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## Adult Samples Suggest Slot Machine and Casino Characteristics Are Possible Sources for Investigating the Illusion of Control

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The illusion of control is a phenomenon in which a gambler identifies his or her odds of winning as being more favorable than would be possible by chance—either through game/device choice or direct manipulation of the device or game-related objects (e.g., dice). To date, relatively little attention has been paid to the illusion of control in behavior analytic research on gambling. The authors' aim is to provide researchers with a base from which to explore the illusion of control in slot machine gambling through analyzing two samples of college students and two samples of adults participants with respect to machine and casino characteristics.

*Keywords:* illusion of control, gambling, slot machine, casino

Bijou, Peterson, and Ault (1968) provided a framework for connecting descriptive field studies with experimental work. Bijou et al.'s primary argument was that, if executed correctly, descriptive studies can be useful in directing future experimental investigations. Within gambling research, descriptive analyses have been conducted that may prove useful for future investigations. For example, Witts and Lyons (2013) studied 20 online no-limit Texas Hold'em poker players who played for either low stakes (\$0.01/\$0.02) or medium stakes (\$3/\$6) and did so either sequentially (1 table played) or simultaneously (multiple tables played at the same time) by purchasing hand histories and analyzing them with commercially-available poker analysis software. One major finding in Witts and Lyons was that players tended to play longer when action, defined as the number of big-blind-sized bets being passed between players, and player win frequencies (regardless of win

size) were high. Such findings prompt future researchers to consider these as potentially important variables when studying poker play in the laboratory.

It is possible, then, that descriptive investigations can yield data which will steer gambling research in more restricted paths. Because data from in-person—as opposed to online—gaming environments are difficult to obtain (see Lyons, 2006, cf. Witts & Lyons, 2013), knowing what specifically to investigate will benefit naturalistic descriptive analyses in that research efforts can be maximized by focusing only on variables more likely to produce meaningful results. The present investigation was designed to approximate a descriptive analysis of gamblers' beliefs, accurate or inaccurate, regarding slot machines without the aid of naturalistic observations so that future research could be better refined prior to experimental analysis or naturalistic observation. In other words, prior to investigating gambling behavior related to inaccurate rules and slot machine play, a descriptive analysis provides a rationale for such work based on the verbal behavior of participants. The primary focus of the analysis was to assess beliefs regarding slot machine characteristics, some within the context of the casino itself, as

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they relate to the probability of winning or losing. The belief that a player can alter his or her chances of winning, either through careful selection or differential play, falls under the larger term *illusion of control* (cf. Langer, 1975).

The illusion of control has been a topic of consideration in the behavioral literature (e.g., Dixon, 2000; Nastally, Dixon, & Jackson, 2009; Wong & Austin, 2008), though its coverage has been relatively limited. One reason for studying the illusion of control is that beliefs regarding gambling outcomes, whether accurate or inaccurate, can serve as rules which then alter how one gambles (cf. Dixon, 2000; Dixon, Hayes, & Aban, 2000). In fact, Dixon (2000) conceptualized the illusion of control as the outcome of a history of rule-following with respect to inaccurate rules. As an example of an inaccurate rule, the gambler's fallacy suggests that after a series of one particular outcome, a different outcome is made all the more likely. In slot machine play the gambler's fallacy would state that after a series of wins (or losses), the opposite outcome is more likely to occur on the next spin as compared to previous spins in the series under consideration. In the casino no such rule is accurate as each spin of the slot machine is independent of all other spins. As Weatherly and Meier (2008) correctly noted to some of their participants, "the machine does not 'keep track' of how you are playing" (p. 5).

With respect to Dixon's (2000) conceptualization, efforts aimed at delivering accurate rules that compete with inaccurate rules could reduce or eliminate the illusion of control. Petry (2005) summarized the research on irrational or inaccurate rules while gambling and concluded that most gamblers, recreational and problem, tend to endorse inaccurate rules. However, as Petry stated, the exact nature, frequency, and relation to gambling behavior of these thoughts are yet to be demonstrated. Furthermore, inaccurate

rules may hold more sway over gambling behavior than the actual contingencies (Dixon, et al., 2000), thus adding to the urgency of needing to address the illusion of control from outside sources (e.g., informational campaigns). However, it is important to note that what information is provided needs to be taken into consideration, as Dannewitz and Weatherly (2007) found that accurate information regarding which cards to play in a video draw poker game resulted in increased risk-taking (i.e., larger bet sizes). Video poker has some element of skill involved and thus accurate rules might instead lead to more-preferred outcomes through enhanced performance, whereas accurate information regarding games of pure chance (e.g., slot machines) tends to reduce gambling (coins bet, number of spins; Weatherly & Meier, 2008), at least in laboratory simulations.

When accurate and inaccurate rules are contacted may be of some interest as well. Consider that in Dixon, Jackson, Delaney, Holton, and Crothers (2007), rules that supported a preferred style of play increased preference for that same style more than contradictory rules that supported the alternative style (in this case, player-selected vs. computer-selected cards in a video poker simulation). Thus, depending on circumstances, interventions related to accurate rules after a period of play under the guidance of inaccurate rules may prove to be a difficult route to altering playing style. It is yet unclear if players who are first supplied with accurate rules who then operate in accordance to those rules would demonstrate the same resistance to change.

What is clear, then, is that cataloguing and subsequently addressing inaccurate rules with respect to gambling should be of interest to the research and treatment communities. To date, the behavioral investigations into the illusion of control, regardless of the game studied, have been conducted under

laboratory conditions. It is in this light that we examined differences between two college samples and two online samples in an effort to begin the process of examining the intersection between slot machine gambling and the illusion of control. Specifically, question related to how one selects (e.g., machine location, day of the week) and interacts with (e.g., player's club cards, vouchers, cash) slot machines was explored.

## METHOD

### Participants and Settings

Fifty students enrolled in undergraduate psychology coursework at a large Western university, 77 students enrolled in undergraduate psychology coursework at a mid-sized Midwestern university, and 117 United States adults enrolled in Mechanical Turk's (MTurk) marketplace participated in this study. MTurk is a website created and hosted by Amazon.com in which individuals can sign up to earn Amazon.com credit to spend on Amazon.com's products by completing assignments created by businesses and researchers. Due to an error in software copying, Western student and MTurk 1 (see below) demographic information were missing. Thus, a comparison between samples is not possible. These two samples (university student and MTurk users) were selected as convenience samples based on the idea that different samples (e.g., Gainsbury & Blaszczynski, 2011) and different recruitment procedures (e.g., Williams, Pulford, Bellringer, & Abbott, 2010) might produce different outcomes or serve to confirm general findings (e.g., consistency of beliefs across multiple samples).

### Materials

A survey was created to assess popular incorrect rules that may be endorsed by gamblers. Survey items were created by two means: 1) the researchers created a list of commonly-heard beliefs regarding slot ma-

chine use, and 2) popular slot machine strategy books (e.g., Jensen, 2010) were read to identify incorrect slot strategies that gamblers may use (e.g., "it is prudent to first run a simple test to judge whether [the machine] is hot or cold" (Jensen, p. 67). Questions included items pertaining to machine selection and style of play. For example, participants were asked to answer true or false to the statement "If a machine has produced a series of small wins, it will continue to do so."<sup>1</sup> Individual questions are explored further in the results section and in Table 1.

### Procedure

Students from the Western university were recruited through SONA systems online recruitment software in the spring of 2013. Students from the Midwestern university were recruited by having the third author attend undergraduate courses in the spring of 2014 and announce to the students the opportunity to participate in the project. Both samples of MTurk participants were recruited through the MTurk website and were compensated with \$0.25 per survey completed. The first group of MTurk participants (MTurk 1) was recruited during the spring of 2013, and the second (MTurk 2) in the spring of 2014. Students were divided by geographical regions, and both MTurk samples were combined as no geographical data were provided save that they were all residing in the United States at the time of the survey.

Students from the Western university completed the survey through the SONA website as the survey for this group was created within that software package. Students from the Midwestern university and adults from the MTurk 2 group completed the survey through SurveyGizmo. Finally, adults

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<sup>1</sup> The complete questionnaire can be obtained by contacting the first author

Question	Response Options	Universities			MTurk n = 117
		Midwest n = 77	West n = 50	Combined n = 127	
The more lines I play on a slot machine, the more I will win	True	36.36%	40.00%	37.80%	42.74%
	False	63.64%	60.00%	62.20%	57.26%
If a machine pays out a large jackpot, it will	Stop paying out	57.89%*	-	-	49.33% <sup>λ</sup>
	The jackpot will not affect future payouts	42.11%*	-	-	50.67% <sup>λ</sup>
If a spin results in 2 out of 3 symbols needed to play a bonus game or get a jackpot, it means the machine is getting close to paying out	True	15.58%	-	-	18.67% <sup>λ</sup>
	False	84.42%	-	-	81.33% <sup>λ</sup>
A series of small wins is a sign that a big win is coming	True	<b>10.39%</b>	-	-	<b>26.67%</b> <sup>λ</sup>
	False	<b>89.61%</b>	-	-	<b>73.33%</b> <sup>λ</sup>
If a machine has produced a series of small wins, it will continue to do so	True	15.58%	82.00%	41.73%	51.28%
	False	84.42%	18.00%	58.27%	48.72%
Stopping the reels manually (hitting the "Spin" button again to stop the reels from spinning) will	Increase my chances of winning	6.49%	-	-	8.00% <sup>λ</sup>
	Decrease my chances of winning	7.79%	-	-	8.00% <sup>λ</sup>
	Have no effect on my chances of winning	85.71%	-	-	84.00% <sup>λ</sup>
When asked to select 2 out of 5 symbols in a bonus round game, the symbol that I pick determines which prize I get <sup>#</sup>	True	31.17%	46.94%*	37.30%*	38.79%*
	False	68.83%	53.06%*	62.70%*	61.21%*
If I insert a "Player's Card" before betting, it will	Increase my chances of winning	20.78%	18.37%*	19.84%*	15.38%
	Decrease my chances of winning	5.19%	6.12%*	5.56%*	2.56%
	Have no effect on my chances of winning	74.03%	75.51%*	74.60%*	82.05%
Using an "Elite" status player's card, rather than the standard player's cards, will	Increase my chances of winning	23.38%	32.65%*	<b>26.98%*</b>	<b>16.24%</b>
	Decrease my chances of winning	3.90%	6.12%*	<b>4.76%*</b>	<b>1.71%</b>
	Have no effect on my chances of winning	72.73%	61.22%*	<b>68.25%*</b>	<b>82.05%</b>
Elite players are often given "Free Play" money from the casino. Using free play money will:	Increase my chances of winning	5.19%	10.42%**	7.20%**	11.11%
	Decrease my chances of winning	11.69%	20.83%**	15.20%**	7.69%
	Have no effect on my chances of winning	83.12%	68.75%**	77.60%**	81.20%
My chances of winning are greatest during	Weekdays (M-Th)	32.47%	-	-	26.67% <sup>λ</sup>
	Weekends (F-Su)	16.88%	-	-	22.67% <sup>λ</sup>
	Neither weekdays nor weekends are different	50.65%	-	-	50.67% <sup>λ</sup>
If I start winning, I need to cash out or the machine will make me lose	True	46.75%	57.14%*	50.79%*	58.12%
	False	53.25%	42.86%*	49.21%*	41.88%

\*n = n-1; \*\*n = n-2; <sup>λ</sup>n = 75; **BOLD** =  $p < .05$ ; # = True (each symbol has a dedicated prize under it), False (the machine predetermines what I win and my choosing does not influence that outcome)

**Table 1.** Response distributions between samples for those questions that produced some degree of illusory belief endorsement. Chi-square analyses were conducted on the largest group of university participants (combined when possible) and the MTurk sample.

from MTurk 1 completed the survey through MTurk. While different survey features were explored during this study (e.g., SurveyGizmo allowed for rank ordering), only those questions that were delivered in a common format were included in the analysis.

When completing the survey, all participants were given an information sheet to read that was approved by the respective university's IRB. Participants were then asked a series of questions related to slot machine gambling. While some questions varied between groups, questions common to both assessment times are presented here. Upon completion of the survey, non-university participants were either paid (MTurk 1) or given a code to enter for payment (MTurk 2). For participants in university settings, extra course credit was issued at the moment of consent, as required by both IRBs.

## RESULTS AND DISCUSSION

Comparison data are presented in Table 1, divided by Western, Midwestern, Combined (i.e., Western + Midwestern), and MTurk samples. Chi-Square goodness-of-fit tests were performed on participant responses to individual survey items (equal proportions of endorsement for each response item were assumed) between the Combined and MTurk (combined) samples when possible, or between the Midwestern and MTurk 2 sample. Significant Chi-Square results were found between Midwestern students and MTurk 2 participants for the question "A series of small wins is a sign that a big win is coming," (True/False),  $X^2(1, N = 152) = 6.70, p < .05$ , such that MTurk 2 participants endorsed this as being true (26.67%) more than Midwestern students (10.39%). An additional significant difference was found between combined university students and combined MTurk samples for "Using an 'Elite' status player's card, rather than the

standard player's card, will," (Increase/Decrease/Have no effect on my chances of winning),  $X^2(1, N = 243) = 6.47, p < .05$  with more students endorsing an effect on winning and losing (26.98% and 4.76%, respectively) than their MTurk counterparts (16.24% and 1.71%, respectively). Non-significant Chi-Square results were not, however, unimportant. For example, 19.84% of combined university students and 15.38% of combined MTurk participants endorsed a belief that using a player's card before betting will increase one's chances of winning. Complete analyses can be found in Table 1.

Generally speaking, there were many differences found within and between samples, suggesting that there is no consensus regarding beliefs about slot machine outcomes given various circumstances. Some questions involved behaviors that could lead to a more profitable outcome, such as with staying on a machine that has produced a series of small wins. Other questions assessed the avoidance of monetary loss with questions like "If I start winning, I need to cash out or the machine will make me lose" (True/False). While no conclusive outcomes can be drawn here, several new lines of research are suggested.

Researchers have examined slot machine characteristics (e.g., manual reel stops) and how they relate to altered play (Ladouceur & Sevigny, 2005) or preference (Nastally et al., 2009). However, casino characteristics (e.g., slot machine location, player's clubs) are less explored, and these results are especially interesting in this light. For example, we asked if a slot machine player was more likely to win on certain days, and 32.47% of the Midwestern sample and 26.67% of the MTurk 2 sample responded favorably to weekdays (Monday through Thursday) as being more profitable. Future research may find differences between weekday, weekend, and weeklong players.

There are various patterns of correlations between each sample's responses that are of interest. If all samples fail to endorse the illusion, then it is likely that investigations into that particular belief would fail to produce meaningful results. If, however, samples are uncorrelated, then it stands to reason that one sample endorses the illusion, or at least a different aspect of it, than the other group. For example, the combined university samples was nearly split on whether continued winning would result in the machine making the participant lose, whereas 58% of the MTurk sample endorsed this belief (42% rejected). Finally, If all samples are in agreement regarding some illusory belief, then research into that specific fallacious rule is most likely to produce meaningful data, particularly as it relates to the alteration of the belief.

There are several ways in which this investigation could have been enhanced. For example, participant characteristic data were missing from the Western and MTurk 1 groups, which also included information on frequency of slot machine play. Of the Midwestern students, 71.43% ( $n = 55$ ) reported having played a slot machine at least once, and of the MTurk 2 participants, 82.67% ( $n = 15$ ) reported the same. Additional characteristics from the Western and MTurk 1 data would have permitted better comparisons between those who had and had not played slot machines. A final limitation involves the possibility of Type I errors given the numerous analyses conducted, though replications and extensions will help to address this concern. Despite these potential limitations, the results are still valuable in restricting future investigations into factors that may contribute to altered, preferred, or prolonged gambling either in the short- or long-term. Furthermore, these results are made all the more robust by the fact that student samples were recruited from two geographically-distinct campuses and that

the MTurk samples were recruited at two separate times (spring 2013, spring 2014).

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