ISSN: xxxxxxxxx

Analysis of Gambling Behavior

Volume 3
Number 2
Summer 2009

The Analysis of Gambling Behavior (AGB) is a peer-reviewed publication that contains original general interest and discipline specific articles related to the scientific study of gambling

Content of the Analysis of Gambling Behavior

The Analysis of Gambling Behavior (AGB) contains general interest and discipline specific articles related to the scientific study of gambling. Articles appropriate for the journal include a) full-length research articles, b) research reports, c) clinical demonstrations, d) technical articles, and e) book reviews. Each category is detailed below along with submission guidelines:

Research Articles – a manuscript of full length (20-30 double-spaced pages approximately), which may contain multiple experiments, and are original contributions to the published literature on gambling.

Research Reports – a manuscript of reduced length (no more than 10 double-spaced pages and a single figure or table page), which may be less experimentally rigorous than a Research Article, a replication of or failure to replicate a prior published article, or pilot data that demonstrates a clear relationship between independent and dependent variable(s). The Results and Discussion sections of Reports should be combined.

Clinical Demonstrations – a manuscript of reduced length (no more than 8 double-spaced pages and a single figure or table page) which lack the rigor of a true experimental design, yet do demonstrate behavior change of persons with gambling disorders under clinical care. This manuscript should contain an Introduction, Methods/Treatments, Results, and Discussion sections. The Results and Discussion sections of Clinical Demonstrations should be combined.

Technical Article – a manuscript of either full or reduced length, depending on necessity, that describes either a new technology available that would be of interest to researchers or a task-analysis style description of how to utilize existing technology for the conducting of research. Examples of appropriate topics may include, but are not limited to, the rewiring of a slot machine for the collection of data or controlling of win/losses, how to use computer software to simulate a casino game, or the way in which neuroimaging devices may interfaced with an experimental apparatus.

Book Review – a review of a contemporary book related to gambling not more than three years after the publication data of the book to be reviewed. The review should be no more than 15 doubled-spaced pages in length.

ANALYSIS OF GAMBLING BEHAVIOR

Volume 3, Number 2, Winter 2009

ISSN XXX-X-XXXXX-XXX-X

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Research Reports

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SOCIAL INFLUENCE WHEN MALES GAMBLE: PERCEPTIONS AND BEHAVIOR

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Experiment 1 tested whether the gambling behavior of 12 non-pathological male participants would be altered by the presence and/or gender of a confederate who also gambled and whether participants' self reports would match their actual behavior. Results showed that although actual gambling behavior did not vary as a function of the presence or gender of a confederate, participants reported that it did. Experiment 2 tested whether the gambling behavior of nine non-pathological males would be altered by the presence of a confederate and/or whether the confederate won or lost. Results showed that the presence of the confederate increased gambling, but whether the confederate won or lost did not influence participants' gambling behavior. As in Experiment 1, participants' self reports did not match their actual behavior; participants reported no influence of the confederate. The present study sheds light on the situations in which the presence of other gamblers may influence gambling behavior. They also suggest that conclusions based on self reports of gambling should be made with caution as they may not accurately represent actual behavior.

Key words: Social influences, confederates, self reports, gambling, males.

The vast majority of individuals will gamble at some point in their lifetimes and a small proportion of those individuals (1-2%) will become pathological gamblers (see Petry, 2005, for a review). Although that proportion is small, it represents millions of people. Understanding the factors that contribute to gambling and gambling problems is therefore a critical undertaking.

Many forms of gambling occur in social settings, so it seems reasonable that social factors might influence gambling behavior. Previous research supports this assertion. For instance, Blascovich and Ginsburg (1974b) had male participants play blackjack along with confederates. Results showed that participants altered the amount of their bets as the confederates changed their bets. Recent research from our laboratory (McDougall, McDonald, & Weatherly, 2008) has demonstrated that male participants played fewer trials and bet fewer credits when gambling on a slot-machine simulation when a confederate was present but quit playing (i.e., left the session early) versus when the confederate remained and played throughout the session (or when the participant gambled alone). Overall, the research literature supports the notion that people conform (e.g., see Asch, 1955) in a number of situations including those that involve risk taking (Blascovich & Ginsburg, 1974a, b; Blascovich, Ginsburg, & Veach, 1975; Carli, Lafleur, & Loeber, 1995; Hardoon & Derevensky, 2001; Lee, 2004; Moore & Kim, 2003).

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Acknowledgements:
Partial completion of this project was made possible by an Advanced Undergraduate Research Award fellowship granted to the third author and a corresponding mentor award granted to the first author by the National Science Foundation (EPSCOR05-08).

Research in non-gambling situations has shown that an effect of gender exists in the area of social influence. For instance, men appear more likely to conform to other men than they are to women (Carli et al., 1995; Lee, 2004). Carli et al. (1995) found, for example, that when participants viewed videos of male and female confederates performing competent styles of persuasion speeches, male participants were influenced more by male speakers than by female speakers. To our knowledge, whether gambling can be socially influenced as a function of gender has not been examined.

Also relevant to the present study is the finding that men tend to engage in riskier behaviors (e.g., less likely to go to a doctor, more likely to abuse alcohol, more likely to gamble) than women (Mahalik, Lagan, & Morrison, 2006). Hardoon and Derevensky (2001), for example, found that fourth- and sixth-grade males increased their non-monetary bets in group settings more so than females when both played a computer-simulated Roulette game. More generally, the gambling literature supports the conclusion that males are more prone to gamble and become pathological gamblers than are females (Petry, 2005). So much so, in fact, gender is one of the six risk factors for pathological gambling (Petry, 2005).

One way to determine how certain environmental factors influence individuals' behavior is to ask the individuals directly. Such self reports are common when studying social influences (Baumeister, Vohs, & Funder, 2007). The majority of research has found that when beliefs and/or attitudes are carefully measured and correspond to the behavior being measured, they can accurately predict behavior (Ajzen & Fishbein, 1977). However, research has also shown that there are sometimes stark differences between what people say they would do and how they actually behave (e.g., LaPiere, 1934). More recent research has shown that self reports can be quite inconsistent with actual behavior, leading researchers to question their validity (Cohen, Manimala, & Blount, 2000; and see Baumeister et al., 2007). Nisbett and Wilson (1977) concluded that self reports would accurately predict behavior only when stimuli influential to the behavior being measured are present when participants provide self reports.

Research on social influence suggests that surveys can sometimes accurately predict peoples' behavior. For instance, high self monitors are more likely than low self monitors to alter their behavior according to the circumstances that they are experiencing (e.g., Ickes, Holloway, Stinson, & Hoodenpyle, 2006). Self monitoring has also been shown to relate to inaccuracy in self reporting, with high self monitors perhaps wishing to appear more socially desirable than low self monitors (Snyder & Gangestad, 1986). Research has not yet investigated the potential connection between self monitoring and gambling behavior and/or how gambling is socially influenced.

EXPERIMENT 1

Experiment 1 tested whether the gambling behavior of male participants would be altered by the presence and/or gender of a confederate gambler. Given previous research results, we hypothesized participants' gambling would be altered by the presence of a confederate who also gambled and that participants would gamble most in the presence of a male confederate. Additionally, prior to gambling, participants were asked to complete two self-report measures designed to assess susceptibility to social influence. Given the past research with these scales, we hypothesized that participants' scores would be predictive of how the presence of a confederate influenced their behavior. At the conclusion of the study, participants were asked to report how the presence and gender of the confederate influenced their gambling behavior. We hypothesized that participants would accurately report that influence.

METHOD

Participants

Participants were 12 male undergraduate students from the University of North Dakota who were 21 years of age or older and who scored below a 5 on the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987). Participants' age ranged from 21 to 23 years old (M = 22.08 years old, SD = .90 years). The range of the SOGS scores was 0 to 3 (M = 1.25, SD = .97). Eleven of the participants self identified as white and one as Asian. Eight of the 12 participants reported having an annual income of under $10,000.

Materials

Participants completed several paper-pencil measures. They completed a demographic questionnaire that asked about age, gender, marital status, ethnicity, and annual income. Information on these factors was collected because each factor is related to pathological gambling (Petry, 2005).

The next questionnaire was the SOGS (Lesieur & Blume, 1987). The SOGS is a widely used screening tool for the potential presence of pathological gambling (see Petry, 2005). It consists of 20 items pertaining to one's gambling experience and history. A score of 5 or more on the SOGS suggests the potential presence of pathology. Research indicates that the SOGS displays good internal consistency (Lesieur & Blume, 1987; Stinchfield, 2003) and test-retest reliability (Lesieur & Blume, 1987).

Participants then completed the Self Monitoring Scale (SMS; Snyder, 1974). This survey contains 18 true-false questions that ask about how much people pay attention to their own actions. The SMS is designed to assess ways in which people adjust their behaviors based on social comparisons presented in their environment and has been shown to predict actual behavior (Snyder & Gangestad, 1986). Higher scores on the SMS suggest that the participant is a higher self monitor. Research on the SMS has been mixed, with some studies reporting acceptable psychometric properties (e.g., Ahmed, Garg, & Braimoh, 1986) and others questioning them (e.g., Dillard & Hunter, 1989).

Participants also completed the Marlowe-Crowne Social Desirability Scale (MCSDS; Crowne & Marlowe, 1960), which consists of 33 true-false statements about actions performed by people. The actions are either socially desirable, but seldom done by most people, or actions that are not socially desirable, but commonly done by most people. The MCSDS was designed to determine how people report doing appropriate behaviors that are in truth unlikely to occur. This survey is widely used to assess social desirability bias (Beretvas, Meyers, & Leite, 2002), has strong internal consistency and test-retest reliability (e.g., Tatman, Wogger, Love, & Cook, 2009), and has been shown to predict actual behavior (Crowne & Marlowe, 1960). Scoring higher on the MCSDS suggests that a participant tends to be strongly affected by social expectations.

The final measure was an exit questionnaire created for the present study. The questionnaire contained 14 items measured on a Likert scale. The questions pertained to whether or not the participants believed the presence or absence of a confederate and/or the gender of the confederate affected them and/or their own behavior. These questions can be found in the Appendix.

Apparatus

The experiment was conducted in a small, windowless room. The room contained three slot machines, two of which were employed in the present study. Participants completed the surveys and gambling sessions in this room.

Participants always gambled on one slot machine, which was an IGT Triple Diamond machine. The machine allowed the player to bet either one or two tokens per play and was programmed to pay back 87% over an indefinite period of play. The maximum number of tokens that could be won on a two-token bet was 2,500. The machine recorded the total number of coins inserted into the machine and the total number of coins paid out. The researcher manually recorded the number of times the participant played.

Confederates played an IGT Red, White, and Blue (wild) slot machine. This machine was approximately 5 feet away from the participant's machine and faced the participant's slot machine (i.e., back to back). This configuration was dictated by the dimensions of the room and the table necessary to support the slot machines. The slot machine played by the confederate(s) was configured similarly to the machine participants played.

Procedure

Participants gambled in three different sessions that were separated by at least 24 hours. In the initial session, the researcher checked the participant's identification to ensure he was 21 years of age or older. Next, the researcher went through the informed-consent process with the participant. Once informed consent was granted, the participant completed the demographic survey and the SOGS. The participant then completed the SMS and the MCSDS. While the participant was completing these measures, the researcher scored the SOGS to determine if the participant was eligible to continue (i.e., scored < 5). No participants had to be eliminated because of their score on the SOGS.

After completing the surveys, the participant was given 100 tokens worth five cents each to play on the slot machine. In each session, the researcher read the participant the following instructions:

> You will now be given the opportunity to play on a slot machine. You will be given 100 tokens worth five cents each. Thus, you are being given five dollars to play with. You may bet as many credits per play as the machine allows. Your goal should be to end the session with as many tokens as you can. You may end the session at anytime by informing the researcher that you would like to end the session. The session will end when a) you quit playing, b) you run out of tokens, or c) 15 minutes has elapsed. At the end of the experiment you will be paid in cash for the number of tokens you have left or have accumulated. Do you have any questions?

Questions were answered by repeating the instructions.

Sessions differed in whether the participant gambled alone or with another gambler (i.e., a confederate posing as another participant). Participants experienced two sessions in which a confederate was present, one in which the confederate was male and another in which the confederate was female. The male and female confederates were the same individuals for all participants. The gender of the researcher always matched that of the confederate for the sessions in which a confederate was present. In half the sessions in which the participant gambled alone, the researcher was a female and in the other half, the researcher was male.

The order in which participants experienced these three sessions varied randomly across participants. If the participant's first session involved a confederate, the researcher informed the participant that the confederate had completed the questionnaires in a previous session. Confederates were instructed to "act normally" during the sessions and to play as long as possible, but not to initiate conversations with the true participant. In other words, the confederate could talk to him/herself and/or the machine, but was instructed not to talk to the participant (unless the participant initiated the conversation). If a verbal interaction occurred, the confederate was instructed to make it as brief as possible. Further, the participant was instructed to not always bet the maximum number of tokens so as to decrease the probability of running out of tokens before the end of the session.

After completing the third and final session, the participants completed the exit questionnaire. Afterwards, the participant was debriefed, given extra course credit for his participation, paid for the amount of credits he had accumulated across the three sessions, and dismissed.

RESULTS

Two dependent measures were analyzed. The first was the number of trials played on the slot machine per session, which can be considered a measure of persistence. The second was the total number of tokens bet per session, which can be considered a measure of risk. Results from separate one-way repeated measures analyses of variance (ANOVAs) indicated that neither measure varied as a function of the presence or gender of the confederate. Participants did not play a significantly different number of trials across the three different sessions ($F < 1$). They also did not bet a significantly different number of tokens across the three sessions ($F < 1$). Results for these analyses, and all that follow, were considered significant at $p<.05$.

Correlations conducted on the participants' scores on the SMS and/or MCSDS and the measures of their gambling behavior resulted in no significant correlations. However, several significant correlations were found between participants' scores on the social surveys and the exit questionnaire assessing the effect of the confederates' presence. A significant correlation was found between participants' total score on the MCSDS and the exit question "It was more enjoyable gambling with another gambler present than alone" (r = .587, p = .045). This result indicates that, although the MCSDS did not predict gambling behavior, it was related to self-reported enjoyment of the presence of another gambler. There was also a significant positive correlation between participants' total score on SMS and the exit question "I felt the pressure to win was less when I was alone" (r = .736, p = .006), indicating that ratings on the SMS were related to self-reported internal pressures elicited by the presence of another gambler.

A significant negative correlation was found between the exit question "I played more conservatively when I was alone" and the total number of trials participants played during the male confederate session (r = -.600, p = .039). This result indicates that participants' self report of the effect of the confederates' presence was somewhat inaccurate, at least for number of trials played when the confederate was a male. A significant correlation was also found between participants' scores on the exit question "I was luckier when there was a female gambler present than when there was a male gambler present" and the total credits bet during the male confederate session (r = .672, p = .017). Thus, the more luck participants reported experiencing when the female confederate was present, the more they gambled when the male confederate was present.

A final correlation was found between participants' self report of self monitoring and their self report of their gambling experience. A significant negative correlation was found between participants' total score on SMS and the exit question "If the money was out of my own pocket, I would have gambled for a shorter amount of time" (r = -.723, p = .008). The higher the self monitoring score the less sensitive participants reported being to the fact they were gambling with money that had been staked to them.

DISCUSSION

Results from the present experiment suggest that the gambling behavior of males playing an actual slot machine did not differ as a function of the presence or gender of a confederate who also gambled. This result is inconsistent with some previous research (e.g., Blascovich & Ginsburg, 1974b), but somewhat consistent with results from our laboratory. Specifically, McDougall et al. (2008) found that gambling was decreased when a confederate quit gambling and left the session but that the simple presence of another gambler did not significantly increase gambling relative to when the participant gambled alone. That result was replicated in Experiment 1.

Results from Experiment 1 also suggest that there is a disconnect between the participants' self reports of the influence of the confederates and their actual influence. Participants reported playing more conservatively when alone than when a confederate was present, but their actual gambling behavior did not correspond with these reports. They also reported "feeling luckier" when a female confederate was present, but tended to bet more when the male confederate was present.

EXPERIMENT 2

The lack of influence of a confederate in Experiment 1 may have been a function of the procedure. Although a confederate was present in two thirds of the sessions, this person played a slot machine that was several feet away from the participant and interaction between the participant and confederate was minimal. For instance, because the slot machines were positioned back-to-back, the participant would have a difficult time seeing the confederate unless he purposely glanced around the slot machine he was playing.

Experiment 2 was an attempt to increase the potential influence of the confederate. Participants played a slot-machine simulation across three separate sessions. In two of these sessions, a female confederate was present and played a second simulation immediately adjacent to the one played by the participant. In one of the confederate sessions, the simulation played by the confederate was programmed to "win" and the confederate boisterously exalted when winning. In the other confederate session, the simulation played by the confederate was programmed to "lose" and the confederate loudly voiced her disdain when losing. We hypothesized that the increased interaction would produce an effect of confederate presence and that the participants' gambling would be directly related to the outcomes experienced by the confederate. We again had participants complete the self-monitoring and self-report measures used in Experiment 1 to determine if similar results would be observed.

METHOD

Participants

Participants were nine male undergraduate students from the University of North Dakota who were 21 years of age or older and who scored below a 5 on the SOGS (Lesieur & Blume, 1987). Participants' age ranged from 21 to 24 years old (M = 21.67 years old, SD = 1.12 years). The range of the SOGS scores was 0 to 4 (M = 1.44, SD = 1.13). Seven of the participants self identified as white, one as American Indian, and one as Black or African American. Six of the nine participants reported having an annual income of under $10,000.

Materials & Apparatus

Participants completed the same materials as in Experiment 1, with the exception of questions 3, 4, and 7 on the end-of-experiment questionnaire. Experiment 2 was also conducted in a small, windowless room (different from that used in Experiment 1) that contained two personal computers. The computers were located approximately three feet adjacent to one another and each was loaded with the same slot-machine simulation (MacLin, Dixon, & Hayes, 1999). Participants always played the computer on the left, which was programmed to pay out at approximately 85%. The confederate (when present) always played the computer on the right, which was programmed to pay off at approximately 118% (winning condition) or 2% (losing condition).

Procedure

Experiment 2 utilized the identical procedure to Experiment 1 with the exception that participants played credits that were preloaded on to the slot-machine simulation prior to their arrival rather than using tokens. Further, the slot-machine simulation allowed participants to bet either one or five credits per play.

RESULTS

Results from a one-way repeated measures ANOVA showed that participants played a different number of trials across the three different sessions ($F(2, 16) = 4.37$, $p=.031$). Comparisons of the different sessions showed that participants played more trials in the confederate losing ($F(1, 8) = 7.82$, $p=.023$) and winning sessions ($F(1, 8) = 5.87$, $p=.042$) than when they played alone, but played a similar number of trials in the two confederate sessions ($F < 1$). Likewise, results from an identical ANOVA on number of credits bet indicated that participants bet a different number of credits across the three sessions ($F(2, 16) = 3.70$, $p=.048$). Participants again bet more in the confederate losing ($F(1, 8) = 10.18$, $p=.013$) and winning sessions ($F(1, 8) = 5.88$, $p=.041$) than when they played alone, but bet a similar amount in the two confederate sessions ($F < 1$). The differences in trials played and credits bet can be seen in Figure 1.

SOGS scores were significantly correlated with the number of trials participants played in the alone session ($r = .706$, $p=.034$), but were not correlated with any other measure of gambling. Scores on the SMS were correlated with the number of trials played in the confederate winning session ($r = -.685$, $p=.042$), suggesting that higher self monitors tended to play fewer trials when the confederate was winning.

In terms of the exit questionnaire, there was a significant correlation between the number of trials participants played when alone and their response to "I felt more alert and motivated when there was another gambler present" ($r = .807$, $p=.009$). Answers to the questions "I played more conservatively when I was alone" and "I gambled differently when there was another player than when I was alone" did not correlate with any measure of gambling behavior.

DISCUSSION

An effect of confederate was observed in Experiment 2. Participants played more trials and bet more credits when a confederate was present than when she was not. Their gambling did not, however, differ as a function of whether or not the confederate won or lost. As in Experiment 1, results from participants' self reports did not match their actual behavior. In the present instance, the difference was that participants did not report an effect of the confederate when, in fact, their behavior differed as a function of the presence of the confederate.

GENERAL DISCUSSION

The present study was undertaken to investigate several things. The first was to determine whether the gambling of males would be altered by the presence and gender of a confederate. The second was to determine whether paper-pencil measures of attributes associated with social influence would be predictive of changes in participants' gambling as a function of the presence of a confederate. The third was to ascertain whether participants' self reports of their behavior matched their actual behavior.

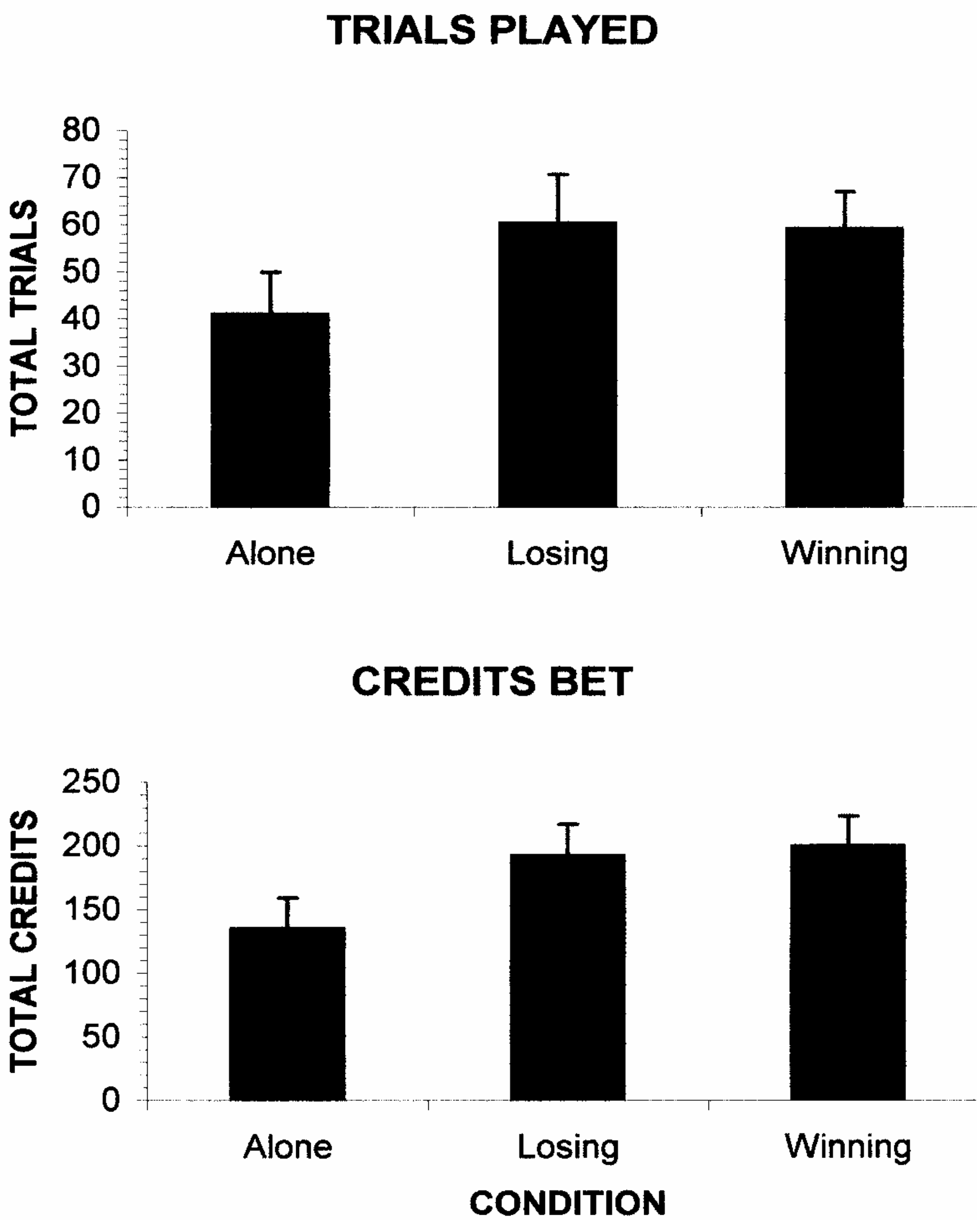

Figure 1. Presented are the mean number of trials played (top graph) and credits bet (bottom graph) in sessions in which the participant gambled alone (Alone), with a confederate when the confederate lost (Losing), or with a confederate when the confederate won (Winning). The error bars represent the standard error of the mean across participants in that particular session.

Results across the two experiments suggest that, in some instances, the presence of a confederate may promote gambling. However, they provide no evidence that the effect of having another gambler present varies as a function of the gender of the other gambler. Only Experiment 1 manipulated the gender of the confederate (i.e., the confederate in Experiment 2 was always female) and no effect of gender was found. Experiment 2 manipulated whether or not the confederate won. This manipulation did not significantly alter the gambling behavior of the participants. Participants did, however, play and bet more in the presence of the confederate in Experiment 2 whereas they did not do so in Experiment 1. The procedures of the two experiments differed in how proximal and vocal the confederate was to the participant. The difference in results therefore suggests that these factors play a role in the influence other gamblers have on gambling behavior. Unfortunately, because both proximity of the confederate and how vocal she was were manipulated together, it is not possible to tell if the present results were the outcome of only one of these manipulations. Future research will need to manipulate these factors independently to determine if one or both of these factors produced the increase in gambling.

With that said, previous studies that have reported significant increases in gambling as a function of the actions of a confederate (e.g., Blascovich & Ginsburg, 1974b) have used procedures that involve interaction between the participants and the confederate. Previous results from our laboratory that failed to find such an increase (McDougall et al., 2008) did not promote any interaction. Other research (e.g., Rockloff & Dyer, 2006) has reported increases in betting when players are informed that others are playing the same game and winning. The results from Experiment 2 do not support the idea that the confederate winning or losing was influential.

One could argue that the failure to find an effect in Experiment 1 was due to our use of only 12 participants. That concern, however, can be somewhat countered by the fact that significant results were observed in Experiment 2, which employed only nine participants. By the same token, one could also argue that a significant effect of the confederate winning or losing would have been observed had we employed more participants than we did in Experiment 2. That argument is legitimate and cannot be countered.

Another goal of the present study was also to measure how well self-monitoring scales would predict or match actual behavior. With one exception (see Experiment 2), neither self-monitoring scale used in the present study correlated with actual gambling behavior. Multiple explanations exist for why this result was observed. One may have to do with the influence the confederate had on gambling behavior. Given that the presence of a confederate had an effect only after a procedural variation was instituted, it may be unreasonable to expect a general measure of self-monitoring to be predictive across any or all procedures. Likewise, these general measures of self-monitoring may not apply to specific types of behaviors such as gambling. As noted above, employing more participants may have revealed that a relationship between these scales and gambling and/or the presence of the confederate indeed exists. Of course, it is also possible that these scales are not good predictors of actual behavior. Further research into these myriad possibilities would be required to draw any firm conclusions. If such research was to be pursued, it might be helpful to prescreen participants to ensure wide variation in scores on the self-monitoring scales.

The present study also found that participants' self reports did not always match their actual behavior. Participants in Experiment 1 reported that the confederate influenced their gambling when such an effect in actual gambling behavior was not observed. Participants in Experiment 2 did not report that the confederate influenced their gambling. However, a significant effect of confederate presence was observed in actual gambling behavior.

The present results should therefore serve to spur the study of actual gambling behavior rather than what has become a reliance on self-reports (e.g., see Baumeister et al., 2007).

More specifically, if self-report measures do not accurately reflect actual behavior in controlled laboratory situations of fairly short durations, then it may be unreasonable to expect them to accurately reflect reality in more complex, wide-ranging situations. Further, given that the self reports gathered in the present study varied in both directions across the two experiments (i.e., reporting an effect when none was observed; not reporting an effect when one was observed), it may not even be possible to expect a systematic bias with self reports. Those interested in using self reports might therefore be well served by taking at least some measures of actual gambling behavior as a measure of reliability.

REFERENCES

Ahmed, S. M., Garg, R., & Braimoh, G. (1986). Psychometric properties of Snyder's self-monitoring of expressive behavior scale. *Perceptual and Motor Skills, 63*, 495-500.

Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin, 84,* 888-918.

Asch, S. E. (1955). Opinions of social pressure. *Scientific American,* 31-35.

Baumeister, R. F., Vohs, K. D., & Funder, D. C. (2007). Psychology as the science of self-reports and finger movements. *Perspectives on Psychological Science, 2*, 396-403.

Beretvas, N. S., Meyers, J. L., & Leite, W. L. (2002). A reliability generalization study of the Marlowe-Crowne social desirability scale. *Educational and Psychological Measurement, 62*, 570-589.

Blascovich, J., & Ginsburg, G. P. (1974a). Risky shifts and gambling: What's at stake? *Personality and Social Psychology Bulletin,* 246-248.

Blascovich, J., & Ginsburg, G. P. (1974b). Emergent norms and choice shifts involving risk. *Sociometry, 37*, 205-218.

Blascovich, J., Ginsburg, G. P., & Veach, T. L. (1975). A pluralistic explanation of choice shift on the risk dimension. *Journal of Personality and Social Psychology, 31,* 422-429.

Carli, L. L., LaFleur, S. J., & Loeber, C. C. (1995). Nonverbal behavior, gender, and influence. *Journal of Personality and Social Psychology, 68,* 1030-1041.

Cohen, L. L., Manimala, R., & Blount, R. L. (2000). Easier said than done: What parents say they do and what they do during children's immunizations. *Children's Health Care, 29*, 79-86.

Crowne, D. P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology, 24,* 349-354.

Dillard, J. P., & Hunter, J. E. (1989). On the use and interpretation of the Emotional Empathy Scale, the Self-Consciousness Scales, and the Self-Monitoring Scale. *Communication Research, 16*, 104-129.

Hardoon, K. K., & Derevensky, J. L. (2001). Social influences involved in children's gambling behavior. *Journal of Gambling Studies, 17*, 191-215.

Ickes, W., Holloway, R., Stinson, L. L., & Hoodenpyle, T. G. (2006). Self-monitoring in social interaction: The centrality of self-affect. *Journal of Personality, 74,* 659-684.

LaPiere, R. T. (1934). Attitude and actions. *Social Forces, 13,* 230-237.

Lee, E. (2004). Effects of gendered character representation on person perception and informational social influence in computer-mediated communication. *Computers in Human Behavior, 20,* 779-799.

Lesieur, H. R., & Blume, S. B. (1987). The south oaks gambling screen (SOGS): A new instrument for the identification of pathological gamblers. *American Journal of Psychiatry, 144,* 1184-1188.

MacLin, O.H., Dixon, M.R., & Hayes, L.J. (1999). A computerized slot machine simulation to investigate the variables involved in gambling behavior. *Behavior Research Methods, Instruments, & Computers, 31*, 731-734.

Mahalik, J. R., Lagan, H. D., & Morrison, J. A. (2006). Health behaviors of masculinity in Kenyan and U.S. male college students. *Psychology of Men and Masculinity, 7,* 191-202.

McDougall, C.L., McDonald, J.D., & Weatherly, J.N. (2008). The gambling behavior of American Indian and non-Indian participants: Effects of the actions and ethnicity of a confederate. *American Indian and Alaska Native Mental Health Research: The Journal of the National Center, 14,* 59-74.

Moore, D. A., & Kim, T. G. (2003). Myopic social prediction and the solo comparison effect. *Journal of Personality and Social Psychology, 85,* 1121-1135.

Nisbett, R. E., & Wilson, T. D. (1977). Telling more than we know: Verbal reports on mental processes. *Psychological Review, 84,* 231-259.

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

Rockloff, M. J., & Dyer, V. (2006). An experiment of the social facilitation of gambling behavior. *Journal of Gambling Studies*, *23*, 1-12.

Snyder, M. (1974). Self-monitoring of expressive behavior. *Journal of Personality and Social Psychology*, *30*, 526-537.

Snyder, M, & Gangestad, S. (1986). On the nature of self-monitoring: Matters of assessment, matters of validity. *Journal of Personality and Social Psychology*, *51*, 123-139.

Stinchfield, R. (2003). Reliability, validity, and classification accuracy of a measure of DSM-IV diagnostic criteria for pathological gambling. *American Journal of Psychiatry*, *160*, 180-182.

Tatman, A. W., Swogger, M. T., Love, K., & Cook, M. D. (2009). Psychometric properties of the Marlow-Crowne Social Desirability Scale with adult male sexual offenders. *Sexual Abuse: Journal of Research and Treatment*, *21*, 21-34.

Action Editor: *Mark R. Dixon*

Appendix

The end-of-experiment questionnaire. Each question could be answered on a scale of 1 – 5, with 1 being strongly disagree and 5 being strongly agree.

1. I am satisfied with the amount of money I won.
2. It was more enjoyable gambling with another gambler present than alone.
3. I felt as though I had to win more when there was a male gambler present than when there was a female gambler present.
4. I was luckier when there was a female gambler present than when there was a male gambler present.
5. I was luckier when I gambled alone.
6. I felt the pressure to win was less when I was alone.
7. It was more enjoyable gambling when a female gambler was present than when a male gambler was present.
8. I was aware that I would be taking home real money.
9. I felt more relaxed when I gambled alone.
10. I felt more alert and motivated when there was another gambler present.
11. If the money was out of my own pocket, I would have gambled for a shorter amount of time.
12. If the money had been out of my own pocket, I would have made smaller bets.
13. I played more conservatively when I was alone.
14. I gambled differently when there was another gambler than when I was alone.

Analysis of Gambling Behavior 2009, **3**, 48-55 Number **2** (Winter 2009)

BRAIN ACTIVITY OF RECREATIONAL GOLFERS UNDER CONDITIONS OF GAMBLING AND NON-GAMBLING

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This research examined the behavior and corresponding brain activity of recreational golfers. Experiment 1 examined four recreational golfers' brain activity in the absence of any task demands. Following this resting baseline, participants were then instructed to putt 10 golf balls from six feet without consequences for accuracy. Following a return to baseline, a final condition was then instituted whereby monetary compensation ($20 gift card) was made contingent upon successfully making 8 of 10 putts. As measured by EEG, levels of alpha, beta, and theta waves, increased during the putting task compared to resting states. Monetary gambling enhanced activity for participants. Experiment 2 extended these findings. It used a condition of uncertain monetary contingencies while continuing to produce similar EEG levels as noted in Experiment 1. Finally, it appears that certain activations and suppressions of brain waves may have an impact on putting accuracy, and that they may be altered when gambling for money.

Key words: Golf, biofeedback, sports psychology, putting, brain waves.

Sport psychology is a rapidly growing area of scientific investigation, and applications encompass many professional and amateur sports including football, soccer, tennis, basketball and golf. Research has indicated that performance in golf chipping shots (Pates & Maynard, 2000), approach shots (Brouziyne & Molinaro, 2005) and putting (Short, Bruggeman, Engel, Marback, Wang, Willadsen; & Short, 2002; Taylor & Shaw, 2002) can be enhanced using relaxation and imagery techniques.

A golfer's performance often varies dramatically (Valiante & Stachura, 2005) for a variety of reasons, with anxiety and stress implicated as primary causes (Cunningham, 2000; Cunningham & Ashley, 2002; Hassmen, Koivula, & Hansson, 1998; Nicholls, 2007). In addition to self reports of anxiety and physiological responses in the body, understanding the brain activity of the golfer may provide insight as to why a player's performance may vary dramatically. Previous research has shown that when golfers were asked to visualize their swing while lying in an fMRI brain scanner, those with higher handicaps (less skill) had more total brain activation than golfers with lower handicaps (more skill) (Ross, Tkach, Ruggieri, Lieber, & Lapresto, 2003) and professional golfers (Milton, Small, & Solodkin, 2004). While these studies provide information on brain activity during simulated, imagined swings, the fMRI is not currently possible to use during the actual movements of golf.

While "stress" has been claimed to impact performance, operationally defining what this "stress" is, remains open to debate. In previous research by Bordieri, Bordieri, and Dixon, (2008) it was shown that when a pathological gambler engaged in a golfing simulation under conditions of money or no-money for shot accuracy, this participant's performance suffered upon introduction of the financial contingencies. It was suggested by these authors that "stress" might be defined as poor performance, the product of risk taking when

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the outcomes of performance are coupled with money. However, poor performance is the outcome of such risk or gambling, it is not the cause of it. It may be possible that entering into such environmental contingencies produces changes within the skin of the gambler, perhaps at a physiological level that is more difficult to examine. Therefore, the purpose of Experiment 1 was to evaluate whether it was possible to measure brain activity of golfers while putting under conditions of gambling and non-gambling contingencies for putt accuracy. Experiment 2 attempted to replicate the findings of Experiment 1 along with introduction of an uncertain monetary contingency arrangement to evaluate potential additional stress such a condition may produce.

EXPERIMENT 1
METHOD

Participants, Apparatus and Setting

Participants in the current study consisted of 2 men and 2 women between the ages of 22 and 26 (M = 24). All participants had prior experience playing golf, yet no participant but had never played competitively in tournaments, for money, or at a college or professional level. None reported a USGA handicap index. None were self-reported pathological gamblers. All sessions were conducted using a DELL Dimension 2500 laptop computer with a 15 inch monitor and an external optical mouse. The laptop computer was interfaced with a ProComp 2.0 multi-channel physiological/biofeedback system, which allowed for the recording of brain activity as measured by electroencephalography (EEG) brain waves. All brain activity was recorded through the use of three electrodes placed on the participants' forehead (active) and cheekbone (referent). Experimental sessions were conducted in a research laboratory at Southern Illinois University and ranged in duration from 15 minutes to 1 hour depending on the participants' progress. Golf putting took place on a 4 foot by 8 foot putting platform surfaced with outdoor carpet and elevated 4 inches off the main laboratory floor. The putting platform contained a regulation size golf hole 1 foot from the far end of the platform. Participants were instructed to select a putter from three available and to attempt to make a six-foot putt. The available putters included 2 standard length (34 and 35 inches) right handed Ping Anser putters and 1 standard length (35 inches) left handed Ping Anser putter.

Procedures

The experiment consisted of four conditions, each with attempted to assess three types brain activity of the participant.

Phase 1. Baseline. During this initial condition, participants were instructed to stand on the golf platform, close their eyes, and try and relax for one minute. The experimenter informed the participant when this time period started and when it terminated. No other demands were presented and no other instructions were given by the experimenter. The purpose of this phase was to evaluate brain activity in the absence of any challenges of either a physical or mental nature.

Phase 2. Golf Putting without gambling. During this second condition, all participants were instructed to putt 10 golf balls, one at a time, from a six-foot distance. No statements were made about putting accuracy. The purpose of this phase was to evaluate shot accuracy and brain activity under golfing conditions of non-gambling.

Phase 3. Baseline. During this third condition, participants were re-exposed to Phase 1 conditions under which they were to close their eyes and relax for 1 minute. The purpose of the re-exposure to baseline was to evaluate if brain activity would return to pre-Phase 2 levels, or if there were residual effects of Phase 2 on activity present in Phase 3.

Phase 4. Golf Putting with gambling. During this final condition, all participants were again instructed to putt 10 golf balls, as done in Phase 2. However, during Phase 4, the experimenter instructed the participant that if 8 or more of the 10 putts were sunk in the hole, a $20 gift card to a local retailer would be awarded. The purpose of this final phase was to induce a gambling contingency and examine putt accuracy and brain activity under its influence.

Dependent Measures and Observer Reliability

Three types of brain activity; alpha, beta, and theta waves, were recorded. The most common frequencies of EEG activity range from 1 and 40 Hz. Lower numbers indicate lower brain activity and higher numbers indicate greater activity. In addition to brain activity, each participants' putting accuracy was recording during Phases 2 and 4 as a behavioral correlate. A second observer recorded the numbers of putts made by each participant on 100% of all experimental sessions. Interobserver agreement was obtained by calculating the two observers' agreement on numbers of putts made by each participant divided by the two observers' agreement plus disagreement X 100%. Resulting interobserver agreement was 100%. EEG measures were recorded by the computer interface and needed no assessment of observer reliability.

EXPERIMENT 1 RESULTS AND DISCUSSION

Figure 1 displays the three types of brain activity for each participant. The top panel displays the mean theta wave activity that occurred during each of the four phases of the experiment. The middle panel displays the mean beta wave activity, while the bottom panel displays the mean alpha wave. From review of this figure it is clear that for all participants, brain activity was relatively low during Phases 1 and 3 compared with Phases 2 and 4. This suggests that when the participants' were instructed to engage in the behavior of putting the golf ball, all three types of brain activity increased compared to the resting baseline. While the finding that task demands (in this case putting) increases physiological activity is not surprising or novel, it does suggest that brain waves of golfers change very quickly. Such changes can quickly reverse upon allowing the golfer to "rest" for a short period of time. Players that find themselves too aroused or unable to focus might wish to use a relaxation activity such as that presented in Phase 1 and 3 to reduce brain activity and increase concentration.

Player putting accuracy varied widely across the 4 participants with only participant 3 successfully making 8 putts during Phase 4. His data provides additional insight as to what optimal levels of brain activation should be during conditions of stress and non-stress. This participant had the lowest overall levels of theta waves (too high of levels suggests inattention and too much relaxation), and the most minimal change in theta from Phase 2 to Phase 4. In fact Phase 2 and Phase 4 theta levels were almost identical, suggesting that perhaps the money conditions of Phase 4 were not perceived by this participant as much different as the conditions of Phase 2. Other participants' theta levels rose dramatically for Participant 1 and 4 during Phase 4, and although decreased slightly for Participant 2, were still much higher than other participants. In summary, the low theta waves of Participant 3 may have allowed for more concentration and resulting putt accuracy during Phase 4. Alpha and Beta waves produced similar resting-golfing activity patterns, yet no additional within subject patterns that correlated with golf performance were observed.

The conditions of "gambling" that we attempted to instate during Phase 4 of the current experiment may have been mitigated by putting accuracy during the first few initial putts of the required 10. If a participant failed

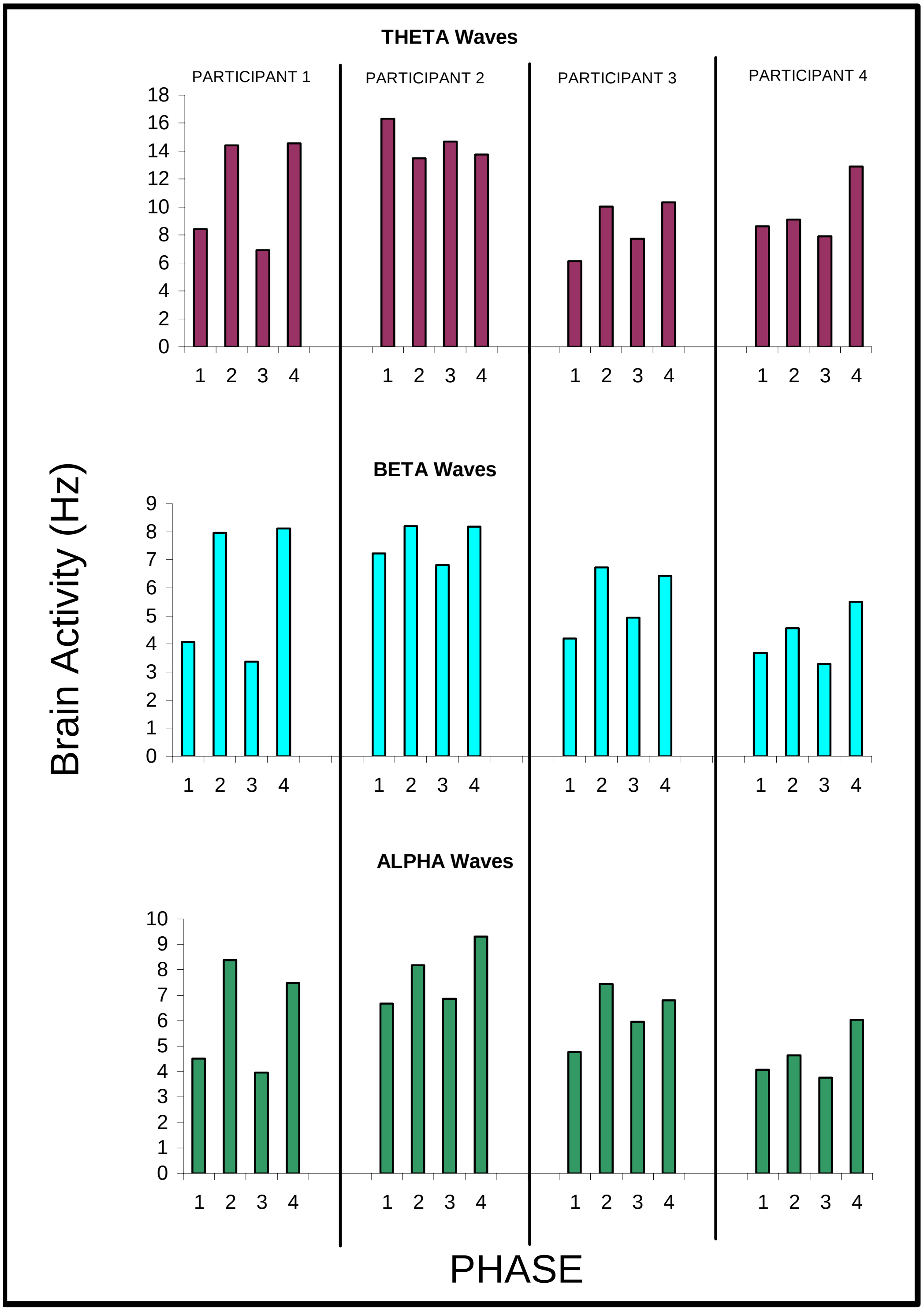

Figure 1. EEG levels of the four participants of Experiment 1.

to make the first three putts during Phase 4, it would be considered impossible to attain the monetary consequences for accurately putting 8 of 10 shots. Thus, for a participant who has missed the first few putts, Phase 4 may have been functional equivalent to Phase 2 at this time and produced minimal changes in brain activity across the two phases. Experiment 2 attempted to sustain participants' actively engaged in the task with potential for monetary compensation during all 10 of Phase 4's putts by exposing participants to conditions of more uncertain gambling outcomes.

EXPERIMENT 2 METHOD

Participants, Apparatus and Setting

Participants in the current study consisted of 1 man and 3 women between the ages of 21 and 29 (M = 25). Of this sample, all participants had prior experience playing golf or miniature golf, yet no participant had a history of playing competitively in tournaments, for money, or at a college or professional level. Similar to Experiment 1, none of the participants reported a USGA handicap index. All other apparatus and environmental arrangements were identical to Experiment 1.

Procedures

Phases 1-3 remained identical to those of Experiment 1. Phase 4 was altered such that instead of participants being required to successfully putt 8 of 10 balls into the cup, the participant was instructed to draw two of ten folded pieces of paper from a small 3in diameter cup. Each piece of paper contained a different number between 1 and 10, which was instructed to the participant to represent the putts that had to be made in order to obtain a 25 dollar gift card to the campus bookstore. Participants were told they should pick two pieces of paper, hand them to the experimenter, and proceed to take their 10 putts. Only after completing the 10 putts would the experimenter inform them of which two "money" putts were required to have been made in order to obtain the gift card.

Dependent Measures and Observer Reliability

The dependent measures of Experiment 2 were identical to those of Experiment 1. Using a second observer on 100% of all putts for all participants, resulting agreement was 100%.

EXPERIMENT 2 RESULTS AND DISCUSSION

Figure 2 displays the three types of brain activity for each participant. The top panel displays the mean theta wave activity that occurred during each of the four phases of the experiment. The middle panel displays the mean beta wave activity, while the bottom panel displays the mean alpha wave. From review of this figure it is clear that for all participants, brain activity was relatively low during Phases 1 and 3 compared with Phases 2 and 4. Replicating the effects of Experiment 1, these data also suggest that putting increases brain activity compared to resting baselines.

Also as in Experiment 1, putting accuracy varied widely across the 4 participants, however in Experiment 2 shot accuracy decreased relatively less than it did in Experiment 1. Table 1 depicts the numbers of putts made by each participant across Phase 2 and Phase 4. As can be observed in this figure, only slight reductions in accuracy occurred, suggesting that perhaps the alterations to Phase 4 during Experiment 2 did not induce the intended additional conditions of stress as they were expected to.

Support for the relatively minimal impact of the altered Phase 4 contingencies is also shown in the resulting theta wave data for each participant. It was expected that Phase 4 theta levels would have been substantially greater than those produced during Phase 2, and this was the case for three of the four par-

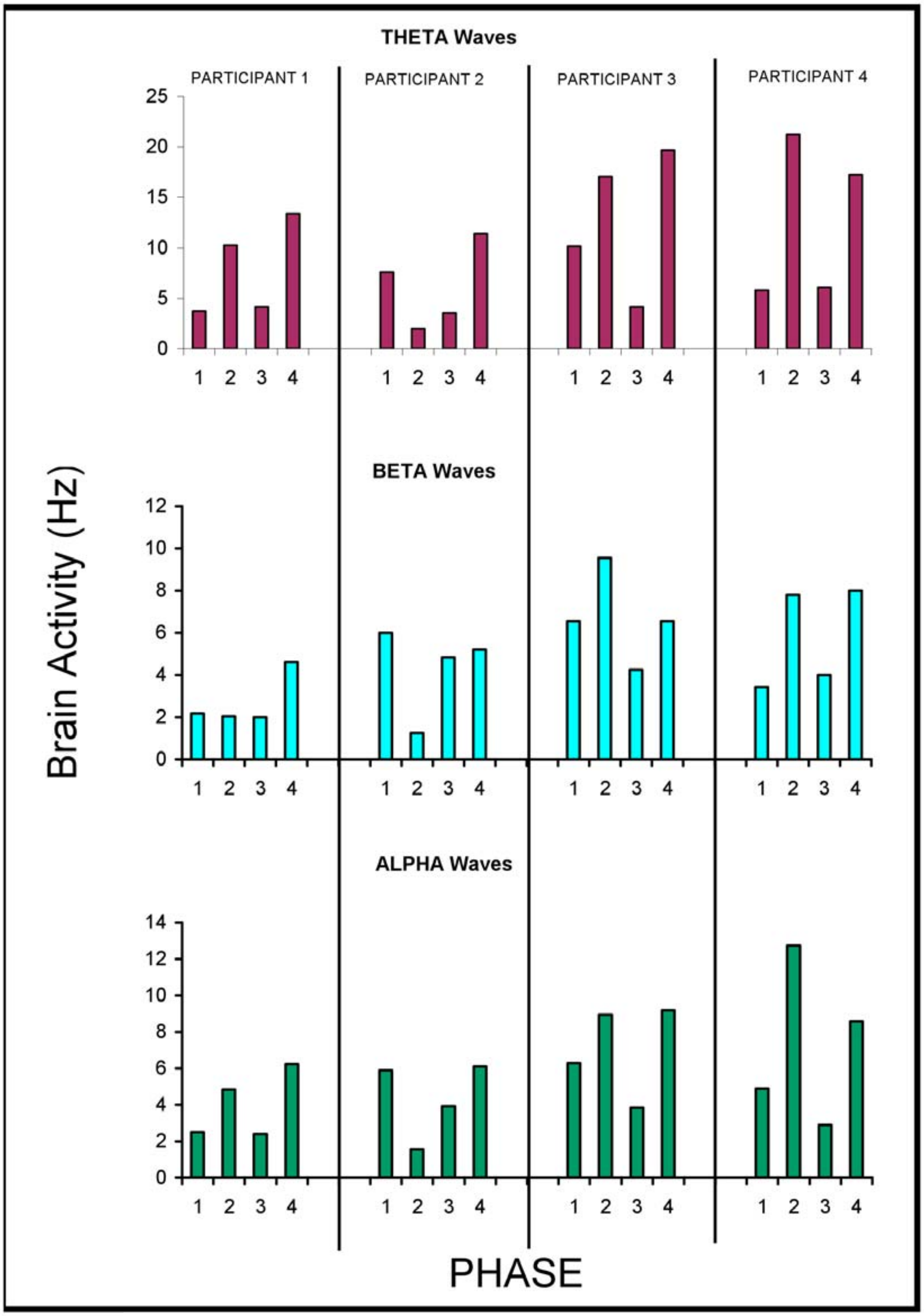

Figure 2. EEG levels of the five participants of Experiment 2.

Table 1. Number of Putts Made (out of 10) for the 5 participants of Experiment 2.

Participant	*Phase 2*	*Phase 4*
1	1	3
2	5	2
3	2	2
4	3	2

ticipants. Only Participant 4 deviated from this pattern. Interestingly, relatively low changes in theta waves were present in Participant 1, across experimental conditions, and this participant improved putting performance from Phases 2 to Phase 4. Similar to that of participant 3 of Experiment 1, the relative theta wave changes were modest in these two participants, suggesting that suppression of theta waves under conditions of stress may be important to sustaining putting performance.

GENERAL DISCUSSION

The data from the two current experiments support prior research by Bordieri, Bordieri, and Dixon (2008) that financial wagers can impact golf performance. These data also extend the previous literature because the exploration of brain activity of golfers during actual playing for actual money is relatively a new endeavor. Unlike prior studies that investigated golfer brain activity outside of the actual game of golf (e.g., McKay et al., 1997; Ross et all., 2003) the present investigation incorporated live capture of brain waves during actual putting for money. The present study suggests that brain waves do in fact change when golfers are placed under conditions of rest and activity. While the data are preliminary, it appears that there may be a relationship between theta wave activity and putting accuracy. Future research should explore relaxation training and incorporate supplemental measures of stress to gain a further understanding of the key to golf optimally. Additionally, future research should utilize much more complex physiological devices, as those used in the present study are considered relatively "low-tech" in today's standards.

Behavior analysts often limit observation to behavior that is readily observed. While physiology is not ignored or considered unimportant to a scientific analysis, it usually is not addressed in behavioral observation. The current data suggest that perhaps behavior analysts should explore physiological assessment as a supplemental measure to explain variability across experimental participants. Using the data obtained through physiological instruments, we may be better prepared to construct interventions that not only impact resulting behavioral performance, but also the underlying physiological contributions to that very performance. Previous research in the field of behavior analysis has incorporated interventions targeted at changing physiological states, and it appears at least plausible that such interventions may be important at improving putting accuracy of golfers.

While the current investigation did in fact yield relatively clear data between resting and active golf EEG levels, it is very possible that any task, be it golf or something else, will produce enhanced EEG levels than resting alone. The avenues which future research should proceed include examining the relative differences between different types of golf-related establishing operations. Our current conditions of gambling and non-gambling were modest and do not necessarily represent the much greater differences between winning and losing thousands of dollars in professional tournaments. Furthermore none of our participants were considered as pathological gamblers, thus potentially limiting external validity to this population. Another limitation of the present investigation is that it did not utilize professional or highly skilled golfers as experimental participants. Our use of recreational golfers may have limited our understanding of the impact of EEG activity on golf performance, as our golfers were rather poor performers to begin with. Future research may wish to explore the use of more highly skilled participants and compare the obtained findings with those of the present study.

In summary, behavior analysts have much to gain by incorporating physiological measures into the battery of behavioral assessments commonly used. In the realm of professional sports, behavior analysts have made minimal impact, while our objective approach to scientific investigation is significant. Many sporting events incorporate an element of gambling, which entwines the subject areas and can lead to some cross-subject research opportunities. As current technologies become more affordable and more easily adapted for applied research, the behavior of the golfer who plays for money should not be limited to only the study of shot accuracy, but include supplemental measures of underlying physiological arousal.

REFERENCES

Brouziyne, M. & Molinaro, C. (2005). Mental imagery combined with physical practice of approach shots for golf beginners. *Perceptual Motor Skills, 101*, 203-211.

Cunningham, G. B. (2000). Trait anxiety among students in a college golf class. *Perceptual and Motor Skill, 91,* 693-695.

Cunningham, G. B. & Ashley, F. B. (2002). Debilitative and facilitative perceptions of trait anxiety among students in a college golf class. *Perceptual and Motor Skills, 94,* 739-742.

Hassmen, P., Koivula, N. &Hansson, T. (1998). Precompetitive mood states and performance of elite male golfers: Do trait characteristics make a difference? *Perceptual and Motor Skills, 86,* 1443-1457.

McKay, J. M., Selig, S. E., Carlson, J. S. & Morris T. (1997). Psychophysiological stress in elite golfers during practice and competition. *Australian Journal of Science and Medicine, 29,* 55-61.

Milton, J., Small, S. & Solodkin, A. (2004). Expert motor performance: Limbic activation is inversely related to skill level. *Neurology, 60(suppl.),* A345.

Nicholls, A. R. (2007). Can an athlete be taught to cope more effectively? The experiences of an international-level adolescent golfer during a training program for coping. *Perceptual and Motor Skills, 104,* 494-500.

Pate, S. J. & Maynard, I. (2000). Effects of hypnosis on flow states and golf performance. *Perceptual Motor Skills, 91*, 1057-1075.

Ross, J. S., Tkach, J., Ruggieri, P., Lieber, M. & Lapresto, E. (2003). The mind's eye: functional MR imaging evaluation of golf motor imagery. *American Journal of Neuroradiology, 14,* 1036-1044.

Short, S. E., Bruggeman, J. M., Engel, S. G., Marback, T. L., Wang, L. J., Willadsen, A., & Short, M. W. (2002). The effect of imagery function and imagery direction on self-efficacy and performance on a golf-putting task. *The Sport Psychologist, 16,* 48-67.

Taylor, J. A., & Shaw, D. F. (2002). The effects of outcome imagery on golf-putting performance. *Journal of Sports Science, 20,* 607-613.

Valiante, G. & Stachura, M. (2005). *Fearless Golf.* New York: Doubleday.

Action Editor: *Terry Falcomata*

Analysis of Gambling Behavior 2009, **3**, 56-61 Number **2** (Winter 2009)

BLACKJACK PLAYERS DEMONSTRATE THE NEAR MISS EFFECT

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The effect of the 'near-miss' as a potential conditioned reinforcer in slot machine play has recently been the subject of behavioral research on gambling. The present study extends prior research by examining this effect during the game of blackjack. Participants consisted of college undergraduates with no history of problematic gambling. Their verbal ratings of closeness to winning were recorded and examined for each of 50 hands of standard blackjack per session. Results indicated that as the number difference between the dealer and player's hands decreased, closeness to win rating increased. Also for each participant, non-bust losses were rated closer to winning than losses where the player busted.

Keywords: Near miss, gambling, blackjack.

Increased psychological research on gambling has led to the discovery of many variables that work to maintain a complex behavioral phenomenon that now adversely affects 1-2% of the population worldwide (Petry, 2005). While to the outside observer, winning may be the sole factor in keeping gamblers responding, studies have shown there are other issues at hand. There seems to be some evidence that actually losing, or being exposed to certain types of losses, may also maintain gambling behavior. An example of this is what is referred to in the literature as a 'near-miss'.

Skinner (1953) was among the first to recognize the possibility of a near-miss on a slot machine functioning as a conditioned or secondary reinforcer at no expense to the owner. To illustrate, first consider that a win on a slot machine is characterized by three or four identical symbols appearing on the payout line. Next, these symbols appear successively, one at a time from left to right. If the first two or three symbols appear identical to one another on the payout line and the last reel stops just short of displaying an identical symbol, it is easy to see how this type of loss shares the properties of a win.

Furthermore, researchers have speculated that even though the probabilities of winning on many casino type games is left purely to chance, near-misses may reinforce a particular strategy of play and increase beliefs about a future success (Reid, 1986). As far as demonstrating empirically that increased slot machine play can be a function of exposure to near-miss trials, the results have been mixed. For example, Strickland and Grote (1967) reported that participants who were exposed to a winning symbol on the first reel of a slot machine more often than others played a larger number of trials. In 2001, Kassinove and Schare investigated the effect of varied exposure to near-miss trials and found that participants who saw a near-miss 30% of the time played longer than those exposed to near-misses 15% and 45% of the time.

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Most recently, Ghezzi, Wilson, & Porter (2006) conducted a series of experiments related to the near-miss investigating the effects of both forced and varied exposure, magnitude of wins, and serial position of winning symbols on slot machine duration of play. These experiments produced mixed results differing from the findings of both Strickland and Grote (1976) and Kassinove and Schare (2001). One explanation for the inconsistency of findings in the near-miss literature may be the role of verbal behavior. Dixon and Schreiber (2004) investigated this variable in terms of the effect of exposure to near-misses on how players rated their closeness to a win on a 1-10 rating scale. The results of this study indicated that all 12 participants rated near-miss losses higher than non near-miss losses. For the majority of participants, response latencies were also larger following losing trials containing a near-miss.

While the near-miss effect has largely been studied solely in slot machines, it is worth investigating in other forms of gambling. For example, it has been proposed that the near-miss effect may also be observed in the playing of scratch off tickets (Griffiths, 1997; Moran, 1979). Table or card games may also set up a context in which it appears players come close to winning and therefore false beliefs are produced. Therefore, the purpose of this study was to examine the near-miss effect in the game of blackjack on participants' verbal responses about their chances of winning.

METHOD

Participants

Five college undergraduates (4 females and 1 male) participated in the study for course extra credit. In addition, their names were entered in a lottery to potentially win a $50 gift certificate according to how many chips they obtained by the end of the session. Participants were administered the South Oaks Gambling Scale (SOGS) (Lesieur & Blume, 1987) and scores indicated no evidence of problematic or pathological gambling.

Setting

All sessions were conducted in a quiet, university laboratory setting containing a standard casino inspired blackjack table. During sessions, only the dealer (who served as the experimenter and independent observer) and the participant were present in the room.

Response Measurement and Interobserver Agreement

Participants were asked to record four dimensions of behavior on data sheets provided by the experimenters during each trial and the experimenter also recorded data on 30% of trials during all sessions. Following the play of one hand (or trial), participants were asked to circle a number from 1 to 9 with respect to the closeness to win rating. The ratings were presented on a 9-point Likert-type scale with anchors of "No Chance", "Moderate Chance", and "Good Chance" at the 1, 5, and 9 positions, respectively. Participants were also asked to record their score, the dealer's score, and a 'yes' or 'no' rating of whether the participant won the hand after each trial. Reliability was calculated as the number of agreements divided by the number of agreements plus disagreements, multiplied by 100%. Reliability was found to be 100% for the closeness to win rating, 88% for participant's score, 94% for dealer's score, and 95% for whether the participant won the hand.

Procedure

After being administered the SOGS (Lesieur & Blume, 1987), participants were brought into the room and asked if they knew how to play blackjack. The basic premise of the game of blackjack is to beat the dealer's hand without exceeding a count of 21 (number cards counted as their face value, face cards counted as 10, and aces counted as either one or 11 upon the player's choosing). To begin, players are given two cards and are shown only one of the two dealer's cards. Players then take subsequent turns either asking for more cards or remaining with what they have been dealt. The dealer then plays out his/her hand and all of the hands are tallied individually. For the purpose of the study, a 'bust loss' was denoted as any participant hand in which the cumulative number, as represented by the various cards, exceeded a score of 21 therefore preventing a win even before the dealer took their turn. A 'non-bust loss' was designated as any participant hand in which the dealer's cumulative score was higher than that of the participant's, with both not exceeding 21. If they were unfamiliar with the game, participants were given scripted verbal instructions, a written task analysis to read, and were allowed to play up to 10 practice trials. As a result, all participants demonstrated proficiency in rules of play and reported they "now knew how to play". The following instructions were then given by the dealer:

> "We are going to play 50 hands of very basic blackjack. There are no 'double downs' or 'split pairs' allowed. You are allowed to bet one chip at a time and the number of chips you have at the end of the session will equal the number of times your name will be entered into the lottery. Do you have any questions?"

The experimenter then answered any questions the participant may have had, and the experiment began. Additional prompts were offered to the participant if the experimenter noticed that he or she had forgotten to record any of the five response dimensions.

RESULTS AND DISCUSSION

To reiterate, a 'bust loss' was denoted as any participant hand in which the cumulative

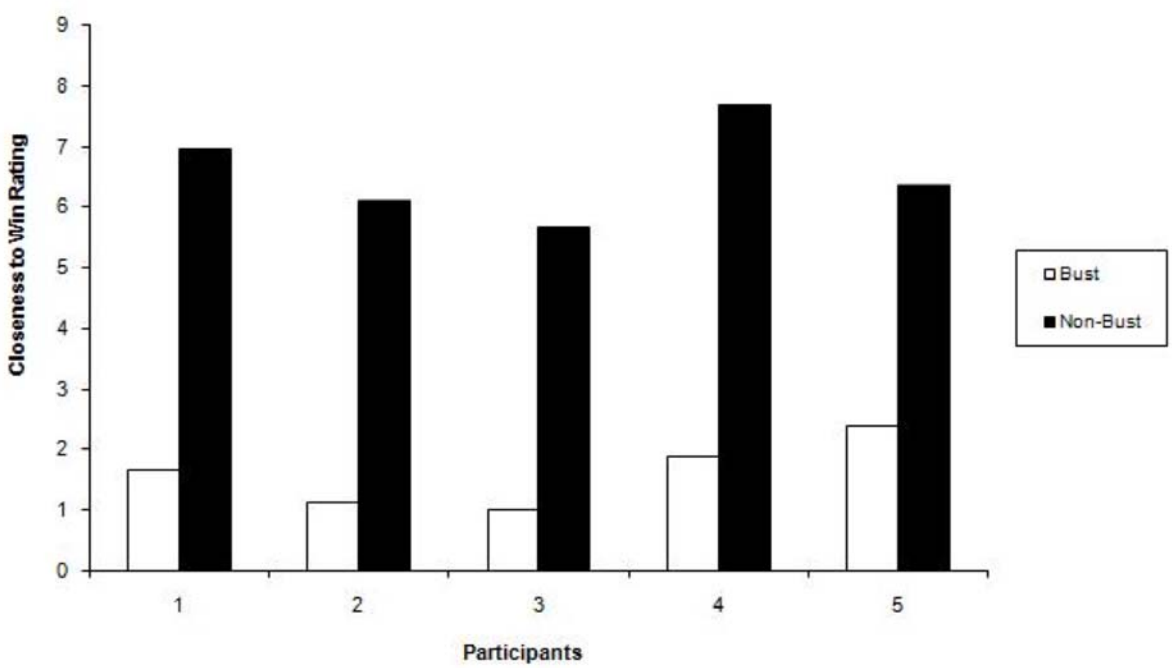

Figure 1. Participants' closeness to win rating with respect to "bust" and "non-bust" hands.

number, as represented by the various cards, exceeded a score of 21. A ‘non-bust loss’ was designated as any participant hand in which the dealer’s cumulative score was higher than that of the participant’s, with both not exceeding 21. The percentage of total losses that could be categorized as non-busts for Participants 1, 2, 3, 4 and 5 were 50%, 72%, 62%, 61%, and 68%, respectively. Across the 50 hands, Participant 1 won 15 and lost 29 chips, Participant 2 won 23 and lost 22 chips, Participant 3 won 21 and lost 24 chips, Participant 4 won 30 and lost 15 chips, and Participant 5 won 28 and lost 13 chips. Because of the trials that resulted in a ‘push’ (the dealer and player’s hand count was even), wins and losses will not necessarily add up to 50. Each participant’s average closeness to win ratings for bust and non-bust losses is depicted in Figure 1. Figure 2 shows average closeness to win ratings as a function of the number difference between the dealer and participant’s hands at the end of a trial. This figure includes both bust and non-bust losses.

The near miss effect often seen in slot-machine play (Parke & Griffiths 2004; Dixon & Schreiber, 2004) has never been replicated in other games of chance, until the present study. From the data shown, we can see that a ‘non-bust’ loss in the game of blackjack has parallels to the ‘near-miss’ effect in slot-machine play that has been demonstrated in the literature (Dixon & Schreiber, 2004; Kassinove & Schare, 2001; Strickland & Grote, 1967). Specifically, participants apparently held irrational beliefs about winning (evidenced through higher “closeness to win” ratings for non-bust as compared to bust losses) because the ‘non-bust’ loss functions as a conditioned reinforcer (i.e., not going over 21 shares the properties of a win). This can be explained by the rules of the game itself in that the probability of reinforcement after a bust loss decreases to zero, while in a “non-bust” loss, there is still a chance that reinforcement will come once the participant “stands” at a number 21 or lower.

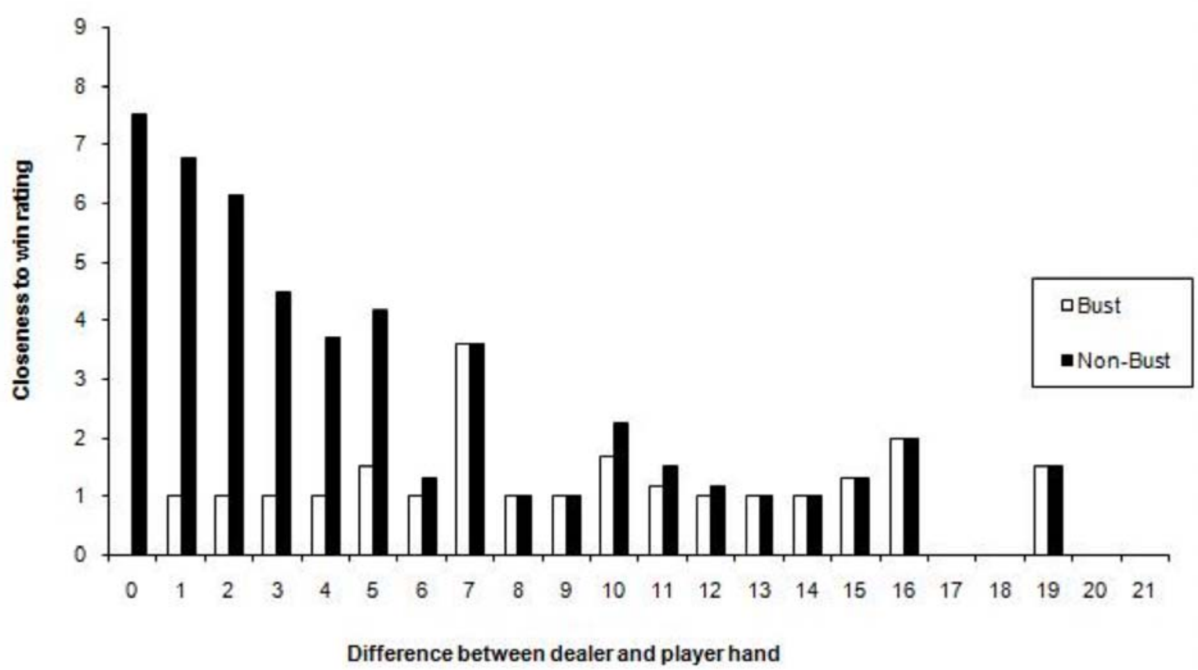

Figure 2. Participants’ closeness to win rating with respect to the difference between the dealer and player hand score

It appears that the effect of nearly winning is similar in both games, however further analysis reveals that the game of blackjack is different. For example, the near-miss phenomenon in this case may present itself through two factors. Not only did participants rate non-bust losses higher than bust losses, but average rates of closeness varied as a function of the number difference between the player and dealer's hands for non-bust losses. That is, as the number differences between the two hands decreased, participants' closeness to win ratings increased. The same did not hold true for bust losses as these stayed more constant.

A possible confound to the present study was the individual participant's experience with the game of blackjack. The amount of risk taken and strategy of play may differ among individuals with varying levels of experience. Without a prescreening of a participant's self-reported experience, we could not account for his or her knowledge of the game. Another limitation of the study was that all of the measures relied on self report from the participant. Future studies should incorporate more objective measures such as duration of play.

Extensions to the current experiment could include the investigation of the near-miss effect in scratch-off tickets, poker, and roulette. Furthermore, a simulated manipulation of the types of losses seen in these games using computer software could be advantageous in that we could assess the "breaking point" at which participants feel they've shifted from "close to winning" to "not close to winning". Another possible extension would be the inclusion of a protocol analysis of participant's verbal behavior during play. This would enable experimenters to access possible rule-governed and/or covert verbal behavior.

Since the game of blackjack is typically played with multiple players at a time, another interesting avenue of research would be to evaluate the effect of social contingencies on the near miss effect found in this game. For example, it could be investigated whether other participant ratings or even wins/losses affect the way players interpret the results of their own cards. Until an extension involving multiple blackjack players is conducted, it should be noted that it is still unknown how the results of the current study would generalize to more typical conditions of the game.

In conclusion, the above study extended prior investigations of the near-miss effect in slot machines (Dixon & Schreiber, 2004; Ghezzi et al., 2006; Kassinove & Schare, 2001; Strickland & Grote, 1967) to the game of blackjack. Although gaming control boards have reduced the amount of slots programmed to produce near-misses (Ghezzi et al., 2006), we shouldn't overlook aspects of other games that may automatically produce the effect. It is only with further analysis that we can work to uncover all of the variables that maintain gambling behavior to address this widespread societal problem.

REFERENCES

Dixon, M.R., & Schreiber, J.E. (2004). Near-miss effects on response latencies and win estimations of slot machine players. *The Psychological Record, 53*, 335-348.

Ghezzi, P.M., Wilson, G.R., & Porter, J.C.K. (2006). The near-miss effect in simulated slot machine play. In P.M. Ghezzi, C.A. Lyons, M.R. Dixon, & G.R. Wilson (Eds.) *Gambling: Behavior Theory, Research, and Application* (pp. 155-189). Reno: Context Press.

Kassinove, J.I., & Schare, M.L. (2001). Effects of the "near miss" and the "big win" on persistence at slot machine gambling. *Psychology of Addictive Behaviors, 15*, 155-158.

Lesieur, H. R., & Blume, S. B. (1987). The south oaks gambling screen (SOGS): A new instrument for the identification of pathological gamblers. *American Journal of Psychiatry, 144,(9)*, 1184-1188.

Moran, E. (1979). An assessment of the report of the royal commission of gambling 1976-1978. *British Journal of Addiction, 74,* 3-9.

Parke, J, & Griffiths, M. (2004). Gambling addiction and the evolution of the "near miss". *Addiction Research and Theory, 12*(5), 407-411.

Petry, N.M. (2005). *Pathological gambling: Etiology, comorbidity, and treatment.* Washington DC: American Psychological Association.

Reid, R.L. (1986). The psychology of the near miss. *Journal of Gambling Behavior, 2*, 32–39.

Strickland, L. H., & Grote, F. W. (1967). Temporal presentation of winning symbols and slot-machine playing. *Journal of Experimental Psychology, 74*, 10-13.

Action Editor: *Jeffrey N. Weatherly*

Analysis of Gambling Behavior 2009, **3**, 62-67 Number **2** (Winter 2009)

THE RELATIONSHIP BETWEEN REPORTED FREQUENCY OF GAMBLING AND RATE OF DISCOUNTING DIFFERENT COMMODITIES USING A FILL-IN-THE-BLANK PROCEDURE

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The present study had 302 participants complete temporal-discounting tasks pertaining to five different commodities using the "fill-in-the-blank" method. These data were analyzed using two different equations, and the resulting rates of discounting were correlated with participants' self-reported frequency of gambling. The discounting data were not entirely consistent with other published data. Statistically significant correlations between discounting and gambling frequency were observed, but varied depending on the type of discounting analysis that was employed and were not always in the same direction as past research.

Keywords: Temporal discounting, gambling frequency.

The idea that temporal discounting is related to gambling is not new. Research has suggested that pathological gamblers discount hypothetical monetary outcomes more steeply than non-pathological gamblers (e.g., Dixon, Marley, & Jacobs, 2003; see Petry, 2005, for a review). Further, research has suggested that rate of temporal discounting of hypothetical monetary outcomes predicts how participants gamble in a controlled laboratory situation (Weatherly, Marino, Ferraro, & Slagle, 2008). Temporal discounting has also played a prominent role in several recent behavioral accounts for why people might become problem gamblers (Fantino & Stolarz-Fantino, 2008; Madden, Ewan, & Lagorio, 2007; Weatherly & Dixon, 2007).

A common way to study temporal discounting is to present the respondent with a series of dichotomous choices (e.g., $75 now or $100 in one year?) in which the immediately available amount and the length of the delay to the alternative are varied across questions. The resulting data are then fit to a hyperbolic function:

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

In Equation 1, V represents the subjective monetary value of the delayed outcome, A represents the amount of the reward, k is a free parameter that describes the rate at which discounting occurs, and D represents the delay (e.g., Mazur, 1987). Higher values of k are indicative of steeper rates of discounting.

This technique is not the only, or even potentially the best, way to analyze rates of discounting. Myerson, Green, and Warusawitharana (2001) argued that the above equation assumes that temporal discounting follows a hyperbolic function, which may or may not be the case. Further, the resulting parameter, k, has a lower but not upper bound, which potential results in a skewed distribution and poses problems for parametric analyses. Instead, Myerson et al. proposed measuring the area under the curve (AUC). AUC can vary between 0 and 1 and is calculated by summing the areas of the trapezoids that are created by the indifference points

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across the different delays (assuming the full value of the consequence when there is no delay) using the following equation:

$$x_2 – x_1 [(y_1 + y_2)/2] \quad \text{(Equation 2)}$$

In Equation 2, the non-discounted reward value is represented on the ordinate and delay is represented on the abscissa. Lower values of AUC are indicative of more discounting. Myerson et al. argued that AUC does not suffer from the problems faced by Equation 1 and is potentially useful because it is standardized across different commodities.

It is also the case that presenting participants with a series of dichotomous choices is not the only way to generate a data set used to calculate rates of discounting. Chapman (1986) introduced what has been called the fill-in-the-blank (FITB; Smith & Hantula, 2008) method in which the respondent is asked to generate the value of the immediately available commodity rather than having it determined by the researcher identifying where the respondent "switches" from choosing the immediately available commodity to choosing the delayed one (or *vice versa*). The FITB method avoids the problem with observing multiple "switches" (e.g., a person choosing $75 now over $100 in one year, then choosing $100 in a year over $80 now; see Weatherly, Derenne, & Chase, 2008), as well as the arduous process of presenting respondents with numerous choices at each particular delay. One potential drawback of the FITB method is that it is more cognitively demanding for respondents than is the dichotomous choice method because they have to generate the amounts themselves rather than choosing one of the two options that is presented to them. Smith and Hantula (2008) also reported that the different methods may produce different results; they reported shallower discounting curves with the FITB method than with the dichotomous choice method.

The present study was designed with two goals in mind. First, we wanted to determine if interpretable data on delay discounting of several different commodities could quickly and easily be collected using the FITB method. Second, we wanted to determine whether respondents' reported frequency of gambling would correlate with one or any of the observed rates of discounting.

METHOD

Participants

The participants were 377 undergraduate students from the University of North Dakota. The final data set (see below) consisted of data from 302 respondents (202 female; 82 male). The mean age of those respondents was 19.95 years (SD = 3.18 years), who reported a mean grade point average of 3.51 on a 4.00 scale (SD = .57). Because many of the respondents were freshmen at the university, many reported their grade point average from high school. In terms of ethnicity, 91.4% of the sample reported being Caucasian. One hundred eighty three participants reported being single, 103 reported being in a relationship, and 11 reported being married or divorced. Only seven participants reported making more than $25,000 in annual income.

Materials and Procedure

The participants completed the survey measures in their introductory, developmental, educational, or abnormal psychology class. The first sheet was a demographic data form that asked participants about their gender, age, grade point average, ethnicity, annual income, and frequency of gambling. Respondents could report three frequencies of gambling: Frequently, Seldom, or Never.

They then completed a series of questions designed to determine how they discounted five different commodities: Being owed $1,000, being owed $100,000, retirement income, medical treatment, and Federal legislation on education. There were eight

Table 1. Presented are the mean delay-discounting values for Equation 1 and 2.

Commodity	*k* (SD)	R^2 (SD)	AUC (SD)
Owed $1,000	0.0487 (0.3099)	0.3542 (0.3172)	0.6538 (0.2389)
Owed $100,000	0.0601 (0.2745)	0.3169 (0.3305)	0.7550 (0.2412)
Retirement	0.0185 (0.1483)	0.5112 (0.3748)	0.8417 (0.1279)
Medical Treatment	0.0408 (0.0368)	0.5117 (0.3319)	0.7418 (0.1477)
Federal Legislation	0.0153 (0.0137)	0.4128 (0.3272)	0.8236 (0.1186)

delays for each commodity, ranging from one week to 10 years. Thus, participants completed a series of 40 questions. The 40 questions were randomly ordered. All participants then completed the questions in the same (random) order. The exact questions are presented in the Appendix.

RESULTS AND DISCUSSION

The responses from all 377 respondents were analyzed using Equations 1 and 2. The resulting *k* and AUC values were then subjected to the following exclusion criterion: A participant's data were excluded if that participant's *k* or AUC value for any of the five commodities was beyond two standard deviations from the mean value for that particular commodity. This criterion resulted in the exclusion of 75 participants.

Of the 302 participants who met the inclusion criterion, 13 reported that they frequently gambled, 122 that they seldom gambled, and 167 that they never gambled. The rates of delay discounting, for both Equation 1 and 2, are presented in Table 1.

Table 2 presents the correlations between respondents' reported frequency of gambling and their rates of discounting for the different commodities. Several of the correlations were significant at the $p < .05$ level. Specifically, the more frequently participants reported gambling, the more steeply they discounted medical treatment and Federal legislation on education when discounting was analyzed with Equation 1. The more frequently participants reported gambling, the less they discounted being owed the monetary sums of $1,000 and $100,000 when discounting was analyzed with Equation 2.

The first goal of the present investigation was to determine whether interpretable data on delay discounting could be quickly and easily collected for multiple commodities. The conclusion as to whether this goal was met may not be easy to discern. On the one hand, the method produced a large data set that did result in statistically significant findings. On the other hand, the FITB method did produce some extreme values for discounting, leading to the elimination of nearly 20% of the original sample. It also did not lead to the expected results in terms of the monetary outcomes. That is, rate of discounting (at least in terms of *k*) typically varies inversely with the value of the commodity. As can be seen in Table 1, the opposite result was observed.

Smith and Hantula (2008) reported less discounting with the FITB method than with the more traditional dichotomous-question method. We only employed the FITB method, so we cannot determine whether steeper rates of discounting of the present five commodities would have been observed using another method. Their conclusion, however, was that the performance of Equation 1 was superior to that of Equation 2. Furthermore, they suggested that the dichotomous-choice method may be preferable to the FITB method because Equation 1 was originally proposed to analyze data generated using the

Table 2. Presented are the bivariate correlations between reported gambling frequency and the participant's *k* and AUC value for each commodity.

Owed $1,000	Owed $100,000	Retire.	Med. Trtmnt.	Fed. Legis.
		k		
-0.086	-0.002	0.030	0.117*	0.130*
		AUC		
0.123*	0.113*	0.058	0.057	-0.050

* $p < .05$

dichotomous-choice method.

The present results may not fully support the conclusions of Smith and Hantula (2008). Across the five commodities tested in the present study, Equation 1 did not fit the data particularly well. As can be seen in Table 1, the variance accounted for by Equation 1 ranged from 32 – 51%. These numbers are well below the fit values reported by Smith and Hantula, which typically exceeded 95%. This outcome could potentially be linked to the present data set. However, both Smith and Hantula (2008) and the present study asked participants about a particular amount - $1,000. For this commodity, Smith and Hantula reported a mean AUC of 0.694 (SD = 0.24) using the FITB method, which is very similar to the mean AUC of 0.654 (SD = 0.24) found in the present study. Given the recommendations of Smith and Hantula, along with the relatively poor fit of Equation 1 to the present data, the use of AUC may be prudent when using the FITB to study delay discounting.

The second goal of the present study was to determine if frequency of gambling would correlate with the rate of discounting of different commodities when the FITB method was employed. Results for this endeavor were also mixed. Statistically significant correlations were found, although not all of them in the direction one would predict given the extant literature. For example, when Equation 2 was used to analyze the discounting data, significant correlations were found between gambling frequency and the rate of discounting hypothetical monetary rewards. However, the direction of the relationship was inverse; the more frequently participants reported gambling, the less they discounted the delayed monetary values. Given previous findings (e.g., Dixon, Marley, & Jacobs, 2003), the opposite result should have been observed. These results might suggest that the FITB method did not produce valid data. They might also suggest that the relationship between gambling and discounting money is not highly reliable. Alternatively, the present results may be linked to the present question itself, which asked about money that was "owed" to them. Research (Weatherly, Derenne, & Terrell, in press) has shown that respondents discount money they are owed differently than money they have won. The presence of this contextual issue in the present study and its absence in previous studies (e.g., Dixon et al., 2003) may have contributed to the different findings.

When the discounting data were analyzed with Equation 1, gambling frequency did not vary significantly with delayed monetary outcomes. It did, however, correlate with hypothetical decisions about medical treatment and Federal legislation. Specifically, the more frequently participants reported gambling, the more steeply they discounted both commodities. It should be noted that none of the significant correlations were particularly large and that, as mentioned above, Equation 1 did not provide an excellent fit of the present data. With that said, however, finding that frequency of gambling may be correlated with the rate of discounting of other commodities besides money is certainly worthy of further research. Pursuing such relationships could potentially help us better understand both the development and treatment of problem or pathological gambling.

It is also very possible that additional, or stronger, relationships between discounting and gambling would have been found in the present study had we employed a more thorough measure of gambling, such as the South Oaks Gambling Screen (Lesieur & Blume, 1987) or the Gambling Functional Assessment screen (Dixon & Johnson, 2007). The present study did not do so because we were attempting to collect a substantial amount of delay-discounting data from participants in a very short period of time (i.e., less than 10 min). Future attempts should involve these other measures given that the FITB methods appears to produce a large amount of reasonably interpretable data can be collected in a relatively efficient manner. Such attempts would also benefit from studying a broader sample of participants, as the present data were drawn nearly exclusively from college students less than 21 years of age.

REFERENCES

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

Dixon, M.R., & Johnson, T.E. (2007). The gambling functional assessment (GFA): An assessment device for identification of the maintaining variables of pathological gambling. *Analysis of Gambling Behavior, 1*, 44-49.

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

Fantino, E., & Stolarz-Fantino, S. (2008). Gambling: Sometimes unseemly; Not what it seems. *Analysis of Gambling Behavior, 2*, 61-68.

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

Madden, G. J., Ewan, E. E., & Lagorio, C. H. (2007). Toward an animal model of gambling: Delay discounting and the allure of unpredictable outcomes. *Journal of Gambling Studies, 23*, 63-83.

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

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

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

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

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

Weatherly, J.N., Derenne, A., & Terrell, H.K. (in press). College students discount money "won" more than money "owed." *The Psychological Record.*

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

Weatherly, J.N., Marino, J.M., Ferraro, F.R., & Slagle, B. (2008). Temporal discounting predicts how people gamble on a slot machine. *Analysis of Gambling Behavior, 2*, 135-141.

Action Editor: *Mark R. Dixon*

Appendix

X times = 1 week, 2 weeks, 1 month, 3 months, 6 months, 1 year, 5 years, & 10 years

Owes You $1,000

If someone owed you $1,000 and was going to pay you that amount in *X time*, what is the smallest amount of money you would accept today rather than having to wait *X time*?

Owes You $100,000

If someone owed you $100,000 and was going to pay you that amount in *X time*, what is the smallest amount of money you would accept today rather than having to wait *X time*?

Retirement

Your financial advisor informs you that you could retire at a wage of $100,000 per year but that you need to work for *X time* before that is possible. What is the smallest annual amount of money you would accept today rather than having to work *X time*?

Medical Treatment

Suppose you were suffering from a serious disease and your physician informed you that you would need to wait *X time* before getting a treatment that was 100% successful. However, you could immediately begin a different treatment that has a lesser chance of success. What is the minimum percentage of success that the different treatment could have for you to choose it?

Federal Legislation on Education

Suppose the Federal Government is attempting to pass legislation that will reform the American educational system. Your senators tell you that it will take them *X time* to craft the perfect policy, but that they can pass a less-than-perfect one immediately. What percentage of perfect (i.e., 100%) would you find acceptable to get the legislation passed immediately rather than waiting for *X time* for the perfect policy?