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VIDEO GOLF AND GAMBLING: THE IMPACT OF MONETARY WAGERS ON PERFORMANCE

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The present investigation explored how experimental conditions of money gain and money loss impacted performance of golfers playing a video-based golf simulator. Five female participants were initially assessed for skill level and history of golf play. Following assessment, players were orientated to a computerized video golf game that translated participants' real world putting stoke into in game simulated putts. Players were exposed to conditions in which putt accuracy led to financial rewards, and other conditions in which putt accuracy led to financial punishers. Results suggest that monetary rewards resulted in decreased putt accuracy and increased variability compared to non-monetary baseline performances in the players. Implications for a behavioral understanding of golf performance, wagering at sports, and the "choking" response are presented.

Keywords: golf, video games, sport performance, choking, wagering

An adult over the age of 21 can bet legally on sporting events in the United States through the licensed Nevada Sports Books. Wagers, however, can be placed illegally on professional as well as amateur sports with bookies in virtually every city and town across the nation. In addition to horse and dog racing, betting on team sports such as football, basketball, baseball and hockey represents a multi-billion dollar enterprise (Sugar, 1992). Golf is an example of an individual sport where gambling frequently occurs (Smith & Paley, 2001). Basketball great Michael Jordan is also well known for wagering large amounts of money on the golf course (Leahy, 2004) and golfers of all skill level will often wager during play. This includes betting on their overall final score, sub totals for each nine holes, total score on a single hole, execution of single stroke, or on a multitude of other performance outcomes.

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In the sport psychology literature, athletes are often described as "choking" when they demonstrate poor performance when the stakes are high (Lewis & Linder, 1997). The role of the autonomic nervous system and associated physiological responses of anxiety and stress are critical to the success of golfers (Miller, 2005). Typically, golfers will describe muscle tension, poor coordination, trembling hands, accelerated heart rate, racing thoughts, and loss of mental focus as correlates of "choking" (Miller, 2005; Valliante, 2005). Beilock and Carr (2001) demonstrated that the complex, proceduralized, and sensorimotor task of putting was susceptible to the choking effect and that directing attention towards the execution of the task resulted in diminished performance. Research has also demonstrated that golf performance in chipping (Pates & Maynard, 2000), full swing (Brouziyne & Molinaro, 2005) and putting (Taylor & Shaw, 2002) can be enhanced using relaxation and imagery techniques to reduce stress and "choking".

A recent single case study examined the effect of monetary consequences on the golf performance of a pathological gambler (Bordieri, Jackson & Dixon, 2007). Using an AB

design, the participant made 10 full swings on a computerized golf simulation game. Swing accuracy (distance from the hole) was the primary dependent measure. Following baseline, he was informed that he would receive a \$20 gift card if the average of the next 10 swings were closer to the hole than the average of the first 10 swings. The introduction of the monetary reward resulted in a decrease in shot accuracy and an increase in shot variability.

The current investigation builds upon the case study by assessing the effect monetary consequences have on simulated golf performance using a more robust withdrawal design. Additionally, performance feedback was provided immediately after each swing and the role of the varying presentations of monetary consequence (response cost or positive reinforcement) was evaluated. This design allowed for putt accuracy and variability to be calculated across and between momentary consequences in order to explore under what conditions the “choking” phenomena would emerge. Specifically, performance differences between baseline and monetary phases as well as discrepancies in performance between response cost and positive reinforcement contingences were assessed.

METHOD

Participants

Twelve participants were recruited from an undergraduate rehabilitation course at a Midwestern university. Seven were excluded from the study because they did not meet the criteria for golf experience which required playing on a regulation golf course, practicing at a driving range, or playing miniature golf. Of the five who met these criteria, two reported playing on a regulation golf course and all five reported playing miniature golf. Given our volunteer golfers were relative beginners, they were presented with a putting task instead of a full swing challenge in the video golf simulation. All participants were female

and they ranged in age from 22-54. At the start of the study participants were assessed for potential pathological gambling using the South Oaks Gambling Screen with all scoring below the threshold for potential pathology (range 0 – 3 $M=.08$).

Experimental Design and Measures

Participants were exposed to three levels of monetary consequences in a multiple-treatment reversal design (ABCA). To mitigate the threat of a sequence effect, participants were exposed to the two intervention conditions, positive reinforcement (B) and response cost (C), in an alternating fashion with three participants assigned to the sequence ABCA and two participants assigned to the sequence ACBA. The independent variable consisted of three levels of monetary consequence contingent upon putting accuracy: A baseline where there was no monetary consequence, an intervention with positive reinforcement (gaining money), and an intervention with response cost (losing money). The dependant variable was the distance the golf ball rested from the hole after the putt as reported by the computerized interface.

Setting and Materials

Sessions took place in a 16' x 20' room containing an observation mirror and chairs. The putting stroke was made on a hardware device that contained a golf ball and various micro-sensors that captured club and ball movement across a 1 ft platform which was constructed of artificial turf. The device was interfaced with a Sony Playstation2 video game system running “Tiger Woods PGA Tour 2006” which used the input from the hardware device to simulate the putt on a 32 inch LCD monitor. Participants were presented with an identical virtual 30 foot putt on the 17th hole at Pebble Beach Golf Links. All were right handed and used a Wilson blade putter to make the putting strokes. Data were collected by an observer that was positioned 4

ft from the LCD monitor and away from the participant swinging the club. During monetary feedback conditions ten new one dollar bills of US currency were used to establish financial contingencies.

Procedures

After gaining consent and screening for golf experience and potential gambling pathology participants were oriented to the golfing interface and putter. They were informed that their job during the study was to stoke the ball just like they would a regular golf ball and to try to make the putt or get it as close to the hole as possible. Prior to beginning the baseline phase participants were told to make a few practice strokes to get acquainted to the interface. During this acquisition phase and all subsequent phases the distance from the hole in feet reported by the interface was recorded following each simulated putt and the observer then reset the interface and returned the ball to the virtual starting point holding constant simulated environmental conditions such as wind and visibility. Each participant continued to make putts in the acquisition phase until their performance researched the stability criterion of a standard deviation equal to seven or less feet from cup after at least five trials. The phase was terminated after ten trials regardless of standard deviation. This acquisition phase ensured that each participant was familiar with the experimental apparatus and that they acquired a reasonably stable level of performance before beginning baseline recording.

Baseline recoding began immediately following the termination of the acquisition phase without participants being informed of the phase change. The covert transition ensured that participants could not deliberately under perform in order to gain an advantage in later conditions. The baseline phase consisted of ten putting opportunities presented in an identical manner as the acquisition phase. At the end of a baseline phase participants

were given a one minute break before continuing on to either the positive reinforcement or response cost condition.

In both the response cost and positive reinforcement condition participants were exposed to an identical financial contingency which allowed them to earn up to \$20 gift card contingent on their simulated putting performance. In both conditions the participants attempted 10 simulated putts with each worth the potential of one dollar of gift card value. The criterion level for the contingency remained constant across the two conditions for each participant and it was set to each participant's mean recorded distance from the hole during baseline. The only difference between the two conditions was in the presentation of the contingency. In the positive reinforcement condition participants were told that they had the opportunity to earn \$1 towards their gift card for every putt that was closer than or equal to their mean baseline performance. In this condition the experimenter placed a \$1 bill on a table in front of the participant for each putt that met criterion. In the response cost condition the experimenter placed ten \$1 bills on the table prior to the condition and told each participant that they could be traded in for a \$10 gift card but that first they would have to make ten more simulated putts. Participants were informed in the response cost condition that for every simulated putt that was further away than their mean baseline performance they would lose one dollar of gift card value. The experimenter removed a \$1 bill from the table for every put that was further away than the participant's mean baseline performance in this condition.

Following the counterbalanced presentation of the positive reinforcement and response cost conditions participants were informed that they were almost finished with the study and that they would receive a gift card equal to their earnings in the two contingency conditions. They were then asked to

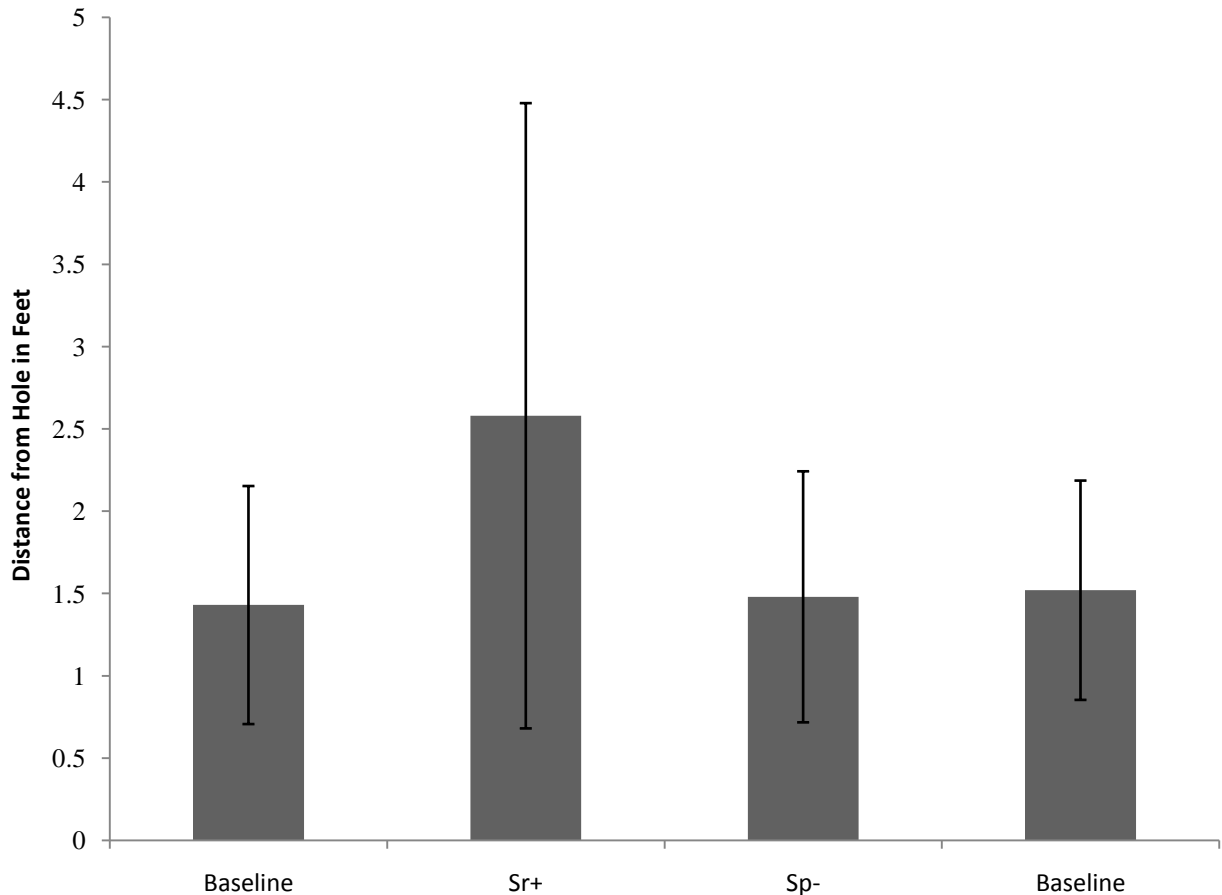


Figure 1. Mean distance from hole in feet across experimental conditions. The error bars represent one standard deviation.

make ten more simulated putts on the golf interface and were explicitly told that their performance would not affect their gift card value. However, they were still reminded that their job was to sink the putts or get them as close to the hole as possible. Following the ten simulated putts in the return to baseline condition participants were given their gift card and then debriefed.

RESULTS & DISCUSSION

Participants' performance on each putting opportunity were pooled for each of the four experimental conditions. A directional hypothesis was assumed for comparisons between the initial baseline condition and the two contingency conditions ($\mu_{\text{Initial Baseline}} < \mu_{\text{Positive Rein-}}$

forcement and $\mu_{\text{Initial Baseline}} < \mu_{\text{Response Cost}}$). A directional hypothesis was also assumed in the comparison of the pooled baseline and contingency conditions ($\mu_{\text{Initial Baseline and Final Baseline}} < \mu_{\text{Positive Reinforcement and Response Cost}}$) with a one-tailed dependent group t-tests used for all directional hypothesis testing. All other tests of significance assumed a non-directional hypothesis and used two-tailed dependent group t-tests. An alpha level of .05 was used for all statistical tests.

Performance across conditions as expressed by mean distance from the hole in feet is presented in Figure 1. Participant performance in the initial baseline ($M = 1.43$, $SD = 1.45$) did not differ significantly from performance in the final baseline ($M = 1.52$, $SD = 1.33$) suggesting the absence of a practice

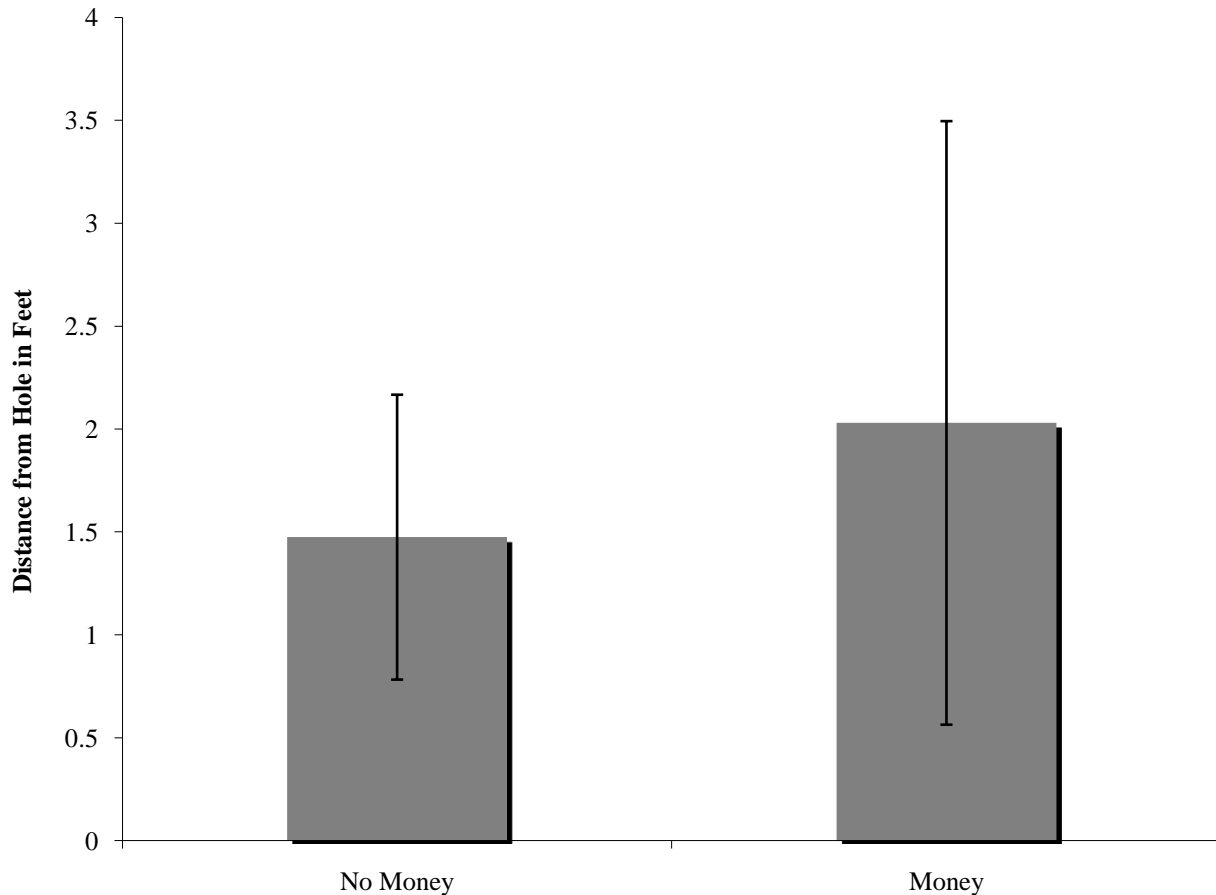


Figure 2. Mean distance from hole in feet for pooled baseline and financial contingency conditions. The error bars represent one standard deviation.

effect, $t(49) = -.33, p = .74$. A significant difference was observed between performance in the initial baseline and the positive reinforcement contingency ($M = 2.58, SD = 3.80$) with performance considerably worse in the positive reinforcement contingency, $t(49) = 1.88, p = .03$. However there was no significant difference in performance between the initial baseline and the response cost contingency ($M = 1.48, SD = 1.53$), $t(49) = -.16, p = .43$. It is of note that performance differences between the two contingency conditions approached significance despite the fact that the underlying financial contingency was identical, $t(49) = 1.88, p = .06$.

A comparison of pooled performance in baseline conditions (No-Money) and contingency conditions (Money) is provided in Fig-

ure 2. Performance in the baseline conditions were significantly more accurate ($M = 1.48, SD = 1.38$) than performance in the contingency conditions ($M = 2.03, SD = 2.94$), $t(99) = -1.72, p = .04$. There was also considerably more performance variability in the contingency conditions as indicated by a greater range of scores (0-24, $SD = 2.94$) as compared to performance variability in the baseline conditions (0-6, $SD = 1.38$).

While the thrust of research into the “choking” effect has been focused on experienced performers (Miller, 2004, Valliante, 2005), this study demonstrated the effect in relatively inexperienced golfers. When participants had the opportunity to earn money in the positive reinforcement contingency the accuracy of their putts decreased. Consistent

with the findings of Lewis and Linder (1997), both mean distance from hole and variability of putts was highest in this condition and suggests the presence of a clear “choking” effect. It is of note that this effect was not observed in the response cost condition despite it sharing an identical financial contingency with the positive reinforcement condition. That is, the response cost and positive reinforcement contingency differed only in how they were presented to the participants (i.e. chance to earn a dollar per putt in positive reinforcement and chance to avoid losing a dollar per putt in response cost) yet responding across the two conditions was markedly different.

Previous research has noted that gambling behavior can be maintained by rule governed behavior and that it is often insensitive to direct contingencies (Dixon, Hayes, & Aban, 2000). A possible explanation for this performance disparity is the role of client generated verbal behavior or “self talk” during the performance task. It could be that participants generated verbal behavior in the positive reinforcement condition which inhibited performance but not during the response cost condition. As a matter of speculation, participants may have approached the positive reinforcement condition with self-talk such as, “I have to make these putts so I can get some money” while approaching the task in the response cost conditions as, “If I miss it’s only a dollar, I have plenty of money already.” Future research should attempt to replicate this effect and use a protocol analysis to identify if verbal behavior serves as mediator of performance.

One limitation of the current investigation was the limited size and nature of the sample. A small number of only female undergraduate students served as participants in this study. However, the discovery of significant findings in such a low powered analysis is promising and replications should be conducted with larger and more representative samples to confirm these findings and extend

them to both male and female participants of diverse ages. Another possible limitation was the relatively insensitive measurement employed by the experiential interface which reported distance from the hole only in feet. Future research should incorporate more sensitive measures of performance (e.g. distance in inches from cup). As the current investigation was a laboratory study, the financial contingencies were quite small relative to “real-world” wagering. While a “choking” effect was noted, the effect might have been more robust if more money was at stake and future research should incorporate reinforcers of larger magnitude and more demanding real world golf performance tasks to extend these findings.

This study successfully replicated the performance “choking” effect in novice golfers using a video golf interface. The introduction of a gambling contingency in the form of performance contingent financial rewards lead to significantly less accurate and less consistent performance. This investigation also demonstrated a marked difference between performance conditions that only differed in the verbal presentation of the contingency highlighting the possible influence of rule governed behavior in the “choking” effect. While still a relatively young line of research, the investigation into the behavior processes behind a financial induced “choking” effect in golf performance has proven to be a fruitful area of study.

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