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ASSESSING AND MANIPULATING THE ILLUSION OF CONTROL OF VIDEO POKER PLAYERS

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The present investigation explored the presence of illusory control in recreational video poker players. Using a multi-monitor computer which allowed for two different types of games to be presented concurrently, one on each monitor, players were allowed to freely choose which game they wished to play. One option allowed for the player to select the cards they wished to hold and discard, while the other option was designed such that the computer automatically selected the most probabilistically optimal sequence of cards to hold and discard. In the first experiment, two groups of ten participants were exposed to one of two rules (accurate or inaccurate) regarding the chances of winning. No differences in response allocations between the games were found. In the second experiment, thirteen participants were sequentially exposed to a non-rule baseline followed by an inaccurate and subsequently accurate rule. Twelve of the thirteen players preferred the self-selecting game, and following the introduction of an experimenter given rule that was designed to strengthen the illusion (i.e., that the self-selecting option was better), most players increased their preference for this option. However, following the introduction of an experimenter given rule that attempted to weaken the illusion, only about half the participants followed that rule and reduced playing the self-selecting option. Variability across participants was able to be explained by examining each player's verbal talk which was emitted overtly throughout the duration of the experiment. Implications for understanding the illusion of control and the verbal behavior of gamblers are presented.

Keywords: risk taking, gambler's fallacy, protocol analysis, video poker, rule-governed behavior.

Changing forms of gambling continue to evolve with the advent of computer technology. One of the most popular forms of gambling, the three reel slot machine, is slowing being replaced with computerized versions consisting of a video display of virtual reels, many times with more than the original three (MacLin, Dixon & Hayes, 1999). Payoffs are possible on the traditional middle display line, along with permutations of diagonals, top line, bottom line, and so on. Other slot machines incorporate "higher level" wagering possibilities whereby gamblers, after obtaining a given display on the reels, have an opportunity to take additional chances by spinning a wheel or selecting items from a video display (MacLin et al., 1999). Computer technology has not only advanced the characteristics of the slot machine, it has also allowed for table games to be played by anyone individually using a computer terminal. Computerized versions of blackjack, roulette, and craps can be found in various casinos throughout the world. The most popular computerized table game however, is video poker. In fact, video poker continues to grow in popularity in many states year after year,

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while slot machine play remains relatively constant (Ghezzi, Lyons, & Dixon, 2000).

Video poker offers players a unique feature the traditional slot machine does not possess. This feature is the ability to select cards from the initially dealt cards which then can be held or discarded in hopes of changing the chances at a winning hand. The ability to select cards crates somewhat of an illusion for the player, the illusion that with enough practice or skill they will be able to "beat" the game. In reality, given the payout structure of most video poker games, not even the best video poker strategy can keep a player from losing money in the long run. Instead the optimal strategy can do no more than slow down the losing process.

The perceived ability to alter chance circumstances has been termed the "Illusion of Control" (Langer, 1975) and this phenomenon has been recognized by psychological researchers studying gambling for some time (Dixon, Hayes, & Ebbs, 1998; Dixon, 2000). Perceptions, or illusions, of control have been shown to alter individual's behavior in clearly observable ways. For example, Dixon et al. (1998) showed that when roulette players were given the opportunity to wager chips on self-selected numbers or experimenter-selected numbers, all players chose to select their own numbers. In reality, there was no logical reason for a preference for one option over another as the outcome of a gamble at roulette is random. No number has any better chance of being "hit" than any other. Interestingly, in this study the roulette players chose to select their own numbers even when they were required to forfeit chips in order to do so, thus illustrating the strength of illusionary control. Other researchers have shown that gamblers will wager more, take larger risks, or both (Dixon, 2000) when under the belief they have control over game outcomes.

A preference for illusionary control may be detrimental to the gambler. First, the player may seek out gambling opportunities which possess illusionary characteristics over those that do not, and as a result may gamble for longer periods of time, thus risking and probably losing more money than initially expected or budgeted. Second, the player may believe their own idiosyncratic strategy of responding may be able to somehow beat the house, when in fact, it actually contains many probabilistic flaws and errors in judgment. Treatment of pathological gamblers often targets attempting to reduce the client's tendency to engage in illusionary control as part of the recovery process (Petry, 2005).

A debate in the published literature appears to exist as to if the illusion of control is a personality characteristic of a gambler (e.g., Knee & Zuckerman, 1998; Kroeber, 1992; Taylor & Brown, 1988) or simply an illogical rule or description of how the world works which, thorough appropriate conditioning, can be altered (Presson, & Denassi, 1996; Dixon, et al., 1998; Chau & Phillips, 1995; Ladouceur & Sevigny, 2005). The findings of Dixon, (2000) suggest that players will indeed reduce their tendency towards illusionary control when given a set of strategies by the experimenter. Yet the Dixon, (2000) findings were preliminary and only may hold for roulette players. The degree to which an individual video poker gambler may reduce illusionary control is still rather unclear, and further more it is unknown to what degree strategies or rules that the gambler him/herself might be saying internally to them could impact the ability for an experimenter's (or clinician's) instructions to take hold of behavior. As video poker continues to rise in popularity, and more and more persons each year are being diagnosed for problem gambling (Dixon & Schreiber, 2002), it seems that a logical step would be to evaluate the relative preference for illusionary control of a group of video poker players, give them accurate rules or instructions that the illusion is just that – an illusion, and see how performance may change. Furthermore, because a gambler

does not just wait for someone else to tell them what to do, they must in fact be telling themselves how best to play the game at any given time. Understanding the illusion without incorporating the gambler's own thoughts and rules about play appears incomplete, and thus must be included in any comprehensive analysis.

There are a variety of means by which an experimenter might tap into the self-talk or self-generated strategies that may govern an individual while they gamble. One might ask the individual, upon completion of play, what the reasons for doing the things they did were. The researcher could ask how they played, why they played, and why they quit. Yet, while appearing straightforward, such techniques often yield less than promising results. Instead, many subjects queried by these methods fail to recall accurately what in fact governed their performance (Dixon & Schriber, 2002). Another method for assessing self-generated strategies of a gambler is to take a running transcription of their own self-dialogue during an entire gambling episode. This technique is called "Protocol Analysis" (Ericsson & Simon, 1993) and essentially involves having the subject speak aloud everything they are thinking to themselves. For over twenty years much discovery has come from using the protocol analysis technique outside of gambling (e.g., Dixon & Hayes, 1998; Hayes, 1986), and therefore seems promising to apply it within a gambling context to examine the strategies utilized by individual players.

Therefore the purpose of the present study was to conduct an experimental analysis of the illusion of control between groups of gamblers, as well as within individual gamblers playing a computerized version of video poker. The first experiment investigated the impact of an experimenter delivered rule that was either accurate or inaccurate on performance across groups of participants. It was hypothesized that participants whom were given an accurate rule about the game would follow the rule and demonstrate less of an illusion of control.

The second experiment further explored the role of instructions to alter the illusion of control by utilizing a single subject design that allowed for successive presentation of rule types within an individual participant. The experimental analysis in the second experiment described above, was supplemented by the utilization of a protocol analysis which allowed for an examination of the self-generated rules or strategies that a player may have while playing video poker as well as how those rules might verbalize the illusion of control. It was hypothesized that all players when given the choice between a video poker game that allowed for card selection and a game that did not permit card selection, that all players would favor the option that allowed selection – thus demonstrating an illusion of control. After the introduction of inaccurate rules about the game, essentially attempting to strengthen the illusion of control, it was hypothesized that players would favor the illusionary poker game even more so. Finally, it was hypothesized that upon receiving more accurate rules about the poker game, and that the illusion of control really was just an illusion, which players would find the two poker games equally favored. It was also believed that each individual player's self-rules may mitigate our experimenter delivered rules, thus making the original hypotheses about game preference only initial and tentative.

EXPERIMENT 1
METHOD

Participants

Twenty undergraduates from a large Midwestern university participated in the hour long study for course extra-credit and a chance for a monetary bonus based upon performance. Demographic information was recorded for 17 of the 20 participants (remain-

ing three were lost due to experimenter failure). Random assignment of participants to two experimental groups yielded: Group 1 (7 female, 1 male, 2 w/o data, 6 w/ associates degrees, 2 High School/GED, 2 unknown, 7 with incomes < $10,000, 1 $20,000-$30,000, 1 $30,000-$40,000 USD, 2 unknown, Mean Age = 24 years; SD = 6.7); Group 2 (7 female, 2 male, 1 w/o data, 7 w/ associates degrees, 2 High School/GED, 1 unknown, 6 with incomes < $10,000, 1 $20000-$30000, 1 > $50,000 USD, Mean Age = 22 years (SD = 0.7).

Setting, Materials, & Apparatus

All experimental sessions took place in a 10 ft by 10 ft room which contained a variety of microcomputers and office furniture. Participants were run on the current experiment individually, and no other person was in the experimental room during the running of any participant. A video camera was located directly behind the participant who was seated at a 5 ft by 3 ft desk containing one microcomputer and two 20" video monitors.

All experimental procedures were programmed on a Windows XP capable microcomputer. A second video card was installed on the computer which allowed for a two monitor display. A two monitor display functions identical to a standard one monitor display with the added ability of opening and interacting with a second piece of computer software on the second monitor which may be different (or identical) to the software displayed on a single monitor. A demographics survey, the South Oaks Gambling Screen (SOGS; Leisure & Bloome, 1987), and the Gambling Functional Assessment (GFA; Dixon & Johnson, 2007) were presented in electronic formats programmed in Microsoft Visual Basic 2005. The commercially available video poker software "Bob Dancer's Win Poker (Dancer, 2004) was installed on the experimental computer and was opened twice – once on each of the two monitors that were used in the present study. The game "Deuces Wild" was used for both instances of Win-Poker. This version of video poker consists of a single line game of 5 card draw poker in which 2s can be used as wild cards and features a payout structure that results in a payback percentage of 100.7620% for perfect play. One instance was set to Autohold the correct cards on all hands, while the other was setup so that participants could choose which cards to hold. These two instances of the software will be referred to as the Autohold and Free Play instances respectively throughout this paper.

Procedure

Participant assignment to rule groups and the left right position of the Autohold and Free Play instances of WinPoker were determined by a random drawing in the following manner. 20 slips of paper were placed in a cup, with 10 with the text rule 1, 10 with the text rule 2, with 5 slips in each group with the Text Autohold Left and 5 slips in each group with the Text Autohold Right.

Upon completion of an informed consent participants were assigned to a rule group by the methods described above. Participants then completed the SOGS and GFA before the two instances of WinPoker were opened. Participants were supplied with 300 credits on both instances of video poker and given the following instructions via the experimenter:

> Before you are two screens showing a video poker game. On one screen, the computer is set to choose your cards for you (indicate which screen this is to the participant) and the other is set so you can choose your own cards (tell them which screen). Your task is play a game of poker. You can play hands on either of the screens at any time, but please play on only one screen at a time. For example, you could play one hand on the left screen, and the next hand on the right screen.
>
> Imagine that you have two machines in front of you. You may choose to play some hands on one machine, and some hands on the other

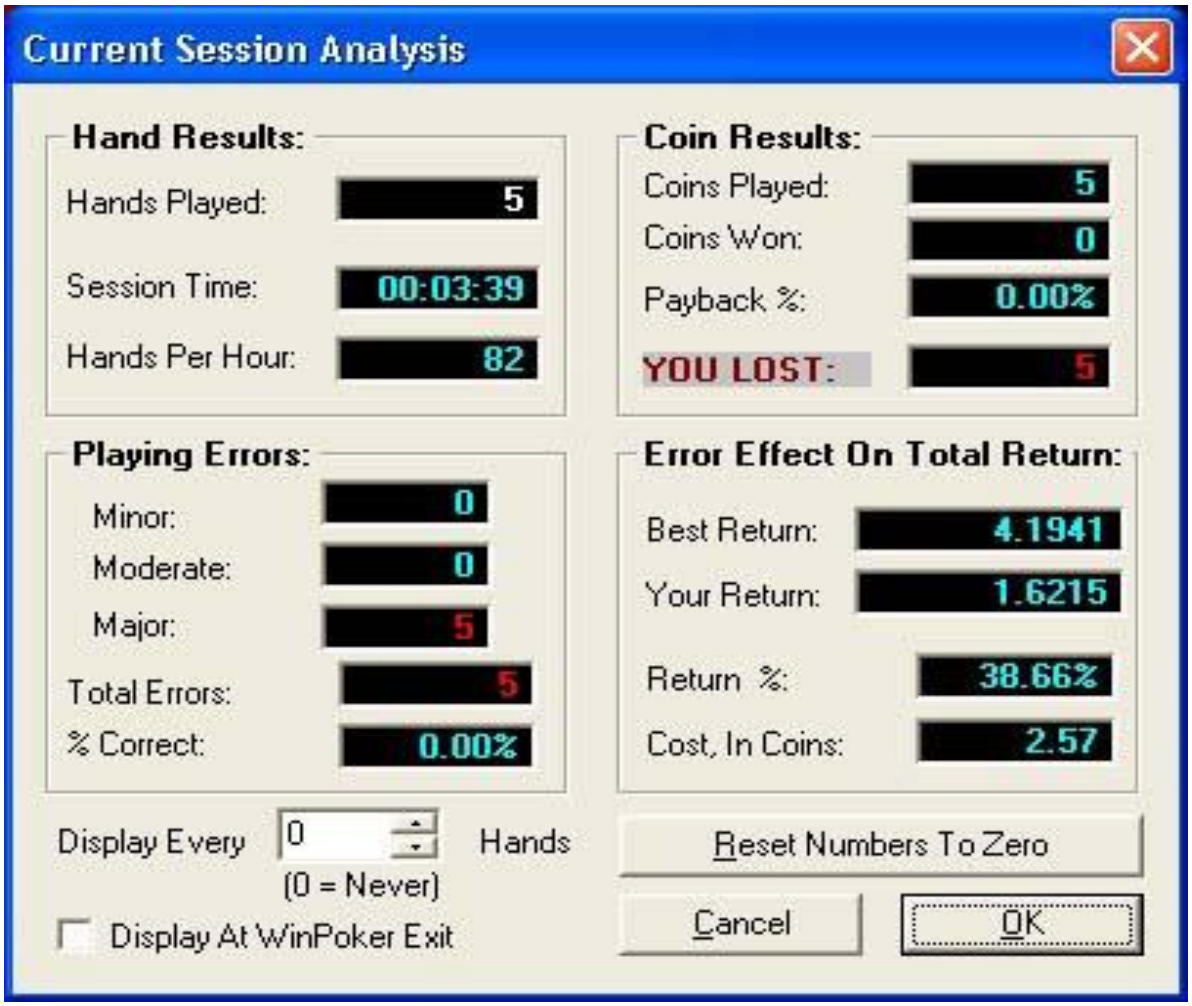

Figure 1: Screen capture of the session analysis window.

machine, but it would be difficult to play both at the same time. Similarly, you can play as many hands on one screen as you choose, and you can switch over and play on the other screen at any time, and keep on switching back and forth if you wish. Just play on one screen at a time.

To play the game, you need to make a bet of coins. You can choose to bet up to five coins at a time. The screen shows the return on the bets you make if you win with a certain hand of cards. To make a bet, click on the bet one coin button, up to a maximum of five times, or press the max bet button. The maximum number of credits you can bet at a time is 5. Then, press the deal/draw button."

The computer will deal you five cards. You will then choose to hold cards that you want to keep. To hold cards, click on the cards that you wish to have held, or click on the HOLD buttons beneath those cards. After you have selected a card you wish to keep, press the DEAL/DRAW button. The cards that you have chosen to hold will remain in your hand, and the others will be discarded. Then, click on the deal/draw button again.

On the free play screen, you may choose to hold whatever cards you want to. On the autohold screen, you don't need to choose which cards to hold, as the computer does it for you. (Indicate which screen is which.)

After the instructions participants were read the following rule based on the rule group to which they were assigned:

Inaccurate Rule:
"If you pick your own cards, you have a better chance of winning."

Accurate Rule:
"The computer does not make mistakes and can increase your chances of winning."

Participants were then instructed to play 100 hands across the two instances of video poker. Participants could freely switch between the Autohold and Free Play instances of video poker with the only stipulation being that they complete the hand on the instance they were currently playing prior to switching. Upon the completion of a total of 100 hands across the two video poker games, participants were debriefed on the purpose of the study and thanked for their participation. The experimenter then recorded data from the session analysis screens of both video poker games including the number of hands played on both the Autohold and Free Play instances of video poker, percentage correct play, number of errors made, coins played, coins won, and payback percentage.

Dependent Variable Integrity

All data were either collected directly by the software program which later was recorded by an experimenter. The number of trials played on each screen, number of errors made, defined as deviations from statistically optimal plays, and other performance characteristics were produced by the poker game and displayed in a "Session Analysis" after the player completed the experiment. An example of a Session Analysis is found in Figure 1.

EXPERIMENT 1 RESULTS AND DISCUSSION

A one-way Analysis of Variance with rule group as the factor revealed no significant differences between groups for age, $F(1, 16) = .735$, $p = .405$, SOGS score, $F(1, 17) = .000$, $p = 1.000$, GFA Sensory function, $F(1, 17) = .248$, $p = .626$, GFA Escape function, $F(1, 17) = .197$, $p = .663$, GFA Attention function, $F(1, 17) = 1.181$, $p = .239$, or GFA tangible function, $F(1, 17) = .120$, $p = .734$, suggesting that the makeup of the two groups did not differ in any significant way.

The number of coins played and won for all participants in each group on each of the two poker games is presented in Table 1. In general, regardless of the rule given, participants played more hands on the Free Play version of video poker, thus demonstrating a preference for the option which allowed them to select their own cards. Participants in Group 1 averaged 21.10 hands (SD = 32.729) and 78.90 hands (SD = 32.729) on the Autohold and Free Play instances of video poker respectively. Participants in Group 2 averaged 23.20 hands (SD = 29.630) and 67.10 hands (SD = 29.726) on the Autohold and Free Play instances of video poker respectively. Analysis of the mean differences for hands played on the Autohold and Free Play options using a one-way Analysis of Variance with rule group as the factor failed to reveal significant differences, Autohold: $F(1, 19) = -.751$, $p = .398$, Free Play: $F(1, 19) = .712$, $p = .410$. Figure 3 displays group means and standard error for all participants on the number of hands played for both the Autohold and Free Play instances of video poker.

The results of Experiment 1 failed to find any differences in the number of hands played on either the Autohold or the Free Play across groups regardless of the fact that one group was directly instructed that playing on the Autohold option would increase their chance of winning. This result may suggest that self generated rules regarding one's ability to better effect the outcome of hands by self selecting the cards, i.e. the illusion of control, may affect responding to a greater degree than experimenter delivered rules. However, a fair degree of individual participant variability within a given participant group can be seen

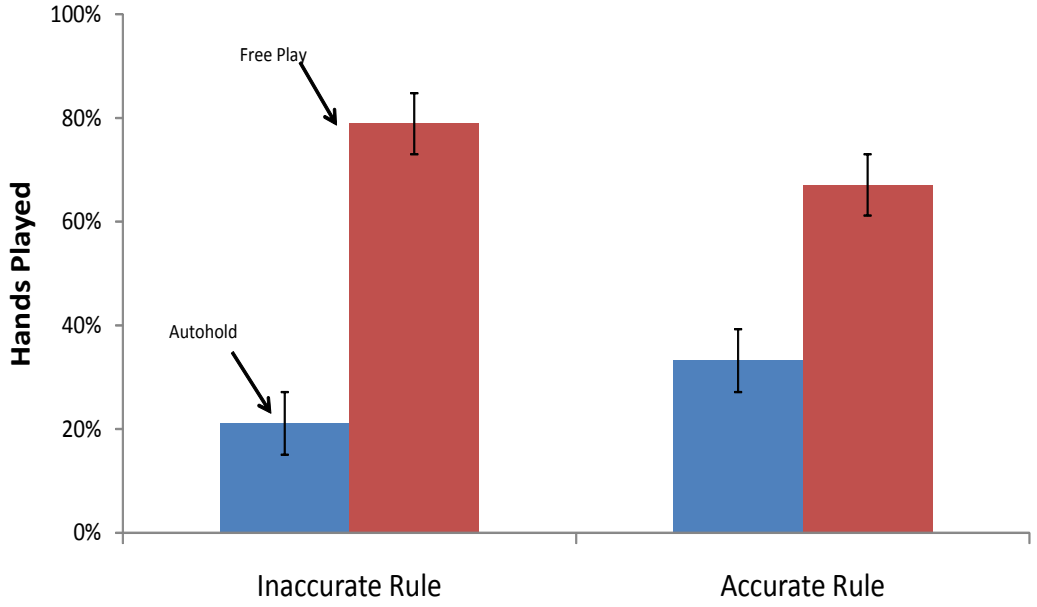

Figure 2: Experiment 1 individual participant data for selection of the Free Play option.

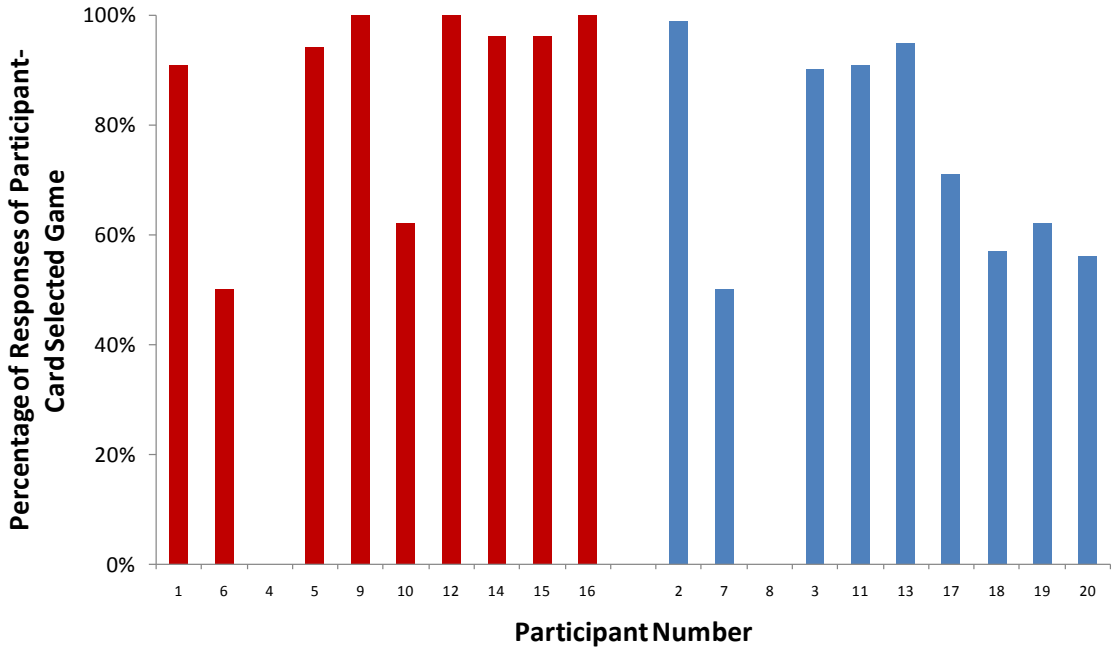

Figure 3: Experiment 2 individual participant data for selection of the Free Play option across baseline, inaccurate, and accurate rule conditions.

Table 1
Each Experiment 1 participant's number of coins played / number of coins won across both the Autohold and Free Play games.

Inaccurate Rule Group			*Accurate Rule Group*		
Participant	*Autohold*	*Free Play*	*Participant*	*Autohold*	*Free Play*
1	45/50	455/320	2	1/1	105/109
6	113/130	97/79	7	250/195	250/165
4	500/480	0/0	8	169/146	0/0
5	6/9	94/79	3	23/8	254/242
9	0/0	493/523	11	26/39	442/351
10	76/85	130/108	13	11/0	321/304
12	0/0	242/222	17	150/90	350/255
14	20/5	480/385	18	215/110	285/205
15	20/30	480/385	19	44/20	69/68
16	0/0	457/157	20	172/191	280/275

Table 2
Each Experiment 1 participant's number of plays on the participant controls card selection (Free Play) number of probability errors during the experiment. Percentages Correct play statistic shown in parentheses.

Inaccurate Rule Group		*Accurate Rule Group*	
Participant	*Free Play*	*Participant*	*Free Play*
1	91/52 (42.86%)	2	99/43 (56.57%)
6	50/22 (56%)	7	50/28 (44%)
4	0/0	8	0/0
5	94/49 (47.89%)	3	90/50 (44.44%)
9	100/53 (47%)	11	91/46 (49.45%)
10	62/37 (40.32%)	13	95/29 (69.47%)
12	100/45 (55%)	17	71/33 (53.52%)
14	96/48 (50%)	18	57/22 (61.4%)
15	96/40 (58.33%)	19	62/36 (41.94%)
16	100/95 (5%)	20	56/16 (71.43%)

in Figure 3. In summary, some participants within a group followed the rule to a greater degree than other participants within the group. From analysis of Table 1 and 2, these differences in response allocation appear unaccounted for by greater reinforcement probability on one option over another. It is possible that some participants believed the rule given by the experimenter to a greater degree than others did, that perhaps a type of self-generated rule was created by the participant that directed performance differently

than what would be predicted by the experimenter delivered rule, or had stronger illusions of control than others. Experiment 2 attempted to further explore these issues in more detail by exposing each participant to various rule-types and concurrently recording self-generated rules via a talk-aloud procedure.

EXPERIMENT 2
METHOD

Participants, Setting, and Apparatus

Thirteen college undergraduate students who expressed an interest in gambling and had a history of playing video poker participated in the current study. No participants were actively seeking treatment for problems with excessive gambling. All experimental sessions took place in a 10 ft by 10 ft room which contained a variety of microcomputers and office furniture. Participants were run on the current experiment individually, and no other person was in the experimental room during the running of any participant. A video camera was located directly behind the participant who was seated at a 5 ft by 3 ft desk containing one microcomputer and two 17 in video monitors.

Procedures

Win Poker was set to run the standard 5 card draw poker game on both monitors, and on the right monitor it was set with the parameters of 100 coins and the "Autohold" feature enabled. This Autohold feature allowed for the player to have the computer select the optimal cards to be held and discarded upon the dealing of the initial 5 cards of the poker hand. Win Poker was set on the left monitor to run with 100 coins and the "Autohold" feature disabled. The disabling of this feature resulted in Win Poker operating identically to that of a commercially available draw poker game whereby upon the dealing of the initial 5 cards, the player was able to select which cards he/she wished to hold and discard prior to the remaining cards being dealt by the computer. Both versions of Win Poker were fair probability 1 deck of 52 cards. The participant in the experiment was able to move the computer mouse freely between the two instances of the game. Figure 4 displays an example of the video poker game.

Upon completing a consent form to participate in the present study, all participants were instructed that the computer in front of them was designed such that they could play either video poker game they saw displayed on the two monitors. On the left monitor, they could select which cards they wanted to hold and discard, while on the right monitor, the computer would select the cards for them. The participants were then told to try and earn as many points as possible, as the high score for the experiment would result in a cash prize from the researchers. All participants were additionally compensated with course extra credit for completing the experiment. The entire experiment lasted no longer than 1 hour.

Baseline. All 13 participants were exposed to varying lengths of baseline contingencies which consisted of five "test" plays on each plays in which they could switch back and forth between monitors and play whichever they preferred. The rationale for exposing participants to varying lengths of baseline conditions was to control for the potential violations of internal validity which could occur if participants were all exposed to the same number of baseline trials. For example, if all were exposed to baseline for 30 trials, then on the 31st trial changes were shown when a new condition was instated, the change in condition the change in conditions is confounded with the length of baseline; as something might happen to a poker player after 30 trials. The varying lengths of baseline used in the present experiment is more formally noted as a "*non- concurrent multiple baseline across subjects*" research design (Bloome, Fisher, & Orme, 1999), and has

Figure 4. Screen capture of the game play screen.

been used previously in some previous gambling studies (i.e., Dixon, 2000).

Inaccurate Rules. Following each participant's individualized number of baseline trials, an inaccurate rule condition was instated whereby the experimenter re-entered the room and stated to the participant: "*If you pick your own cards you have a better chance of winning."* These instructions were repeated if the participant had any additional questions, but were not elaborated on by the experimenter. A copy of the instructions was posted above the computer screen on a piece of paper. Each participant was then instructed to once again play the two poker games freely and was told to continue playing until the experimenter re-entered the room. As in the baseline conditions, each participant was exposed to an individual amount of trials during this condition with a range of around 40 trials. No alterations of any type were made to the computer interface, thus the consequences of playing each game were identical as they were during baseline.

Accurate Rules. Following each participant's inaccurate rule trial exposure, the experimenter re-entered the room and stated to the participant: "*The computer does not make mistakes and can increase your odds of winning."* These instructions were repeated if the participant had any additional questions, but were not elaborated on by the experimenter. A copy of the instructions was posted above the computer screen on a piece of paper. Each participant was then instructed to once again play the two poker games freely and was told to continue playing until the experimenter re-entered the room. As in the previous conditions, each participant was exposed to an individual amount of trials during this condition with a range of around 40 trials. No alterations of any type were made to the

computer interface, thus the consequences of playing each game were identical as they were during baseline and inaccurate rules.

Talk-Aloud. At the onset of the experiment, prior to exposure to baseline conditions, all participants were instructed to speak aloud everything that they were thinking during the entire experiment. They were told a video camera would be behind them, capturing their play, and recording their voice. Participants were also informed that if they were quiet for too long they would be required to start the experiment over again. The experimenter assured the participant there was no right or wrong thing to say, and that they should just say anything that was on their mind.

Dependent Variable Integrity

All data were collected as described in Experiment 1. Participants were not shown the session analysis data between experimental phases, but were asked to look at the back of the room, while the experimenter prepared the next experimental condition. A video camera was also used to capture the talking-aloud of each participant. Each resulting verbal behavior was transcribed word-for-word by an experimenter. Following the transcription, independent clauses were classified into the following categories:

1. Statements regarding the participant's performance. For example, "I am going to hold the 10 and the Jack", or "I am hitting the Draw button right now."
2. Statements regarding reinforcement. For example, "I just won five coins", "That was a good hand", or "No win on that game."
3. Statements related to forecasting the upcoming game outcome. For example "I need a Jack.", or "Come on 2 Queens please."
4. Inaccurate rules about Video Poker. For example, "It has been a while since I won, so a win is sure to come.", or "This game always gives me Aces."
5. Accurate rules about Video Poker. For example, "It does not matter what cards you like, the game is random.", or "Each trial is independent of the next."
6. Comments directly related to the illusion of control. For example, "I need to stay on the left game because I can do better than the computer", or "I pick better cards than the computer can on the right screen."
7. Comments unrelated to the game. For example, "It is hot in here.", "The experimenter is cute.", or "I need to eat lunch."

Inter-observer reliability was assessed on five sessions whereby a second independent observer coded the transcripts themselves and then this new coding was compared to the original observer's classifications. No changes were made post-hoc to either observer's classification, and the degree to which they agreed was assessed. The resulting overall agreement between the two observers was 89%, and was calculated by dividing the number of agreements (for each trial) by the number of agreements plus disagreements, thus suggesting high reliability in protocol content classification.

EXPERIMENT 2 RESULTS AND DISCUSSION

Table 3 displays a summary of the contingencies which all participants in the experiment were exposed to. The left screen, or Free Play, option allowed the participant to select their own cards which would be held or discarded, while the right screen, the Auto-hold option, auto-selected the optimal card combination. Each participant played both screens from time to time, but in general, every participant preferred the left computer screen over the right screen. The only exception to this pattern across participants was #13. The second number depicted in each cell of the Table 3 is the number of coins won. In general, participants played more coins than they won. As with commercial video poker, in the long run, all players would lose coins. Table 4 depicts only the trials which were played on the left screen, or the participant

Table 3
Each Experiment 2 participant's number of plays per game (Free Play; Autohold) / number of coins won during the three conditions of the experiment; baseline, inaccurate rule, and accurate rule.

Participant	*Baseline Free Play*	*Baseline Autohold*	*Inaccurate Free Play*	*Inaccurate Autohold*	*Accurate Free Play*	*Accurate Autohold*
2	72/82	12/6	41/29	0/0	42/72	0/0
3	66/36	0/0	40/40	0/0	0/0	43/34
4	27/37	8/4	38/44	0/0	27/18	18/11
5	19/19	1/1	42/38	2/0	58/50	0/0
6	61/61	19/14	40/24	5/1	18/18	22/29
7	71/66	20/24	47/46	0/0	2/0	39/41
8	134/74	27/23	n/a	n/a	n/a	n/a
9	42/23	5/2	42/42	0/0/	53/53	2/2
10	64/78	18/43	42/47	2/4	35/41	6/4
11	65/46	0/0	39/49	0/0	47/27	0/0
12	24/12	19/27	40/25	7/1	44/33	3/6
13	57/42	109/102	n/a	n/a	n/a	n/a
14	105/117	55/49	n/a	n/a	n/a	n/a

card selecting game. In addition, this Table highlights the number of probability errors that were made by the participant during each experimental condition. Interestingly, all participants made a fair number of errors, ranging from 21% to 98% of trials with an error, thus their overall winnings during this experiment were drastically reduced due to participants frequently making card selections which were not statistically optimal.

The Wilcoxon Signed Rank test for ordinal data was used to compare the percent-age of trials played on the self selection screen during baseline and after the introduction of the inaccurate rule. Results revealed a significant change in the percentage of hands played on the self selection screen ($Z = -2.52$, $p = .012$), indicating that participants played a significantly greater percentage of trials on the self selection screen following the inaccurate rule stating that they could win more if they selected their own cards. The Wilcoxon Signed Rank test for ordinal data was also used to compare the percentage of trials played on the self selection screen after the delivery of the inaccurate rule and after delivery of the accurate rule. Results failed to reach significance ($Z = -1.829$, $p = .069$) indicating that the introduction of an accurate rule stating that the computer did not make mistakes in selecting cards failed to significantly reduce or change the percentage of responses allocated to the self selection screen across all participants.

The changing experimental conditions from baseline to Inaccurate Rule did impact all 10 participants' behavior. Participants 8, 13, and 14 remained in Baseline throughout, to serve as experimental controls. Figure 5 depicts the clear preference for the left computer screen by participants, and displays the percentages of selection for this option separated by each experimental condition of the current study. It can be seen from this figure that all participants increased their percentages of play on the left computer screen following the introduction of the Inaccurate rule condition. The only exceptions are where there was already a 100% preference for this option during Baseline by a participant. The changing experimental conditions from Inaccurate Rule to Accurate Rule failed to yield as

Table 4
Each participant's number of plays on the participant controls card selection (Free Play) / number of probability errors during the three conditions of the experiment; baseline, inaccurate rule, and accurate rule. Percentages of trials with errors are shown in parentheses.

Participant	*Baseline Free Play*	*Inaccurate Free Play*	*Accurate Free Play*
2	72/27 (38%)	41/14 (34%)	42/14 (33%)
3	66/41 (62%)	40/24 (60%)	0/0 (0%)
4	27/9 (33%)	38/10 (26%)	27/7 (26%)
5	19/8 (42%)	42/26 (62%)	58/33 (57%)
6	61/24 (39%)	40/17 (43%)	18/6 (33%)
7	71/66 (93%)	47/46 (98%)	2/0 (0%)
8	134/94 (70%)	n/a	n/a
9	42/9 (21%)	42/11 (26%)	53/14 (26%)
10	64/23 (36%)	42/13 (31%)	35/14 (40%)
11	65/32 (49%)	39/17 (44%)	47/22 (47%)
12	24/16 (67%)	40/26 (65%)	44/34 (77%)
13	57/36 (63%)	n/a	n/a
14	105/50 (48%)	n/a	n/a

robust of an effect across all participants. Upon introduction of the Accurate rule condition, participants 3, 4, 6, 7, 9, and 10 followed the rule given to them by the experimenter and decreased their playing of the left computer screen, and participants 2, 5, 11, and 12 continued to play the left computer screen at high rates even after given the rule by the experimenter. These data show the strength of what an inaccurate rule about Video Poker can do to game preference, yet produced mixed results regarding accurate rules.

In order to further understand the observed differences between participants during the Accurate rule condition, verbal protocols were analyzed phase by phase to assess individual participant differences. Tables 5-7 display the summary data by experimental condition for each participant. Data were classified into 7 content categories with the measurement unit of the independent clause rather than a sentence, which might contain two or more clauses. As a result, each trial may have contained one or more content emissions. In general, all participants spoke primarily about performance or reinforcement during all experimental conditions.

Using the obtained data in Figure 5 and conventions established in previous work on rule following (Wulfert, Greenway, Farkas, Hayes & Dougher, 1994), participants' verbal protocols were either classified as "Rule Followers" or "Non-Rule Followers" depending on if their percentages of selection for the left computer screen increased or decreased during the final condition of the experiment. Using this classification of participants, mean verbal utterances were computed for each group and are displayed in Table 8. The obtained data suggest differences between the Rule Followers and Non-Rule Followers' verbal behavior. Rule Followers talked less about performance than the Non-Rule Followers, talked more about reinforcement, and also emitted more irrelevant statements about the game. Rule Followers also tended to speak more often about accurate rules about the game, and emit statements about illusory

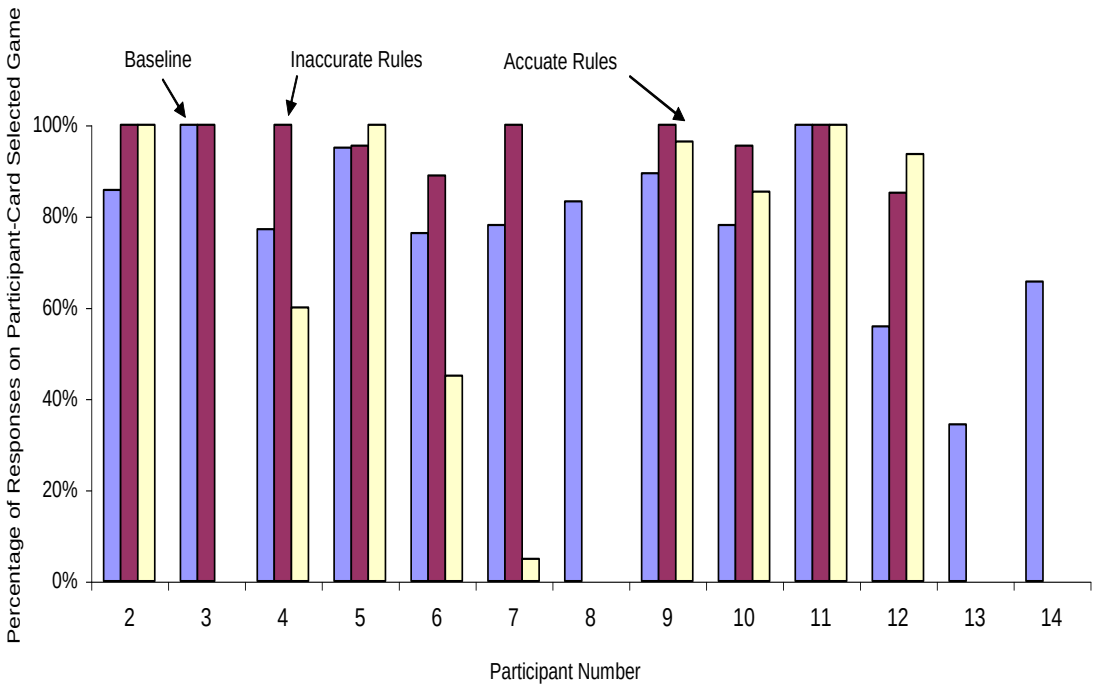

Figure 5: Experiment 2 individual participant data for selection of the Free Play option across baseline, inaccurate, and accurate rule conditions.

Table 5
Verbal protocol analysis summary data for each participant during the baseline conditions of the present experiment. Values are depicted in percentages of total verbal behavior emitted in each category.

Participant	*Performance*	*Reinforce-ment*	*For-casting*	*Inacc. Rules*	*Acc. Rules*	*Illusion*	*Unrelated*
2	59	23	7	0	0	0	11
3	100	21	0	0	0	0	1
4	48	33	15	1	0	0	3
5	46	49	3	0	0	0	3
6	35	23	10	13	1	0	18
7	49	31	6	1	1	1	11
8	14	49	2	4	0	1	1
9	42	41	15	0	1	0	2
10	41	47	3	2	0	0	5
11	68	22	5	0	0	0	1
12	86	7	0	0	0	0	7
13	37	41	9	0	5	0	17
14	24	35	6	1	2	0	0
Mean	46	30	6	2	1	0	6

Table 6
Verbal protocol analysis summary data for each participant during the inaccurate rule conditions of the present experiment. Values are depicted in percentages of total verbal behavior emitted in each category.

Participant	*Performance*	*Reinforce-ment*	*For-casting*	*Inacc. Rules*	*Acc. Rules*	*Illusion*	*Unrelated*
2	47	31	10	6	0	0	7
3	100	16	2	2	0	0	0
4	52	34	9	3	0	0	2
5	42	47	9	2	0	0	0
6	18	27	4	7	2	5	38
7	40	27	11	5	0	1	16
9	42	40	9	0	5	0	5
10	51	41	5	0	0	3	3
11	65	30	2	5	0	0	0
12	80	16	0	4	0	0	0
Mean	49	28	6	3	1	1	6

Note: Participants 8, 13 and 14 remained in baseline throughout the entire experiment, thus they are not depicted in the below table.

Table 7
Verbal protocol analysis summary data for each participant during the accurate rule conditions of the present experiment. Values are depicted in percentages of total verbal behavior emitted in each category.

Participant	*Performance*	*Reinforce-ment*	*For-casting*	*Inacc. Rules*	*Acc. Rules*	*Illusion*	*Unrelated*
2	62	23	0	2	0	2	11
3	39	39	0	2	4	4	9
4	45	42	6	4	0	1	2
5	43	46	7	0	1	2	1
6	19	28	5	5	7	9	28
7	41	27	7	0	7	7	14
9	44	38	0	1	2	9	2
10	41	38	6	1	1	4	9
11	66	32	0	0	0	2	0
12	72	14	3	2	0	5	0
Mean	43	30	3	2	2	4	7

Note: Participants 8, 13 and 14 remained in baseline throughout the entire experiment, thus they are not depicted in the below table.

Table 8
Mean percentages of verbal behavior content in each category displayed for participants that followed the accurate rule during the final condition of the experiment.

Condition	*Group*	*Performance*	*Reinforcement*	*Forecasting*	*Inacc.*	*Acc.*	*Illusion*	*Unrelated*
Baseline	Rule Followers	0.525	0.326	0.081	0.028	0.005	0.001	0.066
	Non Rule Followers	0.647	0.252	0.037	0	0	0	0.055
Inaccurate Rules	Rule Followers	0.500	0.336	0.065	0.028	0.011	0.013	0.088
	Non Rule Followers	0.612	0.297	0.057	0.032	0	0	0.005
Accurate Rules	Rule Followers	0.413	0.353	0.030	0.018	0.025	0.050	0.100
	Non Rule Followers	0.587	0.312	0.040	0.025	0	0.022	0.005

control. These group mean differences were consistent across all experimental conditions.

GENERAL DISCUSSION

Taken together, the two studies presented here have explored the degree to which an illusion of control exists for video poker players, and how instructional stimuli may mitigate that illusion. In Experiment 1, we employed a group design to explore the differential effects of accurate and inaccurate rules on which type of game participants would allot the majority of their responses to. There were slight differences between groups, yet in general results showed that regardless of the rule given, most participants played the majority of trials on the game which allowed them to select cards themselves. These results indicate that a preference for illusory control may exist for video poker players, even when such a preference results in play that deviates from the statistically optimal.

The second study further examined the extent to which recreational video poker players would prefer a game which allowed player card selection over a game which had the computer control card selection, even when the computer option would result in statistically optimal play, and thus more winning games. In baseline of Experiment 2, 12 of 13 players preferred the self-selected card game. These findings suggest that the illusion of control (Langer, 1975) does in fact exist for the majority of video poker players, even when that illusion is detrimental to overall obtained winnings. No player in our study played statistically optimal, thus preference for the illusionary option had detrimental effects on overall winnings. These findings add to the published literature on illusionary control in gambling (Dixon, 2000; Dixon, Hayes, & Ebbs, 1998; Presson, & Denassi, 1996), and suggest that control is highly preferred even if the odds of a positive outcome are reduced by its presence. Future research

might wish to add economic variables to the current study whereby players might need to wager more for identical outcomes if they want the illusionary option, or the payoffs for winning poker hands are less than they are for the computer controlled game. It may have also been possible that our participants preferred the illusionary game option because it was simply somewhat more entertaining or "fun" than just having the computer select cards for them. A future study may also attempt to control for this possible confound by making the card selection of our computer controlled option coupled with a concurrent task the participant would do during the trial time (e.g., like clicking the computer mouse on a section of the computer screen).

Of greater interest in this current investigation is the impact that experimenter delivered instructions had on resulting gambling behavior of our video poker players. Upon the delayed introduction of an experimenter rule about how the computer selected option was not an ideal choice, all of our participants increased the percentage in which they played the illusionary game option. These findings support the ability to experimentally modulate the illusion of control which was demonstrated in roulette players by Dixon (2000). Thus it appears very clear that when given information by others that illusionary behavior should be engaged in, video poker players will increase their tendency to do so. In our study we only gave our participants a one sentence rule about playing the illusionary option. Imagine the extensive rules that a real poker player is exposed to upon entry into a casino. Other players tell him or her to try this or do that, or play a game that is hot and stay away from one that is not. Such rules are more elaborate than the ones used in the current study, and it appears possible that their complexity may result in even greater desire of poker players to engage in illusionary control. Future research should explore the incorporation of more detailed inaccurate rules which are designed to strengthen illusionary control than the one sentence rule used in the current investigation. While some notions of the illusion of control suggest that it is a static fallacy or trait, our data in fact suggest that this construct can be modified through experimental manipulations.

It should also be noted that the order of the rules given could possibly have had an impact on the obtained results. In the current study the Inaccurate rule condition preceded the Accurate rule condition for all participants. While this same order has been used in previous research on the illusion of control (Dixon, 2000), it is possible that the contradiction implied by presenting an accurate rule after first presenting an inaccurate rule may have contributed to the obtained results. Future studies may address this limitation by counterbalancing the presentation of inaccurate and accurate rules across participants. Future studies may also consider randomizing the position of computer monitors across subjects such that a position bias may be experimentally controlled for.

The rather simple rule used in the present study may have also been in part responsible for the relatively mixed findings obtained during the accurate rule condition of the present investigation. The fact that such a simple rule could alter 6 of our 10 experimental participants suggests that this minimal intervention could result in behavior change for a fair number of our participants. The deviations obtained between participants were clarified when conducting more detailed investigations of each participant's verbal behavior. Without the inclusion of our protocol analysis data, we would have been unable to account for variations. Yet, though our incorporation of the protocol analysis we were able to determine that there were some subtle differences between those participants that followed the accurate rule and those that did not. Our classification of participants' verbal behavior into those that followed the rule and

those that did not revealed small, but interesting differences between these two participant groups. First, the rule following participants talked less about performance and more about reinforcement. This finding suggests that perhaps gamblers who are very attentive to their current financial standing on a game are more prone to follow the advice of others. Our experimenter may have been perceived as an expert of sorts, and those players who wished to maximize their winnings tended to follow the directions. Those participants who did not follow the experimenter given accurate rule tended to talk more about their trial by trial performance. It is possible that these participants may have been somewhat less attentive to their winnings and losses, and instead were interested primarily in the cards they had in hand. Perhaps the lack of attention to the current financial standing is a feature which results in continued preference for illusionary control, when in fact, that control can be working against the player in terms of potential winnings. As was seen by all our participants, the illusion did cost the player potential winnings, as the many errors made could have been prevented by selecting the computer controlled game option.

In summary, the illusion of control is present in many video poker players. As opposed to other gambling contexts which the illusion may do no harm to the player (e.g., selecting one's own numbers at roulette or keno), self-selecting cards at video poker often result in errors from probabilistically optimal play. While computer selected card games are not available in many casinos, it remains clear that gamblers may seek out gaming devices which allow the illusion of control to be engaged in. Rising numbers of video poker players and decreasing numbers of slot machine players suggest that changing game preferences could be partially accounted for by the illusionary characteristic of video poker.

The present data are also promising first steps in designing potential treatment strategies for problem gamblers. If illusionary control can be brought under the persuasion of experimenter given rules about the game, then perhaps it can also be brought under the control of treatment providers seeking to reduce their clients' excessive gambling. Our data suggest that if gamblers begin to pay greater attention and think (or talk) about the wins and losses they encounter on a trial by trial basis, they may be more prone to follow the instructions of others. When those instructions are from treatment providers, it may be possible that the problem gambler will be more apt to listening. As the number of problem gamblers continues to increase and successful treatments are few, the time seems right to explore innovative means by which the treatment of this pathology can be enhanced.

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