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THE ROLE OF "EXPERIENCE" WHEN PEOPLE GAMBLE ON THREE DIFFERENT VIDEO-POKER GAMES

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The present experiment was designed to determine if and how experience might alter individuals' gambling when playing video poker. Twelve self-identified "experienced" poker players and 12 self-identified "novices" were recruited to play video poker across three different sessions. A different game (i.e., Jacks or Better, Bonus Poker, or Loose Deuces) was played in each session, with these games differing in what strategies were optimal. "Experienced" participants displayed more knowledge of poker than their "novice" counterparts. However, the only observed difference in the gambling between "experienced" and "novice" players was in how much they bet per hand, with "experienced" players betting higher amounts. Participants in both groups made frequent errors when playing, with error rates increasing when wild cards were introduced into the game. Self-reported strategies suggested that some participants held fallacious views about the games and/or betting strategies, although the presence of fallacious views did not appear to differ between groups. The present results indicate that experience may not necessarily lead to better play and, if anything, may be detrimental to the player if it leads to increased betting without an increase in the chance of winning. The results also suggest that, although players may alter their strategies when playing different poker games, they do not do so optimally.

Keywords: experience, video poker, gambling

Experience plays a major explanatory role within behavioral psychology. This concept falls under the guise of "reinforcement history" within a strict behavioral framework. The idea that experience is a critical aspect of understanding behavior, however, has not gone unnoticed in other fields of psychology. For instance, one can find large amounts of research conducted on the influence of "knowledge" or "expertise" on different types of behaviors. The study of how experience affects behavior has actually resulted in some of the more widely known research results in psychology. For example, de Groot (1965, 1966) attempted to identify the influence of expertise by comparing the behavior of expert chess players (e.g., grand masters) to that of novices (e.g., class A chess players). Both types of player were shown a chessboard on which pieces were arranged in a realistic manner such as one might find in a partially completed game. Participants were asked to identify the best move for the next turn given that arrangement of pieces. Perhaps surprisingly, players of both skill levels were fairly equivalent at identifying what the best move would be. The major difference between the different skill levels was the number of potential moves explored by the different players. The masters went through fewer possible derivations than the novices before concluding

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on a move.

Perhaps more famous within the memory literature is a study by Chase and Simon (1973). These researchers found that chess grand masters were quite adept at recreating configurations of chess pieces from memory even when given only brief exposure to the original configuration. This ability, however, seemed to be connected to whether or not the pieces were configured realistically as one would find in an actual game of chess or had been arranged randomly. In fact, when shown configurations of pieces randomly placed on the board, the grand masters were no better than novices at recalling their positions. Such findings spurred a great deal of subsequent research, some of which has documented that, in some instances, expertise may actually be detrimental (e.g., Castel, McCabe, Roediger, & Heitman, 2007).

Within a cognitive framework, results from research on expertise have been interpreted in terms of cognitive processing and the organization of memory. Within a behavioral framework, however, they can be interpreted in terms of shaping and stimulus control. That is, one could speculate that the results of de Groot (1965, 1966) occurred because, through extensively playing against top-notch competition, experts' behavior of going through certain progressions of potential moves has been reinforced while going through other progressions has either been extinguished or punished. Perhaps due to their lack of experience, novices may not discriminate between productive and non-productive progressions and thus may go through more of them.

Likewise, one could speculate that the results of Chase and Simon (1973) demonstrate that the configurations of chess pieces experienced by masters during actual play had come to serve as discriminative stimuli. Behavior such as recalling the position of the pieces was possible when the pieces were arranged in a particular fashion. The same behavior was inhibited, or at least not facilitated, when the pieces were differently arranged.

Both results have implications beyond chess play or the study of memory. They suggest that the behavior of game players are altered through continued play of the game. It is commonly assumed that this experience will enhance play. However, that is not necessarily the only possible outcome (e.g., Castel et al., 2007). For instance, one could speculate that chess players who continually play against lesser competition might have their behavior shaped in non-optimal ways. This non-optimal play would not be exposed until playing against a more advanced opponent. Likewise, it is possible that stimulus control would develop with continued game play, but that is no guarantee that the stimuli that come to exert control over behavior are the most optimal in terms of maximizing performance.

These possibilities take on added significance when applied to gambling on games of chance. Many games of chance (e.g., poker, blackjack, video poker) involve strategies that can enhance one's chance of winning and/or minimize one's chance of losing. One might assume that continued play at such games would shape appropriate strategies. However, that may not be the case. Because of the element of chance present in these games, proper decisions do not always result in winning. Likewise, poor or improper decisions would not always result in a loss. In fact, poor decisions might reduce the likelihood of winning, but would they would still result in the player winning at least intermittently. This intermittent reinforcement might in turn enhance the likelihood of poor decision making in the future. To our knowledge, research on these possibilities does not exist within the gambling literature.

It is therefore not clear that experience would necessarily equate to improved play across time. Likewise, some games of chance, such as poker and video poker, have many different variations that can be played.

These variations involve the identical or nearly identical stimuli (i.e., the same cards and winning card combinations). However, because different games might require different strategies for optimal play, performance may be inhibited if certain stimuli (e.g., card combinations) come to exert stimulus control over players' gambling behavior (e.g., promoting a certain play when dealt a specific type of poker hand). In short, although intuition would suggest that experience should enhance ability, it may actually inhibit it.

The present experiment was designed to assess if and how experience might influence gambling when participants played a video-poker simulation. Individuals who self identified as "experienced" or "novice" poker players were recruited. These individuals were then staked with money to play three different versions of video poker across three separate sessions. All three games were variations of five-card draw, but differed in terms of what were the best cards to hold or discard on specific hands. If experience promotes play, then experienced players should outperform novice players. Furthermore, one might also predict that players with greater knowledge of the game of poker would alter their play across games as the odds, and thus the optimal strategy, changed. On the other hand, if experience does not necessarily shape the "optimal" pattern of play, then one might not expect experienced players to outperform novice players. Likewise, if players' behavior is under the control of stimuli across the different games, then performance across games should differ because the same hands might require a different decision depending on which game was being played.

METHOD

Participants

Twenty four individuals were recruited from the psychology department participant pool at the University of North Dakota. Participant recruitment proceeded in two phases. The first phase recruited people who self identified as "experienced" poker players (not limited to just video poker). This phase was initiated first because it was anticipated that it would be more difficult to recruit "experienced" players than "novices." The second phase targeted individuals who self identified as "novice" poker players.

For both phases, recruitment information was posted in the psychology department building that targeted individuals who were "experienced" or "novice," respectively, poker players. No other poker-related information was presented beyond indicating the targeted level of experience for each group. To participate in either group, individuals were required to be at least 21 years of age and had to score below five on the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987).

Twelve participants were recruited for each group (Experienced: 6 males, 6 females; Novice: 5 males, 7 females). The mean age of participants in the Experienced group was 28.17 years (SD = 5.70). The mean age of participants in the Novice group was 28.42 years (SD = 13.44).

Materials and Apparatus

All participants were asked to complete a demographic questionnaire during their participation. The questionnaire asked the participant's sex, age, marital status, and annual income. This information was collected because research on gambling (see Petry, 2005) indicates that each of these factors is correlated to the presence of pathological gambling. The present procedure was designed to exclude pathological gamblers from participation. However, it remained possible that these factors could potentially be associated with differences in the gambling behavior of the "experienced" and "novice" participants and were therefore measured.

Participants were also asked to answer four questions meant to determine their familiarity

with the game of poker. The four questions were (with answers in parentheses): What cards are necessary for a full house (Three cards of one face value and two cards of another face value)? What hands beat a full house (Straight flush, Four of a kind, & Royal flush)? What is a set (Three cards of one face value)? In a wild-card game, what is the best hand (a natural Royal flush)? These questions were meant to determine whether the self-identified experienced players differed in their knowledge of poker relative to the self-identified novice players. Participants' answers to these questions did not alter to which group they had been assigned through self identification.

The next task was the SOGS (Lesieur & Blume, 1987). The SOGS is a 20-item questionnaire that focuses on the individual's gambling history. It is the most widely used screening measure (see Petry, 2005), with a score of five or more on the SOGS suggesting the possible presence of pathological gambling. Participants who scored five or above were dismissed before the gambling session and their demographic data were not included in the data analyses. Dismissing these participants ensured that individuals with pathology were not allowed to engage in their pathology.

Lastly, after playing each type of poker game, participants were asked to provide a written response to the following statement: Please describe the strategy you used when playing the last game. No information on strategy was conveyed to the participant and the individual was afforded the opportunity to be as explicit or succinct as he or she deemed necessary.

Participants completed the above materials and played the video-poker game in windowless room that measured approximately 2 m by 2 m. The room contained a table and two chairs, with a personal computer situated on the table. The video-poker software (Zamzow Software Solutions, 2003) on the computer allowed for a variety of five-card-draw poker games to be played. The present experiment utilized three specific games. One (Jacks) was "Jacks or Better," which returned the player's bet for a pair of Jacks or higher. A Flush was paid at 6-1 odds, a Full house was paid at 9-1 odds, and a Four of a kind at 25-1 odds. The second game (Bonus) was "Bonus Poker," which was similar to "Jacks or Better" with the exception that it returned 5-1 for a Flush and 8-1 for a Full house. It also paid three different amounts for Four of a kind, with 25-1 odds for Fives through Kings, 40-1 odds for Twos, Threes, and Fours, and 80-1 odds for Aces. The third game (Deuces) was "Loose Deuces," which was five-card draw with Twos wild. This game required at least Three of a kind to return the player's bet and included payouts for Five of a kind (15-1 odds), a Royal flush with Twos (25-1 odds), and Four twos (500-1 odds).

These specific games were chosen for two reasons. The first was that they sometimes differed in what was the "best play" when dealt the same hand of cards. For instance, if the player was dealt the 7 of diamonds, 8 of diamonds, Jack of diamonds, 9 of hearts, and the King of hearts, the best play would be to hold the 7, 8, and Jack if one is playing Jacks or Deuces. However, the best return on Bonus would come by holding the Jack and King. If the player was dealt the 10 of clubs, Jack of diamonds, Queen of diamonds, Ace of diamonds, and Ace of hearts, then the best play would be to hold the two Aces if one was playing Jacks or Bonus. However, the best return on Deuces would come if one held the Jack, Queen, and Ace of diamonds. In terms of similarity, the best play was most often the same between Jacks and Bonus. To play Deuces optimally, one would need to take an alternate strategy than with the other two games fairly frequently. The second reason was that these three games are commonly found in major commercial casinos in the United States. Thus, if one was an expe-

rienced video poker play, it is reasonable to speculate that one might have played each type of game.

The software recorded the number of times during each session that the player deviated from the optimal play. The optimal play was the one which maximized the player's rate of return given that particular hand. Non-optimal plays were recorded as errors. The software allowed for errors to be categorized from minor to major, depending on the deviation in rate of return from the optimal play. For purposes of the present study, however, plays were categorized as accurate (i.e., optimal play) or inaccurate (i.e., any play that was not optimal). Players were not notified as to what the best play was for a given hand or as to whether they had made the optimal choice. The only information provided to participants was the pay table that appeared on the screen above where the cards were displayed.

Procedure

Participants were run individually. Upon arrival, the researcher initiated the informed-consent process. Once the participant had provided consent, he or she was asked to complete the SOGS. Next, the participant was asked to complete the remaining forms while the researcher scored the SOGS. If the participant scored five or more on the SOGS, then the session ended after the forms were completed. In this event, which occurred once for a female participant recruited for the Experienced group, the participant was debriefed, given course extra credit (if applicable), and dismissed.

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

> You will now be given the opportunity to play a computer generated, five-card-draw poker game. You will be staked with 100 credits. Each credit is worth 5 cents. Thus, you are being staked with $5. You may bet up to five credits per play and your goal should be to end the session with as many credits as you can. You may quit (i.e., end the session) at any time by informing the researcher that you wish to end the session. The session will end when a) you quit playing, b) you reach 0 credits, or 15 minutes have elapsed. You will be paid in cash at the end of today's session for the number of credits you have accumulated or have remaining. Do you have any questions?

Questions were answered by repeating the above instructions. The participant then played the video-poker game until one of the three criteria to end that session was met. The researcher then asked the participant to complete the form pertaining to the strategy the player had just used. During that time, the researcher readied the next type of game. The researcher then read the identical instructions. This process was repeated until the participant had played all three poker games and had completed the strategy forms after each. Upon completion, the participant was debriefed, paid, provided course extra credit (if applicable), and dismissed. The order that participants experienced the three different poker games varied randomly across participants.

RESULTS

Data from participants in each group were compared on the measures of age, marital status, annual income, SOGS score, and the number of poker-knowledge questions correctly answered. The only significant difference between the groups was observed with the poker knowledge questions ($F(1, 22) = 8.17$, $p=.001$, $0^2=.374$), with the participants in the experienced group answering significantly more questions correctly than participants in the novice group[1]. Results from these analyses, and all that follow, were considered significant at $p<.05$.

Figure 1 presents the results from the video-poker sessions. The graphs in Figure 1 did not take into account how sessions ended.

That is, results were calculated across the entire session regardless of whether the session ended before or after 15 min. Sessions lasting less than 15 min occurred on at least 10 occasions because either participants had lost all 100 credits or because they chose to terminate the session. The majority of sessions, however, were 15 min in length.

The data in Figure 1 were analyzed by conducting a two-way (Experience by Game) multivariate mixed-model analysis of variance. In this analysis, poker experience served as the grouping factor and type of game served as the repeated measure. The four measures presented in Figure 1 were the dependent variables. In the omnibus analysis, both the main effect of experience (Pillai's Trace = .453, $F(4, 19) = 3.93$, $p=.017$, $0^2=.453$) and game were significant (Pillai's Trace = .640, $F(8, 15) = 3.33$, $p=.021$, $0^2=.640$). These results suggest that the experienced group played differently than the novice group and that both groups played differently across the three different games, respectively. The interaction between experience and game was not significant.

Follow-up univariate tests indicated that the main effect of experience was limited to the average bet size per hand (see second graph from bottom in Figure 1). Specifically, participants in the experienced group wagered more credits per hand than did participants in the novice group ($F(1, 22) = 12.92$, $p=.002$, $0^2=.370$). Of the other measures, only the total number of credits bet across the session approached statistical significance ($F(1, 22) = 2.78$, $p=.110$, $0^2=.112$).

Follow-up univariate tests indicated that the main effect of game was limited to the accuracy of play (see bottom graph in Figure 1; $F(2, 44) = 8.87$, $p=.001$, $0^2=.287$). Furthermore, the linear polynomial contrast was significant for this measure ($F(1, 22) = 23.14$, $p<.001$, $0^2=.513$), indicating that accuracy decreased across the Jacks, Bonus, and Deuces sessions, in that order.

Responses on the strategy questionnaires completed after each poker session were analyzed, but few participants provided much, if any, detailed information. Completed questionnaires were screened for accurate and inaccurate statements. Fallacious comments were sometimes observed and fell into two general categories, faulty betting strategies (e.g. "One time I bet 5 and lost, so I stopped doing that" or "When I noticed my luck was high, I would switch to betting 2 credits instead of one") and a lack of understanding of the game (e.g., "I also started trying for bigger hands because they give a higher payout" or "I tried going for more advanced things like flushes, straights and full houses"). These latter comments are fallacious because what hands one attempts to obtain should be dictated by the cards one is dealt, not by the payoff table alone. Statistical analyses were conducted on the frequency counts of the number of participants in each group who reported fallacious strategies and the total number of fallacious comments per participant regarding their play in each session. No significant differences were found.

Most, but not all, participants in both groups expressed that they altered their strategy across the different games (e.g., "I didn't keep as many face cards because two of a kind didn't do anything"). Again, however, there were no statistically significant differences between the groups in that respect.

DISCUSSION

The present experiment was designed to investigate whether experienced poker players would play better (or differently) when

[1]It should be noted that additional statistical analyses were conducted that coded data based on how well participants answered the questions on poker knowledge instead of by self-identified group. These analyses also failed to produce significant effects of "knowledge" beyond finding differences in average bet size per hand.

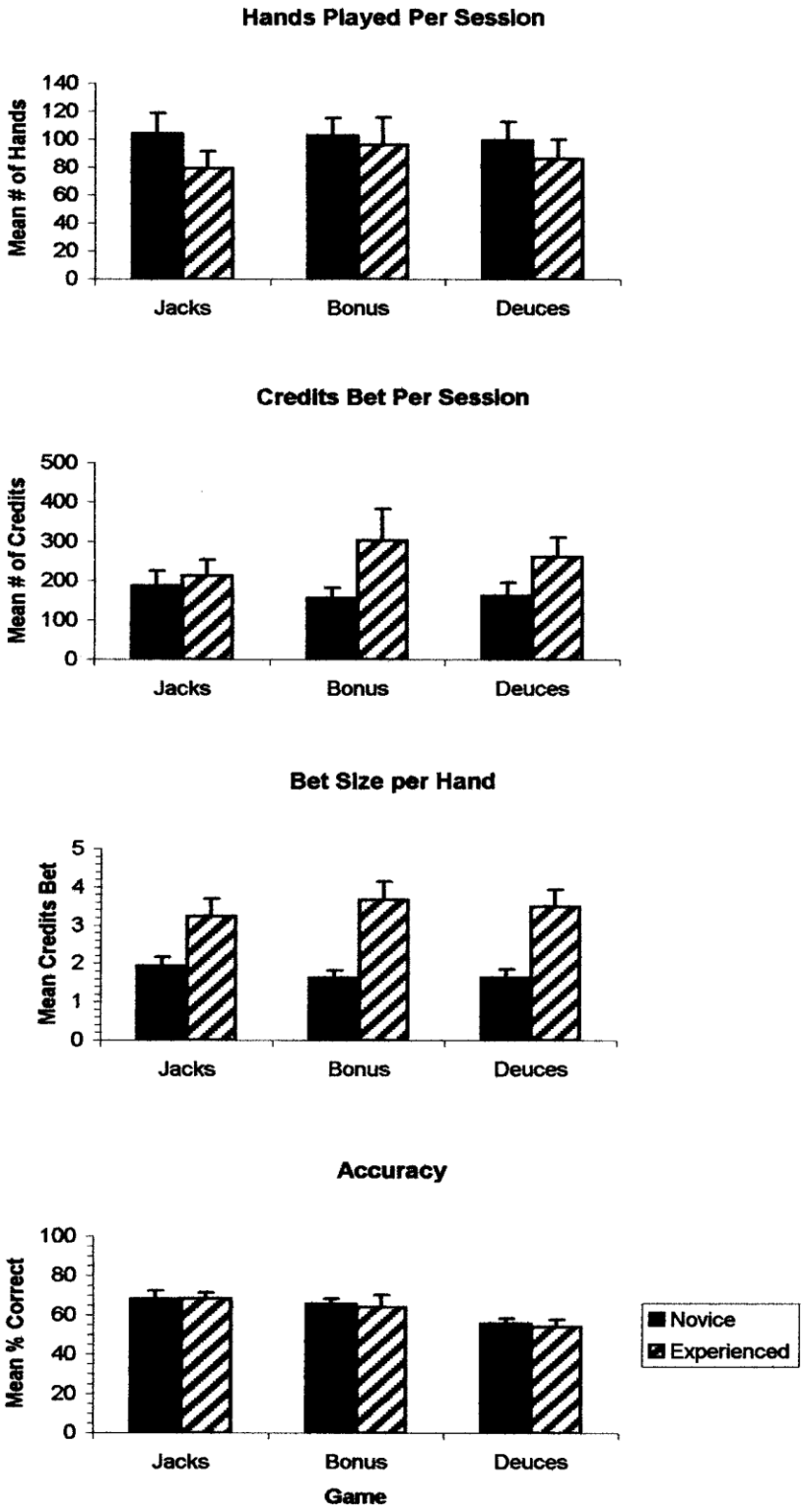

Figure 1. Presented are the means for each group on four different measures of behavior when playing each type of poker game. The error bars represent one standard error of the mean.

playing video poker relative to inexperienced players. It was also designed to assess whether players would alter their playing strategies across games that required different strategies to play them perfectly. In some ways, the results were both intriguing and alarming. Experienced players did not play better than novice players. In fact, they only differed from novices in that they made larger bets than did the novices. Although the qualitative data suggest that players attempted to change strategies across the different games, these attempts did not optimize their chances of winning. Both experienced and novice poker players responded well below 100% accuracy, with the worst accuracy rates being observed when wild cards were introduced into the game.

One obvious criticism of the present study was that, although it recruited "experienced" poker players, the participants may not have been "expert" players. The fact that the experienced participants played no better than the novice participants clearly supports this criticism, as does the fact that the accuracy rate of the experienced players averaged less than 70% across the three games. In the present study, participants who self identified as "experienced" or "novice" poker players were placed in those respective groups without question before their poker knowledge was assessed. Thus, it is legitimate to believe that different results would have been observed if professional poker players (i.e., experts) had been recruited rather than self-identified experienced players. Indeed, past research that reported differences between experienced and inexperienced participants either used formalized criteria to delineate the different groups before (e.g., de Groot, 1965, 1966) or after (e.g., Castel et al., 2007) performance data were collected . The present study did neither and it is therefore possible that there was a sizeable overlap in skill between the groups.[1]

These criticisms notwithstanding, the present results still have value. Participants in the "experienced" group self identified as experienced poker players and it seems reasonable to assume that they therefore believed that their "experience" made them different from novice players. Furthermore, the knowledge base of the experienced players did differ significantly from that of the novice players as measured by the four-item questionnaire administered during the session. Thus, although the present "experienced" participants may not have been poker experts, they did present themselves as experienced poker players and displayed an enhanced knowledge of the game relative to the novice players.

Unfortunately, these differences did not translate into superior play. Rather, experience only functioned to increase how much participants wagered per hand. There are several possible explanations for why this outcome was observed. One might be tied to knowledge level. It is the case that one's chances of winning on each of the three games are maximized if one bets the maximum number of credits possible (i.e., 5) versus any other amount (see below for an explanation). It is possible that "experienced" players recognized this fact. However, this explanation can be questioned. Although experienced players had a significantly higher average bet size than the novice players, the experienced players still averaged well below the maximum bet size (which is needed to maximize the chances of winning). Furthermore, the self reports of strategies used did not provide a single instance in which a player identified that it was in his or her best interest to bet the maximum number of credits.

A second possibility is that participants' experience served to enhance their confidence in winning and therefore they wagered more money per hand than did novice participants. In behavioral terms, experience may have served as a setting event (Kantor & Smith, 1975). Setting events are conditions that alter the reinforcing consequences of a behavior on a relatively permanent basis. It is possible

that experience did so by altering the consequences associated with betting.

A third, but not last, possibility is that experienced participants have habituated (Thompson & Spencer, 1966) to betting small amounts. This process would lead experienced players to bet larger and larger amounts to achieve the same level of stimulation as before. The present study did not ascertain why participants bet the number of tokens per hand that they did, so each of these possibilities remain open.

The failure to find a difference between experienced and novice players in accuracy of play is partially consistent with the results of de Groot (1965, 1966), who found that expert and non-expert chess players would often come to the same decision on which play to make. However, de Groot reported that experts did so more quickly (or at least explored fewer alternatives) than non-experts. This latter finding was absent in the present data. If the experienced players made decisions more quickly than the novice players, then one would predict that they would have been able to play more hands per session than the novices. That was not the case. The difference in the number of hands played was not significant and, if anything, the experienced players averaged fewer hands per session than the novice players. De Groot also reported that both experts and novices ultimately came to a good decision. That was often not the case in the present experiment, as both experienced and novice players made frequent mistakes.

Failing to show that experience had a positive impact on video-poker play has some negative implications. If experience does not enhance play, but rather makes people more likely to wager more money, then gaining experience may not be in the gambler's best interest. Risking larger and larger sums of money without a concomitant increase in the probability of winning may in fact promote pathology. Future research should attempt to assess the reliability of the present findings in this regard. That research should also attempt to explore the mechanism that potentially leads to increases in bet size with experience.

The second question asked by the present study was whether players' behavior would be differentially controlled by the different games or whether players would play similarly across the different games. Qualitative responses suggest that players noted the different contingencies of the different games and altered their strategies. However, the quantitative data suggest that players either did not alter their strategies (and thus their accuracy varied across the games) or altered them inappropriately. That is, accuracy rates were quite low, again averaging less than 70% for all three games.

One could potentially argue that this particular outcome was influenced by the fact that, although participants were gambling with actual money, it was not their own money and therefore they did not take the time or effort to play well. This criticism cannot be completely refuted. However, there is at least one argument against it. Specifically, previous research on the "endowment effect" has demonstrated that when people are gifted something, they take ownership of it and are negatively impacted by its loss (e.g., Kahneman, Knetsch, & Thaler, 1990). None of the present participants expressed surprise when paid cash at the end of the experiment. That outcome suggests participants were aware that they were playing with real money, which should have promoted the endowment effect. However, to fully answer this criticism, one would need to conduct the experiment with participants risking their own money. For ethical reasons, such a replication is unlikely. Given ethical constraints, the present procedure appears to be as close to actual gambling as possible in the laboratory.

The fact that participants performed so poorly when playing is troublesome, especially given that video poker is touted (accurately

so) as one of the most gambler-friendly games in a casino (e.g., see VideoPokerAdvisor.com). That was indeed the case in the present study. If participants had played perfectly and bet five credits per play (which raises one's overall chances because the Royal flush pays above the standard multiplier when one places the maximum bet), their rate of return would have been 99.54, 99.17, and 100.97% for the Jacks-or-Better, Bonus Poker, and Loose Deuces games, respectively. Played perfectly for an indefinite period, Loose Deuces is not gambling, it is investing. However, participants played far from perfectly and actually played the most inaccurately when playing Loose Deuces.

Generalizing laboratory results to naturally occurring situations should always be done with caution. However, if allowed to generalize the present results to a casino setting, then one would surmise that it would be in the casino's best interest to provide patrons with experience playing its games even if it comes at an initial cost to the casino (e.g., staking players with house money, sponsoring low-cost or free "tournaments"). Doing so would promote increased wagers in the future that come with "experience." It would also be in the best interest of the casino to introduce variations of games players are already familiar with but that require different strategies for accurate play. Even though players might alter their strategies when playing these new games, they are unlikely to do so optimally. For readers familiar with casinos, these generalizations are not likely to seem far fetched. They are standard practice at many major casinos.

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