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Determining whether "gambling" behavior in the laboratory differs as a function of whether or not participants are risking actual money is important because the outcome will determine whether results from laboratory research can be generalized to actual gambling. Eighteen participants played video poker in two separate sessions. In one, they risked credits that had no monetary value and in the other they risked credits worth money. Results showed that participants played a similar number of hands and played with similar accuracy regardless of whether or not the credits had monetary value. However, participants risked significantly fewer credits when the credits were worth money than when they were not. These results suggest that findings from studies on gambling that do not have participants risk real money may indeed generalize to actual gambling, but that making such generalizations should be done with caution as the amount of risk people are willing to take may be overestimated.

Keywords: Gambling, Money, Motivation, Video Poker, Risk.

The research literature on gambling is not small. A literature search of the PsycINFO database, conducted on November 11, 2007, using the word "gambling" in an all-text search, identified 3,441 sources. Although impressive, this literature is nearly devoid of experimental research. A second search of the same database that cross-referenced "gambling" and "experiment" yielded only 172 sources (not all of which directly studied gambling, represented actual experiments, or both). Even at the most liberal level of analysis, these searches support the conclusion that only approximately 5% of the published scholarly works on gambling are experimental in nature. Importantly, this low percentage is not the product of using the incorrect database. A search for "gambling" on PubMed conducted on November 11, 2007, yielded 2,144 sources. A search for "gambling" and "experiment" yielded a mere 48 sources.

Given the popularity of gambling and the problems that can be associated with it (e.g., the worldwide prevalence rate of pathological gambling likely ranges between 1 – 2%, see Petry, 2005, for a review), the overall lack of experimental research might be surprising. After all, experiments arguably represent the most direct and straightforward procedure for determining cause-and-effect relationships. If scientists and practitioners in the field are interested in understanding the factors that promote and maintain gambling behavior, as well as identifying the potential causes of pathological gambling, then one would perhaps expect a larger amount of experimental research on gambling than currently exists.

There are, however, legitimate reasons for the paucity of experimental research on gambling (see Weatherly & Phelps, 2006, for a review). In the United States, for instance, it

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is against the law in many states to own modern casino equipment (e.g., slot machines) unless you are a licensed casino. This drawback can be partially circumvented by using software simulations that accurately mimic what gamblers would experience in a real casino (e.g., MacLin, Dixon, & Hayes, 1999). Even with realistic simulations, one also encounters difficulty in mimicking the consequences faced by the actual gambler. Specifically, actual gamblers face the possibility of losing (their own) money. For research purposes, many investigators are constrained by laws that prevent them from having participants risk money. Even when it is possible, the money participants risk is not their own. Rather it is staked to them by the experimenter (e.g., Dannewitz & Weatherly, 2007).

These issues gain in importance because research from our laboratory suggests that the presence of money in the procedure can influence the results of the experiment. For instance, Weatherly and Brandt (2004) had participants play a simulated slot machine. Across groups (Experiment 1) or sessions (Experiment 2), the participants played the simulation with credits that were worth \$0.00, \$0.01, or \$0.10 each. Results of both experiments demonstrated that participants' betting behavior varied as a function of the monetary value of the credits. Specifically, participants played more trials and bet more credits *the less* the credits were worth. Participants were most conservative when the credits were at their highest monetary value (i.e., \$0.10 each).

Weatherly, McDougall, and Gillis (2006) showed that even showing participants money can alter their behavior. In their procedure, participants were asked to play a slot-machine simulation. One group was told that they had been staked with 100 credits worth \$0.10 each (i.e., \$10). The second group was shown a \$10 bill and told that it could be used to secure 100 credits worth \$0.10 each on the simulation. The final group was handed the \$10 bill and told that, if they wanted to play the slot-machine simulation, they could return the bill in exchange for 100 credits worth \$0.10 each. Results showed that 3 of the 36 participants chose not to gamble and simply keep what they had been staked. All three participants were from the final group who had physically handled the money. Furthermore, participants in the group who had handled the money bet fewer credits when playing the simulation and quit earlier than did participants in the other groups.

Such results are not limited to our own laboratory. For instance, McCall and Belmont (1996, Experiment 1) demonstrated that customers left larger tips for wait staff when the tip tray was emblazoned with the emblem of a major credit card versus when it was not. These results can be considered consistent with those of Weatherly et al. (2006) in that credit cards are a step removed from actual cash money. Thus, consistent with the results of Weatherly and Brandt (2004), results from other studies indicate that participants' become more conservative as the salience of money is increased.

More recent research suggests that the influence of money in experiments designed to study gambling may extend beyond simply how much people bet. Weatherly, Austin, and Farwell (2007) recruited self-identified experienced and novice poker players to play three different types of video poker. Perhaps surprisingly, "experts" and novices did not differ in how accurately they played. Both groups committed the most errors (i.e., holding or discarding cards that reduced their rate of return below the optimal) when playing "Loose Deuces," a five-card draw game in which Two's are wild.

Dixon, Jackson, Pozzie, Portera, Johnson, and Horner-King (2007) recently reported a systematic replication of Weatherly et al. (2007). They recruited participants to play "Loose Deuces" video poker. After taking baseline measures of accuracy of play, these

researchers attempted improve participants' performance through training. Their attempt was successful. Relevant to the present study, however, was the baseline measure of accuracy. Whereas participants in Weatherly et al. (2007) played at nearly 70% accuracy, participants in Dixon et al.'s study had a baseline accuracy rate of less than 50%. One potential explanation for this difference is the underlying motivation of the participants. Participants in Weatherly et al. (2007) played for money and could increase their winnings by performing well. Participants in Dixon et al. (2007) played for extra course credit, but not for money.

It is worth noting that this issue is not new. For instance, Anderson and Brown (1984) reported that changes in participants' heart rate when "gambling" was influenced by the amount of money being risked. Indeed, a number of physiological changes (e.g., cortisol levels) have been shown to vary as a function of the value of the risk involved (see Petry, 2005, for a discussion). However, the issue has not been systematically pursued or resolved, likely because so little of the research on gambling involves the use of experimentation. Furthermore, although research indicates that the stakes influence physiological measures, to the best of our knowledge it has not been directly demonstrated that the stakes influence gambling behavior.

If laboratory research on gambling is going to inform us as to the mechanisms and processes that contribute to and control gambling behavior, then the validity of the procedures used in such research should be established. Given research results to date, how people "gamble" in laboratory situations may differ depending on the consequences they face during the procedure. Namely, participants may "gamble" differently when they are risking money than when they are not. If true, then one could legitimately question whether research results from experiments on gambling than do not have participants risk money will generalize to gambling in the "real world."

The present experiment was designed to assess the importance of using money as a consequence when participants gamble in a laboratory setting. Participants were given two opportunities to play video poker. On one occasion, the credits they were staked had no monetary value. On the other occasion, the credits were worth $0.05 each and the participants could win or lose money by playing the game. Based on prior research, we predicted that participants would play more hands, bet more credits, and make more mistakes in play when gambling credits with no monetary value than when gambling credits with monetary value.

METHOD

Participants

Eighteen individuals (11 females, 7 males) were recruited from the psychology department participant pool at the University of North Dakota. To participate in the gambling sessions, individuals needed to be 21 years of age or older, score below 5 on the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987), and have the ability to operate a computer mouse. Participants ranged in age from 21 to 44 years of age (mean = 25.72 years old, SD = 6.47 years). SOGS scored ranged from 0 to 2 (mean = 0.39, SD = .70). One participant self identified as Hispanic/Latino, one as American Indian, and the remaining 16 as White. Twelve of the 18 participants indicated that their annual income was less than $15,000.

Materials

Participants completed three separate survey measures. The first was a demographic questionnaire that asked the participant's sex, age, marital status, race/ethnicity, and annual income. This information was collected because these factors are known risk factors for pathological gambling (see Petry, 2005). The

second questionnaire was the SOGS (Lesieur & Blume, 1987), which is a 20-item measure designed to assess the person's gambling history. It is the most widely used survey measure for pathological gambling (see Petry, 2005), with a score of 5 or more indicating the potential presence of pathology. The final measure was the Gambling Functional Assessment (GFA; Dixon & Johnson, 2007). The GFA is a 20-item measure that is designed to assess the consequences that may maintain the person's gambling behavior. Four possible consequences are assessed: escape, monetary rewards, the sensory experience, and attention.

The experiment was conducted in a windowless room that measured approximately 2 m by 2 m. The room contained two tables and two chairs, with a personal computer on each table. The same video-poker software (Zamzow Software Solutions, 2003) was loaded on to each computer. The researcher programmed the software to play a five-card-draw poker game called "Loose Deuces." This game is a variation of a standard, Jacks-or-Better poker game with the exception that Two's are wild cards. The player is dealt five cards, can choose which of those to hold or discard, and then draw. The five cards held after drawing new cards determines the outcome of the gamble. The game allowed the participant to bet one to five credits per hand. Obtaining at least three of a kind was required to return the player's original bet. In addition to regular poker hands (i.e., Straight, Flush, Full house, etc.), the game paid for Five of a kind (15-1 odds), a Royal flush with Two's (25-1 odds), and Four two's (500-1 odds).

In terms of dependent measures, the software recorded a variety of measures during play. Measures included the number of hands played, number of coins bet, number of coins won, and number of errors made during play. On each particular hand, the optimal play was the one that maximized the player's rate of return given the five original cards that had been dealt. All plays that reduced the player's average rate of return were recorded as errors despite the possibility that the player could win credits by making an "error." Players were not notified as to what the best play was for a given hand or as to whether they had made the optimal choice. The only information provided to participants was the pay table that appeared on the screen above where the cards were displayed (see Jackson, 2007).

Procedure

Participants were run individually. At the beginning of the session, the researcher initiated the informed consent process. Once the participant provided informed consent, the researcher had the participant complete the three questionnaires. The researcher immediately scored the SOGS. If the participant scored 5 or more on the SOGS, the researcher provided the participant with extra credit for the person's psychology course (if applicable) and dismissed the participant. One participant was dismissed because of a SOGS score greater than 5. This participant was replaced (i.e., 18 participants completed the gambling sessions).

The researcher then seated the participant in front of one computer and read the participant the following instructions:

> You will now be given the opportunity to play video poker. Specifically, you will be playing a game called Loose Deuces, which is a 5-card-draw poker game in which 2's are wild. You have been staked with 100 credits. Your goal should be to end the session with as many credits as you can. The game will end when you have lost all your credits, you choose to quit, or 15 min has elapsed. Do you have any questions?

Questions were answered by repeating the appropriate portion of the instructions.

Each participant played poker in two sessions, with the second session conducted immediately after the first. In one session, the 100 credits had no monetary value. In the other session, the credits were worth $0.05 each.

In the session in which the credits had no monetary value, the researcher read the following instructions at the point the asterisk appears in the above instructions:

> These credits have no monetary value, but please play as if they did.

In the session in which the credits were worth money, the research read the following at the point the asterisks appears in the above instructions:

> The credits you have been staked are worth five cents each. Thus, you have been given $5 to gamble. You will be paid in cash at the end of the experiment for the number of credits you have won or have remaining.

The order of sessions was counterbalanced across participants so as to counteract any carryover effects that play in the first session might have had on play in the second session. Nine participants played first with credits with no monetary value followed by the session in which the credits were worth money. The remaining nine participants played for money first, followed by the session in which the credits had no monetary value.

For each session, participants played video poker until one of the three criteria for ending the session was met. After the first session, the participant was then situated in front of the second computer and was read the appropriate instructions for that session. After completing the second poker session, the researcher asked the participants whether they thought they had played differently when the credits had monetary value vs. when the credits had no monetary value. The participant was then debriefed, compensated with extra course credit (if applicable), paid for the number of credits remaining after the session in which the credits were worth money, and dismissed.

RESULTS AND DISCUSSION

Three dependent measures from the poker sessions were analyzed. The first was the number of hands played during the session, which can be viewed as a measure of duration. The second was the total number of credits bet across the session, which can be viewed as a measure of risk. The third was the percentage of hands correctly played during the session, which can be viewed as a measure of accuracy. Each measure was analyzed by conducting a one-way repeated measures ANOVA using the data from individual participants. Results showed that the number of hands played per session (M = 58.33 when credits had monetary value; M = 57.50 when credits had no monetary value) did not differ significantly between the two sessions, $F(1, 17) = .01$, $p=.926$ ($\eta^2 = .001$). Participants bet significantly fewer credits across the session when the credits had monetary value than when they did not, $F(1, 17) = 4.64$, $p=.046$ ($\eta^2 = .214$). Figure 1 graphically presents the difference observed in the credits bet per session. Lastly, the difference in the percentage of hands played accurately did not differ when the credits had (M = 56.68% correct) or did not have monetary value (M = 57.62% correct), $F(1, 17) = .16$, $p=.691$ ($\eta^2 = .010$). Results from these analyses, and all that follow, were considered significant at $p<.05$.

When responding to the question of whether they had played differently when the credits had monetary value versus when they did not, 7 of the participants responded that they had played differently; the remaining 11 responded that they had not.

Pearson product-moment coefficients were calculated for the factors asked on the demographic questionnaire, SOGS score, scores on the four categories measured by the GFA, and the gambling measures in each video-poker session. Two correlations were worthy of note. The first was the correlation between age and SOGS score ($r = 0.507$, p

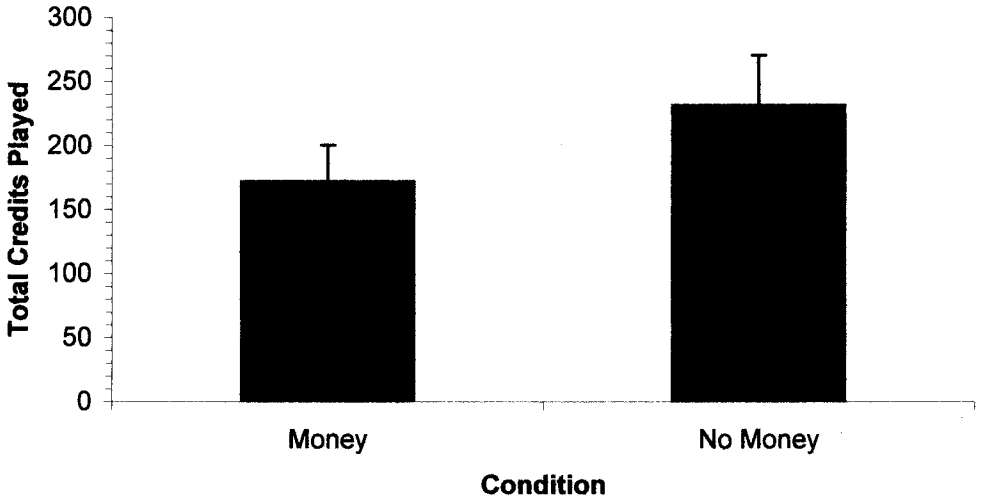

Figure 1. Presented are the total number of credits bet across the session when the credits did or did not have monetary value. The error bars represent one standard error of the mean across participants in that particular condition.

=.032). This relationship is opposite of the larger research literature (see Petry, 2005), but was likely influenced by the limited range of SOGS scores in the present sample and/or the exclusion of pathological participants. The second was between the number of credits bet during the session in which the credits had monetary value and the consequence of sensory experience on the GFA (r = 0.606, p = .008), indicating that participants who scored high on gambling for the sensory experience tended to risk more money.

The present experiment investigated whether participants' "gambling" behavior would differ as a function of whether or not they were risking actual money. Consistent with previous results (Weatherly & Brandt, 2004), participants in the present study risked fewer credits when the credits had monetary value than when they did not. However, how many hands of video poker participants played and how well they played them did not differ as a function of monetary value of the credits the participants were risking.

The present results are important because it is not feasible for many researchers who study gambling to have participants risk actual money (i.e., it may be against the law). If "gambling" behavior occurred differently when participants risked money vs. when they did not, then the applicability of results from studies that did not involve money could be potentially questioned. Thus, the results of the present study provide relatively positive news. That is, participants played a similar number of hands, and played with similar accuracy, regardless of whether or not the credits they were betting were worth money. These findings suggest that results from studies on gambling that do not involve risking money may still generalize to actual gambling behavior.

Of course, one must be wary of placing extensive confidence in non-significant, or null, results. It is possible that if some aspect of the present procedure had been altered, then the effect of money would have emerged for the measures of hands played or accuracy of play. One could potentially argue, for instance, that the present procedure simply did not employ enough participants to uncover a significant effect. That argument, however, can be countered by estimating effect sizes and then extrapolating the number of participants that would have been necessary to produce a sig-

nificant effect. For both the measures of hands played and accuracy of play, the value of Cohen's *F* (Cohen, 1988) was zero. With that effect size, no number of participants would have resulted in a significant effect. Thus, the present results do not appear to be the outcome of using too few participants.

The present experiment did find one significant effect of money. That effect was participants were more conservative in their betting when the credits had monetary value vs. when they did not. Given that the monetary value of the credits did not influence the number of hands played or how well they were played, finding a significant effect on the number of credits risked should be taken as a warning for researchers who study gambling. Namely, procedures in which participants are not risking money may overestimate the risk they would actually take were they actually risking money. Finding that just under half of the participants indicated that they had played differently when the credits had monetary value than when they did not further underscores the need for researchers to take this procedural factor into account when designing their studies and drawing conclusions from their results.

It is also worthy of noting that the amount of money that was at stake in the present experiment was not substantial. Although the effect sizes found for the non-significant effects were very small, it is certainly possible that other effects of money would have emerged had participants been playing for larger sums (e.g., $100). Because of limited funding, it seems unlikely that many researchers would be able to sustain a programmatic line of research by staking participants with large sums of money. However, investigating this possibility is warranted because individuals who suffer from gambling problems are not risking small sums of money.

Finally, the present results shed light on two potentially opposing "effects" that have been reported in the broader literature. One is the "house effect," which is the finding that people tend to be more risky with money that they have been staked (i.e., house money) than they are with their own money (e.g., Ackert, Charupat, Church, & Deaves, 2006). The other is the "endowment effect," which is the finding that people who are gifted something, such as money, take ownership of it and treat it as if it were their own (e.g., Kahneman, Knetsch, & Thaler, 1990). The present results would appear to be at least somewhat at odds with "house effect" in that, although participants may have taken more risks with the money they had been staked than they would have with their own money, they took less risk with staked money than they did with valueless credits. Finding that participants risked fewer credits when the credits had monetary value than when they did not would appear completely consistent with the "endowment effect."

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