of absolute

scores, these criteria resulted in individuals scoring 24 or higher on the SSS being considered high sensation seekers and those scoring 16 or lower being considered low sensation seekers.

A total of 24 individuals (13 female, 11 male), all non-pathological gamblers, were identified for participation. Twelve of the participants were identified AIs (as evidenced by membership in a Federally recognized tribe) whereas 12 participants were self-identified non-AIs. Participants earned extra credit in their psychology course for completing the screening information. They received money and extra credit in their psychology course for completing the gambling sessions.

Participants were divided into four groups: 6 AI high sensation seekers, 6 non-AI high sensation seekers, 6 AI low sensation seekers, and 6 non-AI low sensation seekers.

### **Procedure**

Participants who qualified to participate in the gambling sessions played a customized version of the slot-machine simulation published by MacLin, Dixon, and Hayes (1999). Like the original version, this version had three reels with three symbols visible on each reel. This version differed from the original in that each individual outcome was preprogrammed rather than being randomly determined. The symbols appearing on the middle row determined a win or loss. The simulation was programmed to pay out 16 credits for every credit bet for three bars landing on the win line, 8 credits for three cherries, 4 credits for two cherries and a blank (in that order), 2 credits for one cherry and two blanks (in that order), and 1 credit for three blanks. Overall payback percentages were varied by arranging these different outcomes (with losses) across 150 potential trials.

The slot-machine simulation was loaded on a desktop computer. The computer was situated on a table located in a windowless room measuring approximately 3 m by 3 m. The researcher sat adjacent to the participant during the gambling session.

These 24 individuals each participated in three separate gambling sessions. Sessions differed in terms of the programmed rate of payback on the slot-machine simulation. The different payback percentages were 85, 95, and 105%. The order participants experienced these sessions was pseudo-randomly determined across participants. A preprogrammed series of outcomes was created for each of the three payback percentages. Thus, each participant experienced the same series of outcomes when playing the simulation as did other participants.

The first condition for each participant began with completion of the informed consent process. Participants who had self identified as AIs were also asked to complete the NPBI. The researcher then read the participant the following instructions:

You are about to play a computer-simulated slot machine that is programmed similar to those you would find at an actual casino. You have been staked with 100 credits to bet. Each credit is worth \$0.05 for a total of \$5.00. At the end of the three sessions you will be paid in cash for the total number of credits you have accumulated across all of the sessions. It should be your goal to end the session with as many credits as you can. How you accomplish that is up to you. You may bet one, two, or three credits per play by clicking on the appropriate button. You may quit playing at any time. The session will end when a) you decide to quit, b) you reach 0 credits, or c) 20 minutes have gone by. Do you have any questions?

If the participant had questions, the researcher repeated the appropriate passage of the instructions. Participants then played the simulation until one of the three criteria was met. The different gambling sessions were separated by at least 24 hours, with the above instructions read prior to each session. At the conclusion of the third gambling session, participants were debriefed, paid for their participation, provided with documentation of their participation for extra credit purposes, and dismissed.

## Results

Table 1 presents the SSS scores for the four different groups. These data indicate that inclusion criteria created distinctly different groups in terms of sensation seeking. However, Table 1 also indicates that SSS scores were similar between the AI and non-AI groups.

**Table 1**  
**Mean SSS Scores (and Standard Deviations)**  
**for Participants in Each Group**

	American Indians	Non-Indians
High Sensation Seeking	Mean = 26.6, SD=2.87	Mean = 25.1, SD=1.39
Low Sensation Seeking	Mean = 14.5, SD=2.25	Mean = 11.6, SD=4.58



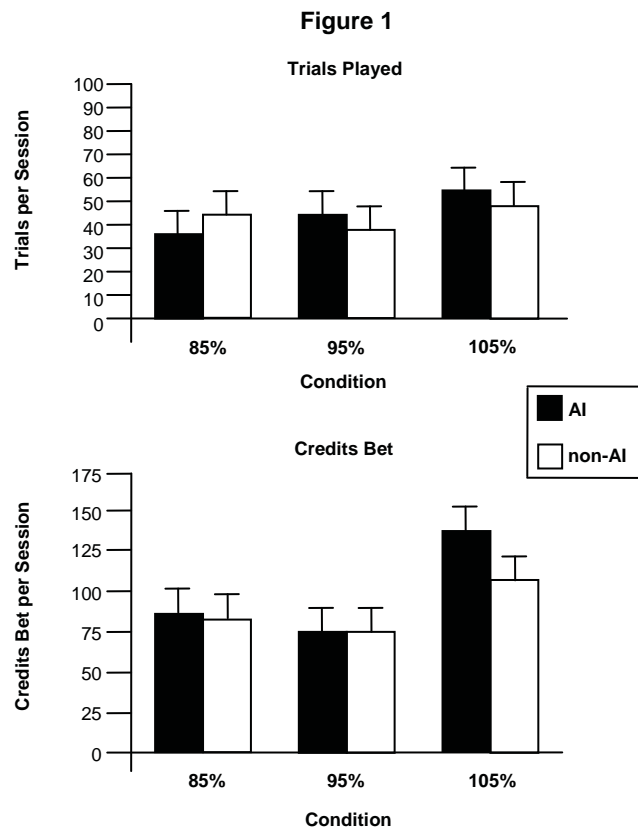
Gambling behavior on the slot-machine simulation was measured in two different ways. The first was the number of trials (i.e., bets made) participants played in each of the three gambling sessions. This measure was analyzed by conducting a three-way (Sensation Seeking X Ethnicity X Payback Percentage) mixed-model analysis of variance (ANOVA) on the number of trials played by individual participants in each of the three gambling sessions. Sensation seeking and ethnicity were each grouping factors. Payback percentage was a repeated measure. In this analysis, the main effect of sensation seeking was not significant  $F(1, 20) = 1.11$ ,  $p=.305$ ,  $w^2 = .053$ , indicating that high and low sensation seekers did not differ significantly in how many times they played the slot-machine simulation. The main effect of ethnicity was also not significant  $F(1, 20) = .00$ ,  $p=.960$ ,  $w^2 = .000$ , indicating that AI and non-AI participants did not differ in how frequently they played the simulation. The main effect of payback percentage was significant  $F(2, 40) = 3.28$ ,  $p<.048$ ,  $w^2 = .01$ , indicating that participants played a different number of trials across the three different payback percentages. However, a follow-up Tukey HSD test failed to find significant differences between any pair of sessions. The interaction between sensation seeking and ethnicity  $F(1, 20) = 1.26$ ,  $p=.275$ ,  $w^2 = .059$ , between sensation seeking and percentage payback  $F(2, 40) = .21$ ,  $p=.812$ ,  $w^2 = .010$ , between ethnicity and percentage payback  $F(2, 40) = .34$ ,  $p=.715$ ,  $w^2 = .017$ , and across all three variables  $F(2, 40) = .70$ ,  $p=.500$ ,  $w^2 = .034$  each failed to reach statistical significance. Results from this analysis, and all that follow, were considered significant at  $p<.05$ .

The second measure of gambling was the total number of credits (i.e., total amount bet) participants wagered across the three different sessions. These data were also analyzed by conducting a three-way (Sensation Seeking X Ethnicity X Payback Percentage) mixed-model ANOVA. Results from this analysis again showed that the main effects of sensation seeking  $F(1, 20) = .39$ ,  $p=.539$ ,  $w^2 = .019$  and ethnicity  $F(1, 20) = .44$ ,  $p=.516$ ,  $w^2 = .021$  failed to reach significance, indicating that participants' betting behavior did not differ as a function of their SSS score or their ethnicity, respectively. However, the main effect of percentage payback was again found to be significant  $F(2, 40) = 9.21$ ,  $p<.001$ ,  $w^2 = .117$ . A follow-up Tukey HSD test showed that participants bet more in at 105% payback percentage than at either the 85% or 95% payback percentages. Betting did not differ between the 85% and 95% payback percentages. The interaction between sensation seeking and ethnicity  $F(1, 20) = 1.22$ ,  $p=.282$ ,  $w^2 = .058$ , between sensation seeking and percentage payback  $F(2, 40) = .23$ ,  $p=.793$ ,  $w^2 = .012$ , between ethnicity



and percentage payback  $F(2, 40) = 1.01, p=.372, w^2 = .048$ , and across all three variables  $F(2, 40) = 1.51, p=.233, w^2 = .070$  each failed to reach statistical significance.

Figure 1 presents the two significant main effects from the above analyses. The top graph presents the total number of trials played as a function of payback percentage for both groups of participants. The bottom graph presents the number of credits wagered as a function of payback percentage for both groups. As apparent in Figure 1, participants' behavior was similar when the percentage payback was 85 or 95%. However, both behavioral measures increased (betting significantly so) when the payback percentage was 105%.



Presented are the number of trials played and total number of credits bet by the mean of all American Indian (AI) and non-Indian (n-AI) participants at each different payback percentage. Error bars represent one standard error of the mean across participants responding at that particular payback percentage.

Finally, scores on the NPBI were analyzed by correlating the scores of the AI participants on each subscale (i.e., the AICI and EACI scores) with each measure of gambling, including the SOGS score. No significant correlations were found, indicating that the gambling behaviors of the AI participants did not vary systematically as a function of their cultural identification.

### **Discussion**

The present study was designed to assess three different factors – ethnicity (and ethnic identity), sensation seeking, and sensitivity to payback percentages – when participants played a slot-machine simulation. Ethnicity was investigated because the literature suggests that ethnic minorities, especially AIs (see Wardman et al., 2001) are more prone to suffer from gambling problems than the majority population. The present study, however, found no differences in the gambling behavior of AI and non-AI participants. Sensation seeking was investigated because researchers (e.g., Zuckerman, 1979) have speculated that this dispositional factor can promote gambling and gambling problems. Again, however, the present results provided no evidence that participants who scored high on the SSS gambled differently on the simulation than did participants who scored low on the SSS. Finally, payback percentage was manipulated because prior results (Weatherly & Brandt, 2004) had suggested that gamblers' behavior was not sensitive to differences in how well slot machines pay off. The present results showed that participants' gambling was in fact sensitive to percentage payback, but only under certain conditions.

The failure to find differences in the gambling behavior of AI and non-AI participants is a somewhat surprising, but perhaps welcome, result. It is surprising because the literature (e.g., Wardman et al., 2001) indicates that AIs suffer from gambling problems at up to 15 times the rate of the majority population. That difference led us to predict that AI participants would gamble differently than non-AI participants. That prediction, however, was not supported.

One could, of course, argue that our failure to find a difference between AIs and non-AIs was the result of a lack of statistical power and thus represents a Type II error. This argument cannot be refuted. If we had employed a much larger sample size, it is possible that significant differences would have emerged.

It might also be suggested that since the AI sample consisted entirely of college students, they were not sufficiently "culturally dissimilar" in terms of self-identity from their majority-culture peers, thus

negating or at least suppressing a potential ethnicity effect. This question is an empirical one that future research can test. The fact that the current study recruited AIs who were enrolled at a university suggests that our sample was a select one, as it did not include AIs in other settings.

The present procedure used to identify high and low sensation seekers might also have served to mask differences that may have existed between AI and non-AI participants. That is, targeting low and high sensation seekers (and excluding “medium” sensation seekers) may have equalized the two ethnic groups. However, Zuckerman’s (2003) claim that sensation seeking does not vary as a function of ethnicity would seem to argue against this possibility because it would suggest that ethnicity and sensation seeking are independent.

Null results are difficult to interpret and one should always be cautious when doing so. With that said, one could consider the failure to find differences in gambling between AIs and non-AIs in the present study welcome. Should this result be a valid one, it would suggest that differences in the prevalence rates of pathological gambling between these groups is not intrinsic or genetic, but rather is the outcome of other factors such as socioeconomic status.

The present experiment also failed to demonstrate an effect of the sensation-seeking personality. One could argue that this failure was due to sample size or to the researchers creating groups that did not truly differ in terms of sensation seeking. However, it is also possible that the SSS is not a good predictor of gambling behavior. For instance, although the SSS may provide a general measure of sensation seeking, it may be unrealistic to expect the instrument to predict behavior in any one particular situation. Prior research from our laboratory has demonstrated that other dispositions (e.g., depression) are not accurate predictors of gambling in a laboratory setting despite the fact that the literature suggests that those dispositions are associated with gambling (Dannewitz & Weatherly, 2007).

With both ethnicity and sensation seeking, one could also argue that differences in behavior were not found because the current study utilized only non-pathological participants. It is certainly possible that statistically significant differences may have emerged had we employed pathological gamblers. We would argue, however, that failing to find differences in gambling behavior in a non-pathological sample supports the conclusion that neither of these factors, in and of itself, necessarily produces differences in gambling behavior.

One might also question whether the present procedure was a legitimate test of gambling behavior because participants were not risking their own money. Rather, they were gambling money that had been staked to them. This concern can, however, be countered by findings in the research literature. Specifically, research on what is known as the “endowment effect” has demonstrated that people tend to take ownership of something that is given to them and are thus negatively impacted by its loss (e.g., Kahneman, Knetsch, & Thaler, 1990).

Finally, the present results partially replicate previous research on gamblers’ sensitivity to percentage payback. That is, Weatherly and Brandt (2004) found, across two experiments, that participants gambled similarly at three different losing payback percentages. The present experiment programmed only two different losing payback percentages, but also found that participants’ gambling behavior was similar across those two percentages. Unlike previous research, however, the present experiment also programmed one winning payback percentage and results showed that participants’ gambling did change when faced with this contingency. Specifically, participants bet more credits than when facing losing contingencies. Technically, one cannot term this particular condition gambling. Because the payback percentage was above 100%, it would be more accurate to term it “investing.”

The present results therefore suggest that gamblers’ behavior may be sensitive to winning vs. losing. However, like previous research, they also suggest that gamblers are not sensitive to differences in percentage payback when those percentages are not in the players’ favor. This outcome can certainly be detrimental to the player because it would potentially lead to large losses that could be avoided if one switched to a slot machine with a higher percentage payback rate. Future researchers might be well served by looking into procedures that may increase participants’ sensitivity to such differences. If such a procedure could be perfected, then it may represent a significant step forward in our understanding (and treatment) of gambling behavior. The value of such research would further increase if conducted in a multicultural context.

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### Footnote

- <sup>1</sup> Risk factors are not necessarily causal factors. Rather, they are factors that are known to be associated with the disorder, in this case pathological gambling. Research suggests that ethnic minorities, young people, men, drug users, people who are single or divorced, and individuals at low socioeconomic status are more likely than their counterparts to become pathological gamblers.

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