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# *ALTERING RESPONSE CHAINS IN PATHOLOGICAL GAMBLERS USING A RESPONSE-COST PROCEDURE*

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Two pathological gamblers could choose between emitting or having the dealer emit the response options when playing each of three casino games. A response-cost procedure was introduced in a multiple baseline design across games in which the participant had to pay to perform the responses himself, which was somewhat effective at reducing many of the initial irrational choices made by each participant.

DESCRIPTORS: addiction, gambling, illusion of control, pathological gambling

During the past 25 years, the United States has experienced rapid growth in legalized gambling (from 2 to 48 states), along with rapid growth in pathological gamblers (from 1% to 3% of the U.S. population; National Research Council, 1999). Treatments of pathological gamblers are in their early stages, because it still remains relatively unclear what maintains the behavior of the pathological gambler. Skinner (1953) noted that schedules of reinforcement maintained pathological gambling, but questions have arisen if reinforcement alone is a sufficient explanation, because most pathological gamblers suffer repeated losses and minimal net gains (Dixon & Delaney, 2006; Rachlin, 1990). Contemporary behavior-analytic attempts to understand pathological gambling have been increasing over the past few years (e.g., Dixon, Jacobs, & Sanders, 2006; Dixon, Marley, & Jacobs, 2003; Ghezzi, Lyons, Dixon, & Wilson, 2006). Zlomke and Dixon (2006) demonstrated that gambling behavior could be modified, using a conditional discrimination training procedure independent of programmed reinforcement contingencies.

The gambling event itself might be conceptualized as a series of behaviors that occur in a chain. First, the gambler selects the numbers to wager on; next, he or she selects the amount to bet; after that, he or she selects to either roll the dice or pass to another player; and finally, after observing the outcome of that gamble, he or she chooses to either quit or continue playing. In the case of many casino games, this simple chain of behaviors is intermittently reinforced. When individuals have long histories of gambling, it is possible that the responses in this behavior chain are resistant to extinction even more so than for novice game players who would terminate future wagering rather quickly following monetary losses. Further, it is possible that random outcomes of repeated gambling (e.g., always betting on 7 when playing roulette and occasionally winning) result in superstitious behavior on the part of the pathological gambler, hence strengthening all responses in the chain, including those that have no objective impact on the outcome of the game. Empirically, it remains to be seen whether pathological gamblers will demonstrate predictable behavior chains during the course of repeated gambling, and if they do, whether irrelevant responses in this chain can be brought under experimental control.

Therefore, the purpose of the present study was to explore how various response chains were emitted by 2 pathological gamblers across various gambling tasks. After initial assessment, if a preference for certain topographical chains existed, the present study sought to weaken these chains of responses via a response-cost

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procedure (DeLeon et al., 2008) that involved a forfeiture of gambling chips by the gambler.

## METHOD

### *Participants and Setting*

Two male university students were recruited via campus flyers or personal contact with graduate assistants and participated in the current institutional-review-board-approved study for a chance at a cash prize of $50. Both participants met criteria for pathological gambling as determined by a score of 5 or higher on the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987). The participants also completed the Gambling Functional Assessment (Dixon & Johnson, 2007) and a delay-discounting task similar to the one used by Dixon et al. (2003). Mike was a 24-year-old pathological gambler (SOGS 7) who had a history of playing various casino games and betting on sporting events and was active in a local poker network. Joe was a 24-year-old pathological gambler (SOGS 6) who had a history of occasionally playing table games at casinos and attended weekly card games in his neighborhood. Even though both participants met the diagnostic criteria for pathological gambling, neither participant was actively involved in efforts to reduce their gambling, and neither was in treatment for gambling problems. The study was conducted in a small casino laboratory (4.5 m by 3 m) that contained four slot machines, a regulation casino craps table, a casino roulette table, and a one-way observation window. Both individuals signed informed consent prior to participation.

### *Procedure*

*Game descriptions.* During the session, participants independently were allowed to play a modified version of craps, a modified version of roulette, and two slot machines. Craps is a casino game that is played by (a) wagering on numbers to be displayed or avoided when two six-sided dice are rolled, (b) multiple players if a casino is busy, (c) a single player at any time. In the modified craps game of our study, participants were given the opportunity to bet whether or not a 4 or a 10 was rolled before a 7. Each winning five-chip wager paid an additional 10 chips to the participant. The ratio of winning on this wager was 1:3. Roulette is a casino game that is played by wagering on numbers between 1 and 36. A large wheel is spun that contains small pockets representing the numbers, and a ball is dropped into the spinning wheel. If the ball lands in a number pocket that corresponds to the numbers bet, the player wins. In the modified roulette game, participants bet on one of three 12-number sections. Each winning five-chip wager paid an additional 10 chips to the participant. The ratio of winning on this wager was 6:19. The slot machines were fair slot machines used in casinos in that they paid off jackpots on a random-ratio schedule of approximately 85% payback. Each winning five-chip wager paid an additional one to 40 chips. The ratio of winning on any given spin was approximately 1:5. Prior to the session, experimenters provided participants with verbal instructions regarding the play of each game and told them that whoever won the most chips would win a $50 gift card at the end of the study. The experimenter gave each participant 400 chips to begin.

*Response options.* Each trial consisted of a mandatory five-chip wager and the opportunity to choose among two different response options during the behavior chain. One type of response option allowed the chain of gambling behavior to occur as normally done in a casino. The other type of response option resulted in the dealer interrupting the response chain of the participant and making a response in the chain herself. The response options for each game were as follows. In the modified craps game, participants could pick which number to bet on or the dealer could pick for them, and participants could to roll the dice or have the

dealer roll. In the modified roulette game, participants could choose which section to bet on or have the dealer choose for them, and they could drop the ball themselves or have the dealer drop the ball for them. On the slot machines, participants could pick which slot machine to play or have the dealer select the machine, and the participants could stop the reels (using three small buttons located below the reels) or have the dealer do it for them. Thus, prior to each trial, the experimenter asked participants whether they wanted to engage in the behaviors described above or whether they wanted the dealer to perform those tasks. Games were alternated after each trial for each participant.

*Baseline and response-cost trial types.* During baseline, the participants could choose between response options described above at no extra cost. During the one-chip condition, participants had to pay an additional chip to prevent the experimenter from interrupting the response chain. This additional chip was in addition to the mandatory five-chip bet and was not considered part of the wager. Instead, it was simply forfeited to the dealer. For example, if a participant wished to roll the dice, it cost him one additional chip, whereas the dealer could roll the dice at no extra cost. During the two-chip condition, the participant had to pay an additional two chips to prevent the dealer's interruption. No response choices of this experiment had any impact on the outcomes of the games played.

*Research design and dependent variable.* A multiple baseline design across games was used for both participants. Subsequent manipulations occurred for each participant and each game; these included various response-cost conditions along with a return to baseline for each participant to assess whether alterations in preference would be sustained in the absence of the programmed contingencies.

The primary observer concurrently served as the dealer. In this role, the observer provided instructions regarding each game, collected wagers, delivered winnings, and tracked responding. An independent second observer was present for 100% of the trials for both participants, and interobserver agreement was calculated for both dependent variables—chips earned (agreement was 100%) and participant choices (agreement was 99%)—by dividing the number of agreements of participant choice among options as well as chips won or lost by the number of agreements plus disagreements and converting this ratio to a percentage.

## RESULTS AND DISCUSSION

Figure 1 displays the cumulative choices made by Mike (left) and Joe (right) during baseline, response-cost condition, and return to baseline. During the initial baseline, Mike chose to engage in five of the six options that allowed him to prevent the dealer's interruption of the response chains across the three casino games. The only option that he did not choose to engage in was picking the section to bet on when playing the roulette game. After the introduction of the response-cost procedures across the three games, he showed occasional reductions in four of the five choices made during baseline. These changes in responding did not coincide directly with phase changes, but occurred at various points during the response-cost conditions. While playing craps, he made fewer choices to pick the number (4 or 7) that would be rolled before a 7, and he also made fewer choices to roll the dice instead of having the dealer roll the dice. While playing roulette, Mike showed slight reductions in picking the numbers wagered on, and while playing the slot machine, he decreased his choices of what machine was played. The response-cost conditions produced only minimal changes in his preference for rolling the dice at craps or stopping the slot-machine reels. Return to baseline immediately increased choices to initial baseline levels.

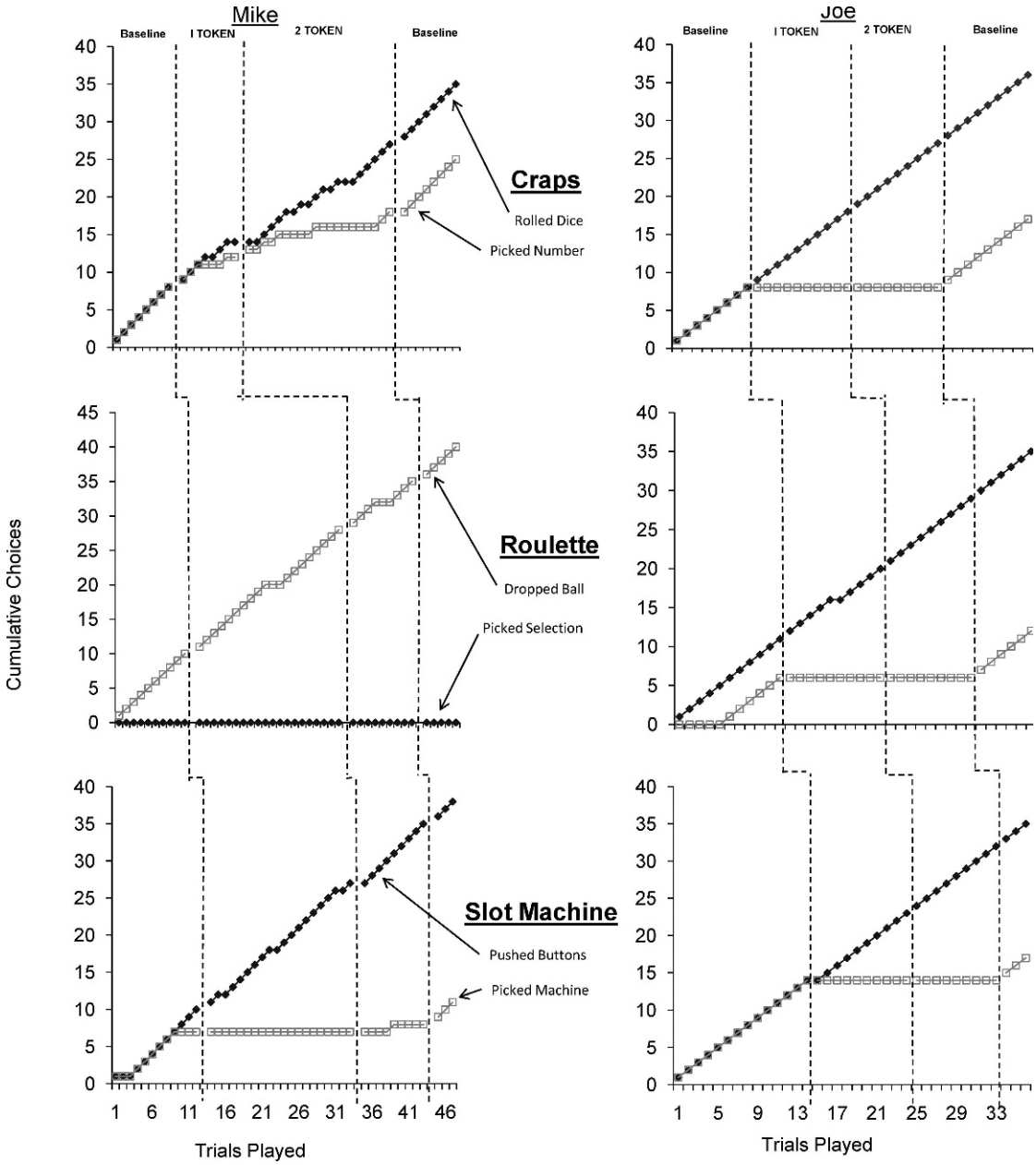


Figure 1. Cumulative choices made for various game options by each participant across baseline and response-cost conditions.

Joe chose to engage in six of the six response options that allowed him to emit a response chain independent of the experimenter across the three casino games during the initial baseline. After introduction of the response-cost procedures, immediate reductions occurred for only three of these six response options, suggesting less control over behavior than observed with Mike. Regardless of one- or two-chip response costs, Joe continued to

roll the dice at craps, pick his own numbers wagered on at roulette, and stop the reels of the slot machine. After the return to baseline, the suppression of the three response options seen during response-cost conditions immediately ceased, and preference for these choices returned. Wins and losses across each game for both participants were within the objective probabilities of winning noted above and are available from the corresponding author.

Although the current procedures were only partially successful at altering all of the response chains presented by 2 pathological gamblers, they are promising. Clinical interventions might consider incorporating response-cost procedures in which pathological gamblers are allowed to gamble in controlled environments and repeatedly forfeit a portion of their wagering chips each time certain decisions are made. After each trial occurs, discussion could take place regarding the nature of the wager, how losses could be minimized by not engaging in such choice making, and how the activities preferred (i.e., rolling the dice, selecting the numbers bet on) really have no outcome on the game. Teaching these skills to pathological gamblers may be critical to reduce the tendency to generate inaccurate rules about the game, which may sustain gambling beyond that which is financially responsible or may result in choice making during gambling that has no bearing on the outcome of the game (e.g., Zlomke & Dixon, 2006). Future research should also consider increasing the magnitude of the response costs beyond that used in the present study to see if larger amounts would have a more sustained impact on performance. In our study we explored only the maximum of a response-cost two-chip condition because for the games of craps and roulette, no net gain could result from a winning trial for the player at response-cost conditions of larger amounts. The fact that certain behavior chains persisted even under the current response costs of the present experiment illustrate perhaps just how resistant to change the behavior of a pathological gambler may be.

The present study, as well as that of Zlomke and Dixon (2006), might be criticized as not demonstrating true clinical gains for the participants used in the research procedures. Rather, both investigations resemble translational research that capitalizes on a clinical population in a rather contrived experimental environment. External validity is minimized by such explorations. However, until behavior analysts can demonstrate even minimal experimental control over the behaviors exhibited by those individuals with the growing clinical disorder of pathological gambling, such preliminary explorations are warranted because they will pave the way for more objectively based clinical treatments for pathological gamblers in the near future.

## REFERENCES

DeLeon, I. G., Hagopian, L. P., Rodriguez-Catter, V., Bowman, L. G., Long, E. S., & Boelter, E. W. (2008). Increasing wearing of prescription glasses by individuals with mental retardation. *Journal of Applied Behavior Analysis*, *41*, 137–142.

Dixon, M. R., & Delaney, J. (2006). The contribution of verbal behavior to gambling. In P. M. Ghezzi, C. Lyons, M. R. Dixon, & G. Wilson (Eds.), *Gambling: Behavior theory, research, and application* (pp. 171–190). Reno, NV: Context Press.

Dixon, M. R., Jacobs, E. A., & Sanders, S. (2006). Contextually controlled delay discounting of pathological gamblers. *Journal of Applied Behavior Analysis*, *39*, 413–422.

Dixon, M. R., & Johnson, T. E. (2007). The gambling functional assessment: A way to identify the causes maintaining pathological gambling. *Analysis of Gambling Behavior*, *1*, 44–49.

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

Ghezzi, P. M., Lyons, C., Dixon, M. R., & Wilson, G. (2006). *Gambling: Behavior theory, research, and application*. Reno, NV: Context Press.

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.

National Research Council. (1999). *Pathological gambling: A critical review*. Washington, DC: National Academy Press.

Rachlin, H. (1990). Why do people gamble and keep gambling despite heavy losses? *Psychological Science*, *1*, 294–297.

Skinner, B. F. (1953). *Science and human behavior*. New York: Appleton-Century-Crofts.

Zlomke, K. R., & Dixon, M. R. (2006). Modification of slot-machine preferences through the use of a conditional discrimination paradigm. *Journal of Applied Behavior Analysis*, *39*, 351–361.

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