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THE IMPACT OF JACKPOT AND NEAR-MISS MAGNITUDE ON RATE AND SUBJECTIVE PROBABILITY OF SLOT MACHINE GAMBLERS

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The present study examined the degree to which varying amounts of jackpot size would impact the rate and subjective probability of slot machine play in recreational gamblers. Twenty college undergraduates who reported occasional slot machine playing served as participants. Two groups of 10 participants were utilized with each group exposed to one of two monetary contingencies ($0.50 USD versus $2.00 USD). Various behavioral measures (e.g., inter-response times, subjective probabilities) were measured on each individual trial, and resistance to extinction was also examined. A significant difference of trial outcome (following losses and following wins) was found in respect to inter-response time in that inter-response times were significantly greater following winning trials (i.e., spins) than losing trials, and this difference was not mitigated by jackpot size. Jackpot size only altered responding to near-miss jackpots during extinction conditions. Implications for the treatment of pathological gamblers are presented.

Keywords: near miss, slot machine, reinforcer magnitude, extinction

The foundational behavioral account as to why people continue to gamble when the odds of winning are against them was that the maintenance of the behavior occurred via a specific reinforcement history (Skinner, 1953). Most games consist of a delivery of reinforcement on a variable/random-ratio schedule of reinforcement (Knapp, 1997; Skinner). This intermittent schedule of winning is one of the principal elements involved in theoretical accounts of gambling from a behavioral perspective (Petry & Roll, 2001; Rachlin, 1990). However, the complexity of the natural environment where gambling takes place appears to be more multifaceted than a single reinforcement schedule. Various environmental stimuli (lights, free drinks, other gamblers) exist, as well as the resulting psychological functions those stimuli have on the individual gambler of interest (see Weatherly & Dixon, 2007 for a discussion). The additional influence of verbal behavior and rules, both in the environment and within the skin of the person of interest, have also been investigated as potential maintaining influences on gambling behavior (Dixon & Delaney, 2006; Dixon, Hayes, & Aban, 2000).

Controlled explorations as to what variables do in fact impact responding of the gambler are often conducted in analogue or contrived settings. Experimentation in an actual casino is difficult, if not impossible, and attempts would lack the necessary control needed to ensure internal validity. Without tightening control over the various extraneous variables in a casino, scientific research on gambling will be limited to only correlational accounts and not cause-and-effect deductions. Perhaps one of the most common problems in controlled gambling-like research is the delivery of a consequence that mirrors that to ac-

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tually winning money in a casino. Players may be given money by the researcher (e.g., Weatherly & Meier, 2007), promised course extra credit if they are college students (e.g., Dixon & Jackson 2008; Zlomke & Dixon, 2006), or some approximation of both. Others may play simply for the "fun" of gambling being an enjoyable activity. The wide variation in consequential outcomes for participation in casino-like studies has led to debates as to if real money outcomes are functionally similar or different to non-money outcomes (see Weatherly & Meier). For example, research by Weatherly and Meier found that video poker players did not differ in trials played when winning game outcomes were paid with money when compared to conditions where winning game outcomes were paid nothing. These findings run contrary to those of Weatherly and Brandt (2004) that did show differences in trials played by slot machine gamblers when comparing money and no money conditions. In short, the value of money in experimental research is still unknown.

Following from the issue of money or no-money outcomes in experimental research on gambling is the effect of such outcomes' magnitude or size. Conflicting data have been generated with respect to large or small wins sustaining gambling for longer periods of time. For example, Weatherly, Sauter, and King (2004) exposed one group of gamblers to a large win early in their gambling history (within the context of the experiment) followed by an extended period of no wins, and another group of gamblers to equal total valued amounts of small frequent wins, followed by the same extended no win period. These authors found that the participants exposed to the smaller more frequent wins sustained their gambling behavior under extinction conditions much longer than those participants who experienced a single "big win." Similar reports have been made by Dixon, MacLin, and Daugherty (2006). The opposite findings of the effects of a single large win have been reported by Delfabbro and Thrupp (2003) who claimed that a large win early in a gambling history is highly correlated with significant gambling problems.

Outside of the mainstream behavioral literature, other gambling researchers have investigated how other structural characteristics of the game itself may sustain gambling. The "near-miss", or almost winning is exemplified on a slot machine when the display presents two of three winning symbols on a payoff line and the required third winning symbol immediately above or below that payoff line. Reid (1986) has claimed that the near-miss itself could be a reinforcer because "almost winning" is almost as good as winning itself. Griffiths (1999) has argued that near-misses could contribute to a "gamblers fallacy" in which a win is sure to ensue after a string of losses or in this case, the near-miss. According to Skinner (1953) the near-miss or "almost hitting the jackpot increases the probability that the individual will play the machine", thus sustaining play. Contemporary behavioral conceptualizations of the near miss have ranged from stimulus generalization to a verbal discriminative stimulus (Dixon & Schreiber, 2004). Regardless of which theoretical conceptualization that one may take, the near-miss occurs, alters responding of gamblers (Dixon, Nastally, Jackson, & Habib, under review), and it appears logical that a near-miss for a small jackpot may alter responding differently than a near-miss for a large jackpot.

The primary purpose of the following study was to examine the impact of jackpot size and trial type (win, loss, and near-miss) on recreational gamblers playing a simulated slot machine. Unlike previous studies (Weatherly & Brandt, 2004; Weatherly, Sauter, & King, 2004) in which small monetary incentives were used and made possible to participants, this study utilized relatively larger incentives in hopes of expanding the body of

research on jackpot size and near-miss effects on responding.

METHODS

Participants, Recruitment, and Group Assignment

Twenty undergraduate students served as participants in this study. All participants were at least 18 years of age and students of Southern Illinois University Carbondale. There were 14 males and 6 females ranging in age from 18 to 24 years old. Of the participants, 18 were undergraduate students and 2 were graduate students. Participation took between one and two hours to complete.

Participants were recruited through several means. Public postings describing the study and its compensation (i.e., having the chance to win money; described below) were located within the Rehabilitation Institute and across other university buildings located on the campus of Southern Illinois University Carbondale (e.g., Student Center). In addition, the first author made in-class presentations in Rehabilitation and Psychology courses in which the study was briefly described, notification of potential compensation was provided, and process to participate was outlined.

Potential participants were administered the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987). This is a 16-item questionnaire devised to assess the participant's previous gambling activity. Scores of 5 or greater have been demonstrated to be an indicator of potential pathological gambling behavior (Lesieur & Blume). Psychometric properties have indicated the discriminant validity to be excellent in that it correctly identifies problem gamblers 95% of the time in comparison to social gamblers (Friedenberg, Blanchard, Wulfert, & Malta, 2002). No SOGS score exclusion criteria was used in the current study. Obtained SOGS scores were used to ensure group homogeneity. No participants were removed from the study based on SOGS score, and no participants elected to terminate the study prematurely before completion.

Participants were randomly assigned to one of two conditions of the study. If a participant dropped out or failed to attend a scheduled session, participants were added to each of the conditions.

Experimental Setting and Apparatus

All experimental sessions were conducted in a small room (3 x 3.5 m) within the Rehabilitation Institute at Southern Illinois University Carbondale. The room contained gambling equipment (e.g., craps table, four slot machines, roulette wheel) along with a table, two chairs, physiological equipment, personal computer, and a one-way observation mirror.

The experimental apparatuses consisted of two IBM-compatible laptop computers running slot machine simulations. The slot-machine simulation was a custom version of that described by MacLin, Dixon, Robinson, and Daugherty (2006) and was programmed on the first computer (Toshiba Satellite Pro) in Microsoft Visual Basic.Net. Figure 1 displays an image of the slot machine. The other computers were not used in the present study.

The slot machine simulation had three reels, each consisting of six symbols, which spun when the participant hit the "Spin" button, and a "payout line". Three positions were visible to the participant by means of the payout window. Only when three of the same symbols were aligned on the "payout line" would a spin be considered a WIN. When two of the same symbol were aligned on the "payout line", that was considered a Near-Miss (NM); however, near-misses were not utilized in this study until the extinction phase (described below). All other combinations were considered a LOSS. Reels stopped sequentially from left to right with the entire reel spin lasting approximately four seconds. When three of the same corresponding

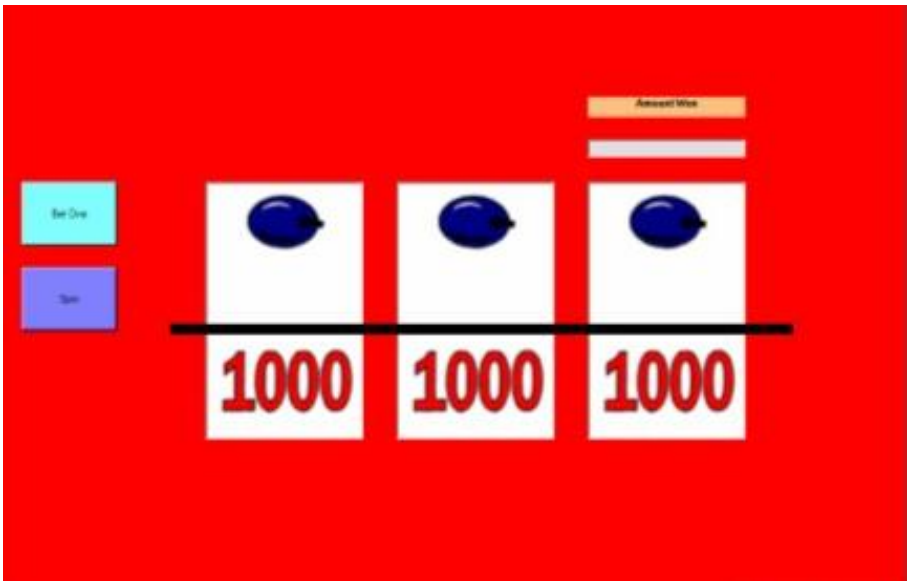

Figure 1. Graphical representation of the simulated slot machine interface.

symbols were aligned on the "payout line" (WIN), the dollar amount per WIN corresponding to the experimental group the participant was randomly assigned to was added to the "Amount Won" textbox located directly above the reels. Topography of wins, losses, and near-misses were determined randomly via random number generators that were part of the computer program.

The version used in this study was dissimilar to the MacLin et al. (2007) version in three ways. Initially, each spin (i.e. trial) outcome was pre-determined by the experimenters. Second, a probability bar was added so participants, at the completion of each spin and before the commencement of the next spin, provided an indication of how confident they were the next spin would be a win. The probability bar ranged from '1' (losing hand for sure) to '10' (winning hand for sure). Lastly, the "TOTAL CREDITS" and "AMOUNT BET" textbox's were removed from the MacLin et al. (2007) version.

Research Design

A between-groups design was utilized in the present study. Participants were assigned to one of two groups that varied in the amount of money earned following a winning trial. A reversal design (i.e., ABAB) was used within each group with experimental phases alternating between monetary contingencies absent and present. Both groups of participants were exposed to the same distribution of wins, losses, and near-miss slot machine outcomes.

Procedure

Prior to the participant arriving, the first author randomly assigned the participant to one of the two experimental conditions. Upon arriving, the participant was asked to show a valid student ID and to subsequently sit at a desk in the room in which the study took place. The participant was subsequently provided with the informed consent form and asked to read and sign it. Upon signing, the participant was given the SOGS as detailed above.

The first author then read, similar in parts to Weatherly and Brandt (2004), the following to the participant:

> You will now be given the opportunity to play a computer-simulated slot machine.

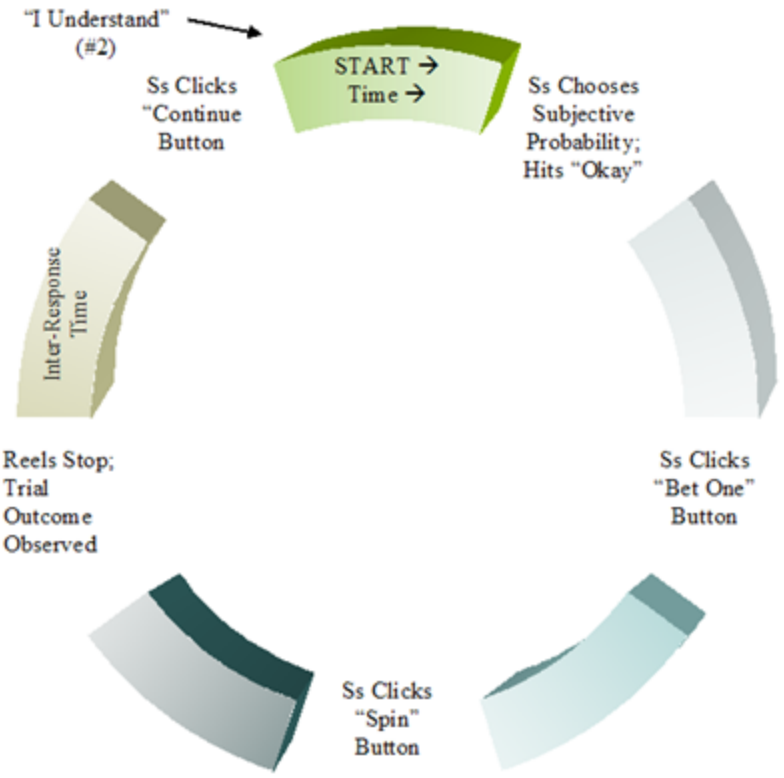

Figure 2. Schematic of the temporal sequence of a trial.

This simulation has been designed and is programmed identically to those found in actual casinos. That is, each potential winning result is programmed at a constant odds and each individual play is independent of the previous play. A variety of symbols will appear on the slot machine while you play, however, the same three symbols must be on the middle row to be considered a win.
You will start off with $0.00 dollars won. While playing, you will see two different background colors for the slot machine. When the slot machine background is red, each time three symbols are aligned on the middle row (i.e. WIN), you will win $0.00. When the slot machine background is blue, each time three symbols are aligned on the middle row, you will win ($0.50 or $2.00 depending on experimental condition) cents/dollars. You may quit (i.e., end the session) at any time after the "Exit" button appears by clicking on the "Exit" button at the bottom of the screen. The session will end when (a) you click "Exit," or (b) two hours in duration have passed. Do you have any questions?

Any questions asked were answered by repeating the instructions above. After the experimenter read the instructions and answered any questions, the participant began the experimental task. The simulation began with the participant reading another set of instructions shown on the computer screen that were very similar to Dixon & Schreiber, 2002):

> Before each trial, a probability bar will appear. Use the bar to indicate how confident you are that your next spin will be a winning one. Selecting a '1' indicates that you guess the next spin will be a losing one for sure, while selecting a '10' indicates that you believe your next spin will be a winning spin for sure. Respond on the numbers between 1 and 10 to your varying degree of confidence about the outcome of your next spin.

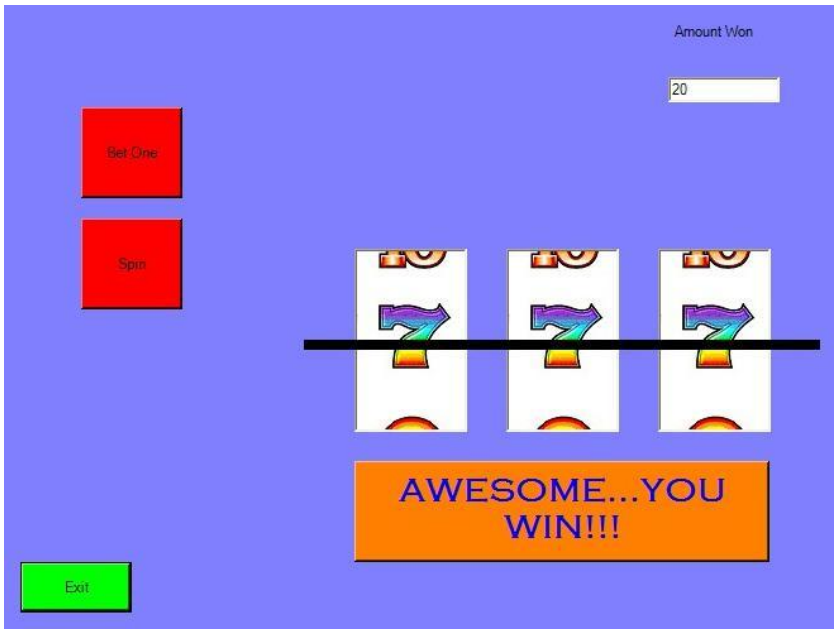

Figure 3. Graphical display of slot machine simulation following a winning trial.

After hitting an "I Understand" button, the next screen provided more instructions about the computer interface and procedures for each trial.

> During the game, once you select a probability number and hit the "Okay" button, the next spin will be available. You will need to click on the "Bet One" button located in the upper left hand corner of the screen. Once you have hit the "Bet One" button, you will then need to hit the "Spin" button to start the reels.

After hitting the second "I Understand" button, participants played the simulation until one of the aforementioned criteria was reached. Figure 2 displays a chronological depiction of each trial completed by the participant, and Figure 3 provides an illustration of the slot machine simulation interface after a "Win".

As visualized in Figure 2, the participant initially clicked the second "I Understand" button to start the first trial. The participant subsequently chose a subjective probability value and selected the "Okay" button as a confirmatory response. A response was then made on the "Bet One" button, thus simulating a wager of one credit. After clicking the "Bet One" button, the participant clicked the "Spin" button at which time the reels spun. Approximately four seconds later, the reels stopped, the outcome was observed, and if a WIN occurred, the number of dollars won changed (i.e., if a winning trial occurred in the accurate corresponding background condition) along with a message that read "AWESOME…YOU WIN!!!" Correspondingly, no change was observed if a losing trial occurred or if a WIN occurred in a no-money condition. Finally, the participant hit the "Continue" button upon which the subjective probability bar appeared again and a new trial began. The point counter was constantly displayed and cumulative across all experimental conditions.

Upon completion, the participant was verbally debriefed, handed a permanent product of the debriefing, and paid the amount of money (in the form of a gift card) respective to the study condition they were randomly

assigned to. Session length never exceeded 120 minutes.

Experimental Conditions

Adaptation. This adaptation phase was 5 min in duration and was implemented to control for any idiosyncratic effects of initial responding to the experimental procedures. Participants played an average of 20 trials and lost on approximately 18 of the 20 trials.

Monetary Contingency Absent (A1, A2). During this phase, the background to the simulated slot machine was the color *Red*. Each participant played a total of 50 trials, which consisted of 5 WINS (10% of trials) and 45 LOSSES (90%). The location of each of the WINS and the topography of each spin was determined randomly via a random numbers generator. Initially, the location of each of the five WINS was determined by taking the first five numbers (moving horizontally from left to right) less than or equal to 50 produced by the generator. Subsequently, the topography of each spin outcome was determined via the ensuing described method. Each reel had 6 symbols and 6 blanks, thus 12 positions were available to land on for each reel during each spin. These 12 positions were each given a number (1 through 12) that associated each position of the reel with a number to be used in a random numbers generator. Each spin consisted of three positions (one for each reel) that fell on the "payout line," thus three random numbers were used for each spin (one for each of the positions). The three random numbers for each spin were determined using the procedure described above with three caveats: (1) only numbers less than or equal to 12 were utilized, (2) if the same position number was observed in a string of three random numbers (e.g., 6, 4, 6; i.e., a near-miss result would occur), the last of the duplicate numbers was disregarded and the next number, one that failed to match either of the other numbers was used, and (3) on trials in which a WIN occurred, the first number in the generator was used for each of the three positions (e.g., 12, 12, 12) in order for a WIN to occur.

Monetary Contingency Present (B1, B2). During this phase, each participant played a total of 50 trials consisting of 5 WINS (10% of trials) and 45 LOSSES (90%), similar to the *monetary contingency absent* phase. Trial topography and outcomes were determined utilizing the exact protocol described above. However, in this phase, the background color was *Blue* and each WIN resulted in the specified monetary reinforcer (e.g., \$0.50 (\$5.00) or \$2.00 (\$20.00)).

Extinction. The Extinction phase commenced on trial 201 as the final WIN (number 20) occurred on trial 200 for each participant. During this phase, no WINS were programmed and only Near Misses (NM's) and LOSSES resulted from each spin. Each block of 50 extinction trials consisted of 5 NM's (10%) and 45 LOSSES (90%) with NM location and LOSS trial topography determined as described previously. In regards to trial topography for NM's, there were three possibilities: (a) winning symbols located on the left and middle positions of the payout line (left), (b) winning symbols located on the left and right positions of the payout line (split), and (c) winning symbols located on the middle and right positions of the payout line (right). The quantity of each was determined by providing each possibility with a number (e.g., 1, 2, and 3) and using a random numbers generator to determine the trial topography for each of the 5 NM's (e.g., 2 left, 2 split, 1 right). The actual topography within the NM was further determined via a random numbers generator, similar to that already described (e.g., positions 6, 4, and 6). The same trials and within NM topographies were used in each block of extinction trials and across participants.

Despite previous literature demonstrating that the frequency of NM's is greater than WINS in a non-simulated slot machine

Table 1
Sex, Group Assignment, and Money Won for each Participant

Participant	Sex	Group	Money Won
1	M	1	$20
2	M	1	$20
3	F	2	$5
4	M	2	$5
5	F	1	$20
6	M	2	$5
7	F	2	$5
8	M	1	$20
9	F	2	$5
10	F	1	$20
11	M	1	$20
12	M	2	$5
13	M	1	$20
14	M	2	$5
15	M	1	$20
16	M	2	$5
17	F	1	$20
18	M	2	$5
19	M	1	$20
20	M	2	$5

(Dixon & Schreiber, 2004), the percentage of NM's remained the same (in comparison to WINS in previous phases; i.e. 5%) in this phase to control for any effects that both fewer LOSSES and an increased percentage of NM's (compared to WINS) would have had on resistance to extinction. In addition, an "Exit" button was displayed on trial 201 that participants could voluntarily hit at any point subsequent to its availability, at which time the participant was finished.

Dependent Measures

This study concentrated on the following dependent measures: (a) total number of trials played during Extinction, (b) inter-response times between trials/spins, and (c) subjective probability following each trial. Total number of trials played during extinction was defined as the number of trials played after the completion of Trial 200. Response latency was defined as the time from the stopping of the reels of the slot machine to the participant hitting the "Continue Button" to start a new trial (see Figure 2). Subjective probability was defined as the Likert-scale number provided prior to the commencement of each trial.

Data Analysis

Two 2 x 2 mixed analyses of variance (ANOVA) were conducted to determine whether main effects of monetary incentive value ($5.00, $20.00) and/or trial outcome (following a loss, following a win, following a near-miss) or an interaction between monetary incentive value and trial outcome were present on inter-response times for the ABAB phase (following loss, following win) and EXT phase (following loss, following near-miss) of the study. Further, two additional 2 x 2 Mixed Analyses of Variance (ANOVA)

Table 2
Score and Result on the South Oaks Gambling Screen (SOGS) for each Participant

Participant	Score	Classification
Group 1		
1	0	No Problem
2	0	No Problem
5	2	No Problem
8	9	Probable Pathological Gambler
10	1	No Problem
11	0	No Problem
13	6	Probable Pathological Gambler
15	2	No Problem
17	3	No Problem
19	1	No Problem
Group 2		
3	0	No Problem
4	1	No Problem
6	0	No Problem
7	0	No Problem
9	0	No Problem
12	0	No Problem
14	5	Probable Pathological Gambler
16	0	No Problem
18	7	Probable Pathological Gambler
20	0	No Problem

were conducted to determine whether main effects of monetary incentive value ($5.00, $20.00) and/or trial outcome (following a loss, following a win, following a near-miss) or an interaction between monetary incentive value and trial outcome were present on subjective probabilities for the ABAB phase (following loss, following win) and EXT phase (following loss, following near-miss) of the study. Finally, independent samples t-tests were conducted between monetary incentive value groups for the number of trials played during extinction.

For all statistical tests, and alpha level of 0.05 was utilized with the effect size provided when a statistically significant result was obtained and power provided when no statistically significance was obtained. When pair-wise comparisons were calculated with more than one pair-wise comparison, a Bonferroni correction for multiple comparisons was utilized.

RESULTS

Demographics

Table 1 displays the composition of the participants in this study, specifically their sex, group assignment, and corresponding amount of money won. Each group of 10 participants consisted of 7 males and 3 females with Group 1 winning $20 and Group 2 winning $5. Table 2 exemplifies the score for each participant (separated by group) on the South Oaks Gambling Screen (SOGS) along with its ensuing classification. An independent samples *t*-test was conducted to

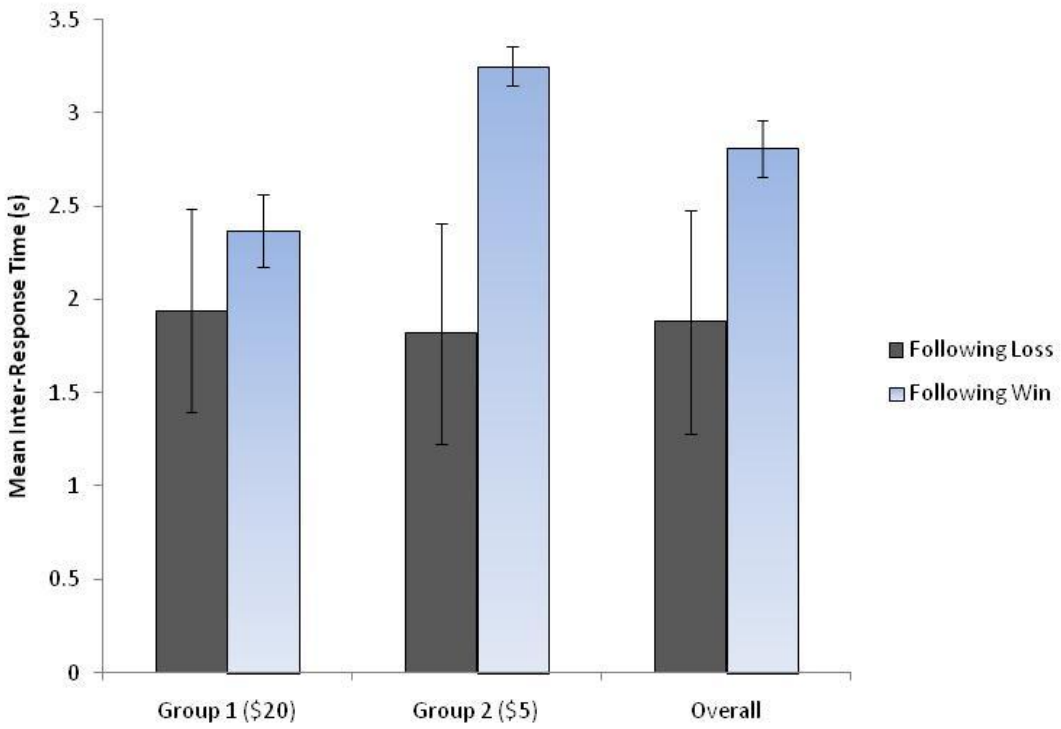

Figure 4. Mean inter-response times following losses and wins for each experimental group and overall during ABAB portion of study. Error bars represent one standard deviation around the mean.

determine whether a difference in SOGS scores was present between the mean scores of Group 1 (M = 2.40, SD = 2.95) and Group 2 (M = 1.30, SD = 2.54) with no significant difference found, $t(18) = .893$, $p > .05$, d = 0.42. In summary, each group consisted of eight participants classified as having 'no problem' with gambling and two participants classified as 'probable pathological gamblers.'

Inter-Response Times

A 2 x 2 mixed analysis of variance was conducted on group by trial outcome (following loss, following win) during the ABAB phase of the study to test for differences between Mean Inter-response Times (MIRT) for Group 1 ($20) vs. Group 2 ($5) across trial outcomes, differences between MIRT following losses vs. following wins for both groups, and for an interaction effect between group and trial outcome during the ABAB phase. The main effect of trial outcome was found to be statistically significant by the Wilks' Lambda Criterion (Wilks' $\lambda = 0.612$, $F(1, 18) = 11.415$, $p = 0.003$, $\eta^2 = .388$). Specifically, and as observed in Figure 4, MIRTs were significantly greater following winning trials (M = 2.81, SD = 1.20) than losing trials (M = 1.88, SD = 0.31). No main effects of group (p = 0.114, power = 0.304) or interaction (p = 0.087, power = 0.403) were found. Examining the mean inter-response times (MIRT) by group during the ABAB phase of the study, both demonstrated overall greater MIRT following winning trials (M = 2.37, SD = 1.09 and M = 3.25, SD = 1.18 for Group 1 and 2, respectively) than losing trials (M = 1.94, SD = 0.39 for Group 1, M = 1.82, SD = 0.21 for Group 2) (see Figure 4).

A 2 x 2 mixed analysis of variance was conducted on group by trial outcome (following loss, following near-miss) during the EXT phase of the study to test for differences

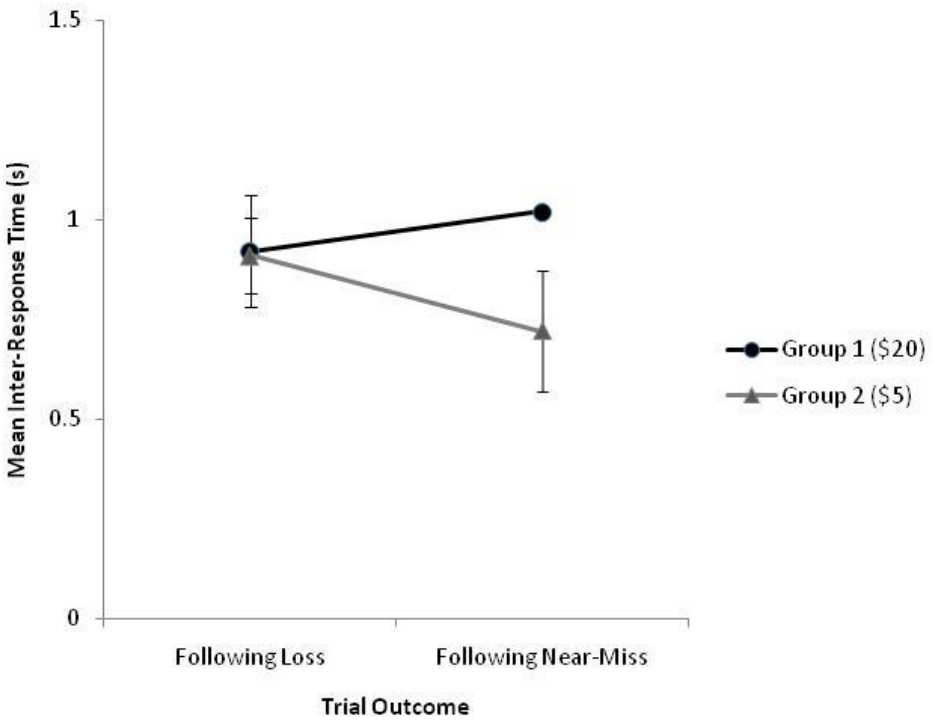

Figure 5. Interaction between mean inter-trial interval by group and trial outcome during EXT phase of study. Error bars represent one standard deviation around the mean.

between MIRT for Group 1 vs. Group 2 across trial outcomes, differences between MIRT following losses vs. following near-misses for both groups, and for an interaction effect between group and trial outcome during the EXT phase. An interaction effect was found to be significant by the Wilks' Lambda Criterion (Wilks' $\lambda = 0.719$, F (1, 14) = 5.473, $p = 0.035$, $\eta^2 = .281$). This interaction can be observed in Figure 5. The graph demonstrates that MIRTs were nearly identical following losing trials across groups; however, MIRT was significantly greater following near-misses for Group 1, the larger monetary group, than for Group 2, the smaller monetary group. No main effects of slot-machine outcome ($p = 0.463$, power = 0.108) or group ($p = 0.195$, power = 0.245) were observed. Investigating the MIRT during the EXT phase in which losing and near-miss trials were present, Group 1 ($20) demonstrated greater MIRT following near-misses ($M = 1.02$, $SD = 0.27$) than losses ($M = 0.92$, $SD = 0.28$) whereas the opposite was true for Group 2 ($M = 0.72$, $SD = 0.30$ following near-misses; M = 0.91, $SD = 0.19$ following losses).

Subjective Probability

A 2 x 2 mixed analysis of variance was conducted on group by trial outcome (following loss, following win) during the ABAB phase of study to test for differences between subjective probability for Group 1 ($20) vs. Group 2 ($5) across trial outcomes, differences between subjective probability following losses vs. following wins for both groups, and for an interaction effect between group and trial outcome during the ABAB phase. The main effects of trial outcome ($p = 0.075$, power = 0.433) and group ($p = 0.768$, power = 0.059) along with an interaction ($p = 0.276$, power = 0.186) were all found to be statistically nonsignificant. Inspecting the mean subjective probabilities across groups (see Figure 6), both demonstrated greater mean subjective probabilities following losses ($M =$

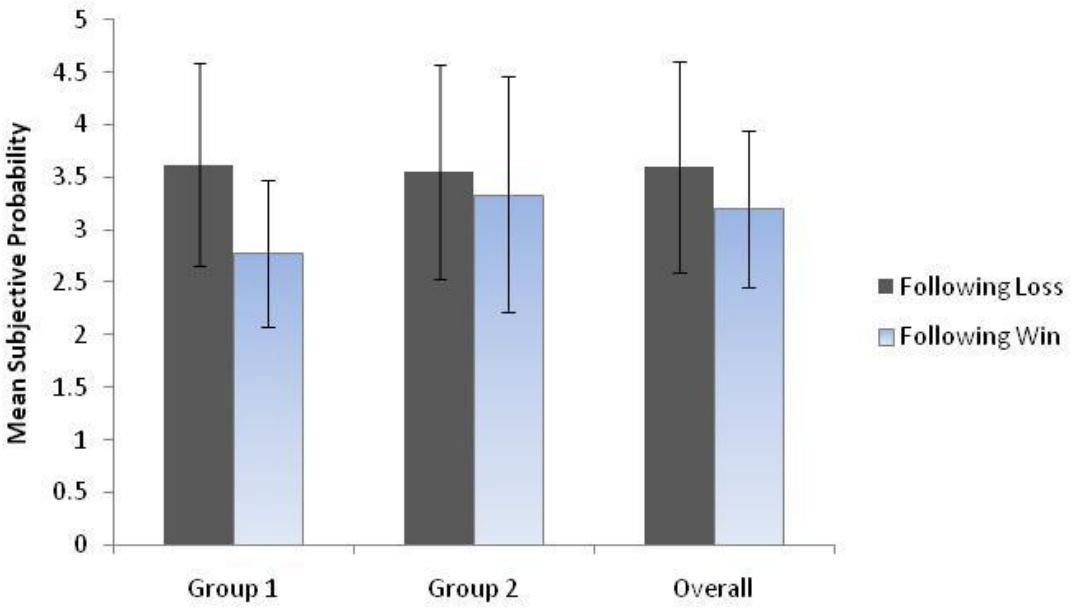

Figure 6. Mean subjective probabilities following losses and wins for each experimental group and overall during the ABAB portion of the study.

3.62, *SD* = 1.93 for Group 1 and *M* = 3.55, *SD* = 2.05 for Group 2) than following wins (*M* = 2.78, *SD* = 1.39 for Group 1 and *M* = 3.34, *SD* = 2.24 for Group 2).

A 2 x 2 mixed analysis of variance was conducted on group by trial outcome (following loss, following near-miss) during the EXT phase of the study to test for differences between subjective probability for Group 1 ($20) vs. Group 2 ($5) across trial outcomes, differences between subjective probability following losses vs. following near-misses for both groups, and for an interaction effect between group and trial outcome during the EXT phase. No main effects of trial outcome ($p = 0.887$, power = 0.052), group ($p = 0.808$, power = 0.056), or an interaction were observed ($p = 0.205$, power = 0.236).

Extinction Trials Played

An independent samples *t*-test was conducted to determine if a statistical significance was present between the two groups in the number of EXT trials played. No significance was found, $t(18) = 0.343$, $p = 0.736$, $d = 0.16$. Group 1 averaged 120.80 (*SD* = 90.37) EXT trials whereas Group 2 averaged 104.00 trials (*SD* = 125.89)

DISCUSSION

The purpose of the current study was to determine whether differences exist in behavioral measures such as inter-response time and subjective probability following wins, near-misses, and losses at different monetary incentive magnitudes. No statistically significant difference was found between jackpot size on the inter-response times following winning and losing trials during the reversal (i.e., ABAB) phase of the study. In other words, monetary incentive value had no effect on MIRT within or between participants. However, a statistically significant result was obtained within participants with respect to trial type or trial outcome; specifically MIRTs were significantly greater following winning trials than losing trials, which supports previous research (Dixon & Schreiber, 2004; Schreiber & Dixon, 2001). Behavioral accounts for this finding include the position that increased inter-response times following wins can be viewed as a type of post-

reinforcement pause. An alternative account is that of a negative reinforcement model in which losing trials are considered aversive stimuli and by initiating the following trial in an expedited fashion, the aversive stimulation is subsequently removed and the individual escapes the stimulation (Dixon & Schreiber, 2004).

In contrast, monetary jackpot size did appear to impact MIRT during extinction. Here all trial outcomes were losses, and near-misses were introduced as a type of loss. Under such contingencies, Group 1 responded in a manner in which near-misses resembled more of a win. That is, they showed minimal MIRTs. This was the opposite to the performance of participants in Group 2 in which MIRTs following near-misses were similar to those following total losses. In short, jackpot size impacts near-miss MIRTs. Thus, the most powerful variable that differentiated responding by our participants was the presence or absence of a near-miss during extinction conditions. It is possible that "almost" winning $20 was more of a conditioned reinforcer than almost winning $5. Magnitude effects of the near-miss have not been experimentally investigated and should be parametrically analyzed. It follows that near-misses of large jackpots may in fact result in larger pauses, and if these outcomes contain some conditioned reinforcer properties, these outcomes may reinforce gambling for longer periods of time.

Despite the non-significant findings of group and trial outcome for subjective probabilities during the ABAB portion of the study, the overall group averages for both trial types (i.e., following losses, following wins) fails to support previous behavior research (Dixon & Schreiber, 2004). Specifically, subjective probabilities were greater following losses than following wins, thus supporting the "gambler's fallacy". The "gambler's fallacy" is described as a belief that a particular event or set of events (e.g., losing trial) has an impact on or is predictive of future events. In other words, it is the gambler's belief that following a losing trial or string of losses, a winning trial is more likely to occur. This same pattern of demonstrating the characteristics of the "gambler's fallacy" was observed for Group 1 during the EXT phase of the study, however, subjective probabilities following near-misses were greater than following losses for Group 2.

The obtained results in the present study are further relevant to the research literature examining real versus hypothetical rewards (Weatherly & Brandt, 2004; Weatherly & Meier, 2007), and do not provide strong support for the added value of using real money in experiments on gambling behavior. In our study, we found no differences in performance between jackpot size, and hypothetical versus real rewards in our participants. This begs the question of how real money of various magnitudes alters the participant's performance on gambling tasks. Perhaps there are individual differences across gamblers in these studies with some finding small amounts of money earned via participation a greater source of reinforcement than for other participants. Much more research is needed to establish conclusive evidence of how money interacts with gambling performance. While our study produced some interesting results, a potential limitation is the small sample size and thus further replications are necessary with larger groups of participants and potentially larger amounts of jackpot payouts.

In summary, the present findings add to the growing research literature on jackpot size and its effects on participant performance at slot machine games. We have found that size of a jackpot does not appear to alter performances, but the size of a near-miss jackpot does. The complexity of what a near-miss is does to a slot machine gambler remains unknown. When almost winning costs the casino nothing, it may in fact cost the player

something much more. In the present study we have only shown an impact on time between trials played. However, if the near miss is indeed a type of a conditioned reinforcer, its presence may result in longer periods of time played by a gambler as illustrated by MacLin, Dixon, Daugherty, and Small (2007). When the odds of winning are against the slot machine player, longer periods of exposure only can result in longer periods of financial loss.

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