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Examining Rate of Play with Varying Speed and Win Rate on Simulated Slot Machines

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When gambling in a casino, there are many factors (other than the games itself) that add to the effects of the experience. The social contingencies have a large influence over the amount a patron will bet and time spent at the casino. Previous studies also show the use of confederates will have an influence over the rate of the observed behavior. Researchers chose to utilize a confederate to gamble and display excitement when a win was reached throughout all sessions. Researchers also manipulated the speed at which the simulated slot machine spins as well as the win rate. These manipulated phases were alternated between 8 total phases. Five graduate students between the ages of 21-30 played these 8 phases on the simulated slot machine with the confederate gambling simultaneously. The design was reversed for two of the participants to determine if there was a sequence effect. Results displayed that participants chose to bet the maximum amount of credits more often during the phases with the higher win rate than in the phases with the quicker spinning reels. Clinical limitations and recommendations for future research are discussed.

Keywords: simulated slot machines, confederate, gambling, pathological gamblers

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CHAPTER 1

INTRODUCTION

Gambling has been an increasingly preferred leisure activity throughout the past 30 years. The legalization of gambling began with weekly drawings, similar to the lottery. Due to a rise in popularity, they were quickly increased to daily drawings (Volberg, 1996). Since then, gambling has matured into technologically advanced stimulating apparatuses (e.g., poker). Currently in the United States, electronic gaming devices have been legalized in 39 states (American Gaming Society, 2013). These include traditional slot machines, video poker, and bingo at Indian casinos, commercial casinos, racetrack casinos, and bars, restaurants, or other licensed establishments (American Gaming Society, 2013). All states except Utah and Hawaii have legalized gambling according to the American Gaming Society. Nevada was the first state to legalize casino gambling in 1931, followed by New Jersey in 1976 (American Gaming Society, 2013). Petri and Weinstock (2007) found that 23% of 1,356 college students reported engaging in gambling in their lifetime, while 6.3% reported that they engaged in gambling on a weekly basis.

Volberg (1996) claimed that many of the states sell forms of gambling to receive extra taxes, as well as, raise funds to contribute to education. The Gross Gaming Revenue (GGR) is measured by the amount wagered minus the winnings returned to players, in which is a true measure of the economic value of gambling (American Gaming Society, 2013). In 2002, the gross gaming revenue in the United States averaged out to be $28.07 billion (American Gaming Society, 2013). A steady increase occurred every couple of years. In 2005, the gross gaming revenue topped out above $30 billion for the first time. That number jumped in a matter of a decade from $28.07 billion in 2002 to $35.64 billion in 2011 (American Gaming Society, 2013).

It is important to note that with the increase in gambling and attendance at casinos, that also increases employment opportunities. With increasing gambling and employment opportunities, casinos are viewed as tourist attractions and a way to increase economic growth.

As society may view casinos to be only beneficial to the community, it is also important to look at the downside to the convenience of gambling. With having the ability to go to almost any gas station, convenient store, or bar to purchase lottery tickets, and many other gambling revenues, it increases the possibility for individuals to acquire a gambling disorder. A prevalence rate of approximately 1% of the total United States adult population are said to be considered pathological gamblers (Shaffer et. al, 2004). According to the American Gaming Association (2013), even though there has been a dramatic increase in casino gambling in recent years, the prevalence rates have remained stable. In past studies, a correlation between particular demographics and pathological gambling have been found. Records show a higher prevalence in non-white minorities gamble more than Caucasians (Welte, Barnes, Wieczorek, Tidwell, and Parker, 2001). Welte, Barnes, Wieczorek, Tidwell, and Parker (2001) also reported that divorced individuals and those of a lower socio-economic status are more apt to engage in gambling. The Harvard Medical School meta-analysis of prevalence of gambling disorders in the U.S and Canada reports approximately 5% of adolescents will experience some sort of serious gambling problem (American Gaming Association, 2013). This is important for researchers to pay attention to because these adolescents will soon be adults, which will only make the problem of pathological gambling in the United States worse. According to the Diagnostic and Statistical Manual for Mental Disorders, 4th Edition Text Revision (DSM-IV-TR: American Psychiatric Association, 2000), pathological gambling is defined as:

A) Persistent and recurrent maladaptive gambling behavior as indicated by five or more of the following: 1) is preoccupied with gambling (e.g. preoccupied with reliving past gambling experiences, handicapping or planning the next venture, or thinking of ways to get money with which to gamble), 2) needs to gamble with increasing amounts of money in order to achieve the desired excitement, 3) has repeated unsuccessful efforts to control, cut back, or stop gambling, 4) gambles as a way of escaping from problems, or relieving of a dysphonic mood (e.g. feelings of helplessness, guilt, anxiety, depression), 5) after losing money gambling, often returns another day to get even, 6) lies to family members, therapists, or others to conceal the extent of involvement with gambling, 7) has committed illegal acts such as forgery, fraud, theft, or embezzlement to finance gambling, 8) has jeopardized or lost a significant relationship, job, or education or career opportunity because of gambling, 9) relies on others to provide money to relieve a desperate financial situation caused by gambling.

B) The gambling is not better accounted for by a Manic Episode. (p. 674)

Pathological gambling was first recognized as a psychiatric disorder in 1980 (American Psychiatric Association, 2000). It has been hypothesized that disordered gambling behavior may be the cause of an underlying manifestation of addictions whether it be drugs, alcohol, food, shopping, or gambling (Shaffer et al. 2004). Comorbid mood disorders are commonly displayed in those who are considered pathological gamblers. Some examples of frequent comorbid mood disorders that accompany pathological gambling are major depressive disorder and anxiety disorder, and personality disorders such as obsessive-compulsive disorder (Black & Moyer, 1998). Black & Moyer (1998) conducted a study consisting of 30 subjects, typically a 44 year-

old white male and an average income of $32,250 with a history of visiting a casino once or more weekly. All of the subjects reported gambling more money than they typically intended to, with 67% of the subjects reporting gambling as a current problem and 70% of the participants wanted to quit gambling but did not feel confident that they could. These subjects completed structured as well as semi-structured assessments. Results displayed that a large amount of the participants also had antisocial personality disorders as well as impulse control disorders (Black & Moyer, 1998). These results confirm that individuals with pathological gambling disorders also suffer substantial psychiatric comorbidity (Black & Moyer, 1998). Research displays the prevalence of gambling disorders is higher among youth than adults (American Gaming Association, 2013). There are many factors that could lead an individual to increase their gambling behavior. According to Thomas, Allen, Phillips, and Karantzas (2011), everyday life stressors were positively related to avoidance-motivated gambling as well as socially motivated gambling.

According to Aasved (2003) in "The Sociology of Gambling," compulsive gambling is characterized by three essential features. The first is the addiction itself, which may be viewed as incurable and increases that gambler's "drive" for risk taking. The second feature is known as the gamblers "dream world". This is where the gambler will rationalize that he or she must continue to gamble in order to make up for past debts. This is also known as "chasing" a big win. The gambler may have unlimited amounts of optimism that he or she will eventually win big. The third feature is the gambler's self-punishment. This phase is typically where the gambler is somewhat "addicted" to losing, proving how intense and dangerous gambling can really be on an individuals' life. This idea is similar to the "near-miss" effect. Dixon and Schreiber (2004) focused on response latency and win estimations in slot machine players. The

participants used a rating scale throughout the study to report how close they felt they were to a win. Results of this study indicated that all of the participants rated the near-miss trials closer to a win than they rated total loss trials (Dixon and Schreiber, 2004).

Casinos accommodate many interests of the individuals that choose to attend. Craps, poker, roulette, blackjack, and slot machines are the main advertized games available at a casino. The most preferred form of gambling, however, is on slot machines. The American Gaming Association (2013) reports there are over 830,000 slot machines throughout the country. From 1970's to today, slot machines have grown from covering 40% of casinos to around 70%. The continuous growing appreciation for slot machines has helped expand commercial gaming (American Gaming Association, 2013). Breen (2004) discovered that machine gambling turned out to produce pathological levels of gambling behavior at a much higher rate than other traditional forms of gambling such as instant lottery games, card games, track betting, and sports betting. According to the American Gaming Association (2013), slot machines are preferred forms of gambling by pathological gamblers as well as individuals who do not have a gambling disorder. Casinos earn 90% of their revenue through the use of slot machines (American Gaming Association, 2013). Slot machines typically are the easiest and most stimulating games in a casino. A patron can engage in an array of slot machines without having to wait for a turn unlike in craps, roulette, or blackjack. Slot machines are also much cheaper to play a round than playing in a game of roulette or craps. The reinforcement rates in a slot machine also tend to be higher and quicker to receive. This could be the flashing lights, sounds, as well as the flashing words displaying "Winner".

Slot machines come in a variety of games, in order to satisfy many preferences of individuals. One can play on a typical slot machine in a casino, or resort to a computerized

virtual slot machine. The patrons at a casino are able to bet on a variety amount of lines depending on the slot machine they are using. A common misconception to the patrons is that the more lines a slot machine has, the more opportunities they have to win. This simply is not true. Many patrons also feel that when it comes to winning, slot machines are on a predetermined schedule. If a slot machine has a multiple string of losses, patrons may feel that a win is coming. In reality, slot machines run on a random ratio schedule of reinforcement, meaning the payout rate is less likely to be predicted. Due to the unpredictability of wins in a slot machine, patrons may find it more reinforcing to increase their rate of play in hopes to get that next win. Skinner (1958) suggests that gamblers may continuously return to the slot machines due to the schedules of reinforcement being difficult to predict. It is suggested that the gamblers become hooked because of the unpredictability of the slots. They never know when the next win will be even though they may contrive ideas and strategies to justify their playing.

Gambling is not an activity solely for individual thrill. Patrons enjoy going to casinos because there is an extremely reinforcing social factor involved. The social aspect is a major part of gambling and extremely reinforcing to patrons. Behaviorally, these individuals have observed the effects of social influence through engaging in drinking while at the casinos. As previously stated, there are flashing lights, sounds of slot machines, and alcohol being served at casinos. The environment itself is generally an adrenaline rush. Patrons around are winning and cheering, as well as losing. The near-miss effect will be a part of many patrons' experiences. When confederates are involved, their rate of gambling may increase and match that of the confederates. The Sociology of Gambling (2003) suggests that social rewards of gambling are one of the greatest attractions at a casino since few gamblers are able to actually make money gambling. Basically, it is said that the social rewards outweigh any other contingency at the

casinos. Aasved (2003) describes in The Sociology of Gambling that the rewards of persistent gambling is social due to the fact that quitting would also result in ending those social relationships that they have created while spending excessive time at the casinos. Through the social bonds regular gamblers at a casino form, they also get a "listening ear" and are also able to share common feelings. An emotional support system seems to form as they have a shared interest. Aasved (2003) claims that in many cases, a problem gambler will tend to cut off ties with outside relationships and end up mainly having their social "clique" that has been formed in the gambling setting.

The field of behavior analysis has come a long way with expanding the research and areas in which it can be utilized. Dixon (2007) describes the importance of behavior analysis getting into the field of pathological gambling. Dixon (2007) describes pathological gambling as being a serious area of concern in today's society but, unfortunately, has been minimally addressed by behavior analysts. One reason for this is the lack of funding for gambling research as compared to research in developmental disabilities, education, and drug addiction. In fact, Ladouceur and Shaffer (2005) reported that as of 2002, there have only been 20 published articles on interventions for pathological gambling. Dixon (2007) explains that failed funding attempts would in turn, result in failures to obtain sought after reinforcers. When researchers choose to conduct experiments, typically, their choice of research goes hand in hand with the amount of funding they are able to obtain. It is risky to utilize a large portion of personal funds on research that you are unsure will be a success and launch onto bigger opportunities. Without the necessary funding, the research projects will not be of priority to the experimenters, failing to produce meaningful outcomes. The research will then find itself being published in low impact journals. Dixon (2007) reports two types of solutions that may result in more behavior analysts

contributing to an understanding of pathological gambling and gambling behavior in general. The first solution is to provide a high profile, scientifically rigorous, peer reviewed journal that actually promotes behavior research in gambling (Dixon, 2007). The second solution is to make behavior analysts realize the amount of individuals that are suffering from pathological gambling and gambling disorders in general, that would benefit greatly from the types of scientific outcomes the behavior analysis field could potentially produce. Volberg (1994) suggests that there are much less pathological gamblers in states where gambling has been legal for less than 10 years than the pathological gamblers who reside in states where gambling has been legal for 20 or more years. These findings are great enough reason for behavior analysts to gain knowledge and begin treating individuals with gambling disorders.

Behavioral Interventions

Weatherly and Dixon (2007) published a study and introduced the ”behavioral model of gambling”. This model took into consideration the importance of immediacy of reinforcement as well as the schedules of reinforcement that were commonly involved in gambling settings. Weatherly and Dixon (2007) utilized verbal behavior as well as rule governed behavior and the role of establishing operations when conducting this study. Results of this study displayed that all gamblers in a casino will come into contact with similar schedules of reinforcement throughout their gambling experience; however, they will not all turn into pathological gamblers (Weatherly & Dixon, 2007).

Dixon, Bihler, and Nastally (2011) conducted a study on slot machine preferences of pathological and recreational gamblers study. The goal of the study was to alter preferences for concurrently available slot machines of equal payout through the development of equivalence classes and subsequent transfers of functions (Dixon, Bihler, & Nastally, 2011). The participants

in this study rated stimuli consisting of words thought to be associated with having a gambling disorder, words associated with overcoming gambling disorders, and various colors according to their opinion of the level of "pleasantness". After rating the stimuli, the participants alternated between playing 2 simulated casinos. Each of these casinos consisted of 2 slot machines. Equivalence classes were formed between pleasant and aversive rated stimuli, stimuli associated with the slot machines at the casinos, and neutral color stimuli. Overall, the researchers were successful in altering the preferences for the slot machines through the transfer of stimulus functions. A similar study was conducted by Hoon, Dymond, Jackson, and Dixon (2008). Participants were trained and tested to select stimuli that had different physical quantities in the presence of two color contextual cues for more than or less than. It was discovered that the subjects directed the majority of their responses towards the slot machine that shared formal properties of color with the contextual cue for "more than". When the participants were given an option to gamble on the yellow or blue slot machine, they tended to choose to gamble on the yellow due to the derived rule that yellow equals "greater than" whereas blue equals "less than".

An interesting trend shown in studies display that it is not the payout rate or percentage that keep a patron coming back for more. Verbal behavior plays a large role in gambling behavior and what is communicated during the debriefing sessions prior to engaging in gambling. A study conducted by Weatherly, Thompson, Hodney, and Meier (2009) used 6 women with no history of pathological gambling to play two concurrently available commercial slot machines. The slot machines were each programmed to pay out at different rates that varied between 87%-97%. The goal of the researchers was to assess whether the subjects could demonstrate sensitivity to reinforcement, therefore choosing to play on the machines with higher payout rates. Data from this study suggests that the subjects did not always demonstrate

preferences for the higher paying machines. Factors other than the programmed or obtained rate of reinforcement may control gambling behavior. Weatherly, Thompson, Hodney, and Meier (2009) describe the importance of behavior analysts looking beyond the direct, contingency-driven explanations of gambling.

McDougall, McDonald, and Weatherly (2008) chose to conduct a study to determine if gambling with a confederate of the same race and a different race affected gambling behaviors of the participants. Eight male American Indians and eight male non-American Indians participated in five gambling sessions. In one session, the participants each gambled alone, however in the other four gambling sessions, the participants played with the presence of a confederate. The confederates varied from being the same race or of a different ethnicity as the participants. The gambling behavior was the same across all sixteen participants and the confederates of the same and different race did not have an effect. The results discover that the gambling behavior of the participants lessened when the confederates left the sessions than when the participants were alone or the confederates remained in the sessions. These results confirm that the actions of other gamblers do, in fact, have an overall effect on other patrons' gambling behaviors. A few years later, McDougall, Terrance, and Weatherly (2011) conducted a similar study looking at the effects of male confederate presence, betting, and accuracy of play on males' gambling in blackjack. Similar to the previous study, participants played blackjack either alone or in the presence of a confederate. When the confederate stayed for the entire sessions, the experimenters manipulated how much the confederate bet per hand and how accurately he played. As found in the previous study, the participants' gambling more money when the confederate played the entire session than when the confederate exited early. Overall, the results

indicated that gambling behavior can be predicted and controlled through another gamblers' (the confederate) gambling.

Through past research, it has been discovered that individuals will engage in a higher gambling behavior with the influence of others present gambling. DeRicco and Niemann (1980) chose to focus on the drinking rates of one subject with four confederates. One subject and four confederates participated in the study. In intervention 1, one confederate modeled drinking at a rate of 50% less than the subjects drinking rate during baseline. Interventions 2 and 3 were identical to the first intervention however, two confederates were involved in intervention 2, and 4 confederates participated in intervention 3. The results of this study showed that the subjects drinking rate was not affected when there were only one or two confederates, however, when four confederates drank at a lower rate, the subjects drinking rate matched that of the four confederates. The findings coincide with McDougall, Terrance, and Weatherly (2011) showing that confederates do in fact have an affect on the behavior of the participants'.

Confederates are proven to have an effect on the gambling rate of other individuals present. Weatherly, Bushaw, and Meier (2009) chose to examine the influence of a confederate when males gamble. Two experiments were conducted in this study using 9-12 non-pathological male participants. The first experiment tested whether the gambling behavior of the males would change when in the presence of a confederate who was engaging in gambling as well. The researchers also wanted to determine if the participants' self reports were equal to the actual observed behavior. The participants gambled in two sessions with confederates present, and one session alone. One condition was a female confederate and one being a male confederate. Results displayed the participants did not play a significant different amount during the three conditions. There was a significant correlation when the participants were asked if they enjoyed

gambling with another individual present or alone. The participants reported that they gambled more "conservatively" when alone. However, results suggest their actual gambling behavior did not match with these reports. The second experiment made an attempt to actually influence the gambling behavior of the participant. Three sessions were used again, however, the confederates played directly next to the participant instead of across the room. This time, in one confederate session, when the confederate experienced a win, they were instructed to celebrate loudly. In another confederate session, if the confederate experienced a loss, they were told to loudly voice their disappointment. Results of this experiment suggest that the presence of a confederate did, in fact promote gambling in some instances. However, they were unable to determine if it was the gender of the confederate present, or simply the fact that another person was engaging in gambling. It was discovered that participants did gamble more in experiment 2 when compared to experiment 1. A final conclusion that was discovered by the researchers was that the self-reports were not an accurate representation of their actual behavior. This sheds light on how easily gambling can turn into a severe disorder.

As previously mentioned, pathological gambling is a serious, yet overlooked behavioral disorder that should be studied more throughout behavior analysis. Again, Dixon (2007) suggests that the lack of funding for this area of research has been a major reason as to why pathological gambling is minimally addressed. As previous research has confirmed that confederates maintain a crucial role when dealing with gambling and other problem behaviors, it is important to open this area of research to reduce the potential rise in pathological gambling. Casinos are filled with patrons that are at risk for acquiring a gambling disorder. The odds that accompany slot machines are very different from the odds in blackjack and roulette.

The goal of this current study is to examine the rate of play in the participants with varying amounts of wins on simulated slot machines. Furthermore, researchers wanted to examine the influence of other gamblers in the environment on gambling behavior. Weatherly and Dixon (2007) claims that verbal behavior would be able to offer more individual differences among the experience of gamblers that could account for the development of gambling disorders. Researchers hope to expand that idea by observing the gambling behavior of the participants in the current study. Three types of slot machines were created through Microsoft Visual Basic 2010. One slot machine was used during baseline and was a typical slot machine with a "normal" speed and win rate. The second slot phase had a fast rate of play with a regular win rate and the third machine had a regular speed with a high amount of wins. Researchers observed the rate of play with the participants and how many trials they engage in throughout these phases as well as the effects of having another individual present playing a slot machine.

CHAPTER 2

METHOD

Participants

Five adults over the age of 21 served as participants for this study. Four females and one male participated in this study with an age range of 21-30. All of the participants had already obtained a bachelor's degree, and were working on their master's degree or doctorate. A confederate was also utilized during this project. The confederate was aware of the procedures and was instructed to play the slot machines and display excitement when a win was obtained. Excitement was defined as clapping their hands with a smile on their face and happily saying "Yes!", "Winning!", or other words describing wins. The participants were recruited through personal connection, word of mouth, and through solicitation in undergraduate and graduate classes at a Midwestern university. The participants were asked to volunteer for the study and in return, offered extra credit points in the respective course or a gift card. Those who did not wish to volunteer were offered other means of extra credit. All methods were approved by Southern Illinois University at Carbondale's Office of Sponsored Projects Administration.

Prior to beginning the study, the participants were given an informed consent form. The participants then completed a brief questionnaire that covered their gender, income, level of education, and history of any drug, alcohol, and gambling treatment. The South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) will be provided to the participants to complete as well as Gambling Functional Assessment (GFA) created by Dixon and Johnston (2007). The GFA consists of 20 questions in which assists in determining the function of an individual's gambling behavior. The functions consist of "sensory experience," "escape," "attention," and "tangible rewards". The scoring goes up to 30 and the highest score is the indicator of the maintaining

function of the gambling behavior. The SOGS consists of a self-report questionnaire that is purposely designed to determine the type of gambling history each participant has. An individual may be at risk of a gambling disorder if they score a 5 or higher on the SOGS. Any individual who scores 5 or higher on the SOGS was provided with information on Gambler's Anonymous as well as given the SOGS debriefing statement and were not included in the study.

Setting, Apparatus and Reliability

Sessions were conducted in a quiet, empty room in the Rehabilitation Institute on campus. The procedure took place on a MacBook Pro laptop provided by the experimenter. The entire procedure was conducted on Microsoft Visual Basic 2010 Professional Edition, which was programmed by the researcher. A total of 3 different slot machine phases were created. The researchers created the first slot machine phase to operate at a regular pace with regular win rates. This was utilized during baseline sessions. During this phase, researchers observed the rate of play in the participants. The researchers manipulated the speed for the second slot machine and had it operate at a fast pace. This was utilized in the "B" conditions. The third slot phase operated at a regular pace but the rate of wins was increased and was utilized in the "C" conditions. All of the slot machines had a "Spin" button as well as an "End" button along with typical stimuli that can be found on most slot machines. The slot machines had an option of "Bet One" and "Bet Max", worth 5 points, for the participants to choose which to bet with. Each slot machine also included a data collection system, which measured the rate of play as well as the number of trials played. The data then was sent to a notepad file on the laptop. Comparisons were made between the effects of wining and the effects of the general fast play. Researchers also observed the effects of a confederate gambling at the same time as the participant.

In order to ensure reliability, the computer recorded the data and then the data was double checked with a Microsoft Debugger program. The researcher was in the room for the entirety of the study to observe and take data along with the data collection system on the program itself. The data collection system measured response latency and number of trials played.

Experimental Design and Procedure

The design utilized in the present study was an ABABACAC reversal design with a counter-reversal of ACACABAB with half of the participants. Researchers chose to measure the amount bet throughout each phase. The participants read instructions that were provided prior to the start of the experiment and informed that they may back out at any time throughout the procedure. Each session lasted between 30-45 minutes with phases lasting around 5 minutes. As previously mentioned, a set of instructions appeared on the computer prior to the participant beginning the session. The instructions are as follows:

> "You will now be asked to play on a slow machine presented on the computer screen. When you are ready to start, click the "Begin" button and a slot machine will appear. To place a bet, click "Bet One" or "Max Bet" and then click the "Spin" button to place a spin. Continue doing so until the "Exit" screen appears, concluding the study. Thank you for your participation."

The three participants who engaged in the ABABACAC design, began in baseline. During baseline, the participants were observed simply playing a slot machine. The data was sent to the notepad in order to determine the rate of play and effects of winning. The participants played the slot machine in baseline for approximately 5 minutes. Intervention phase B was introduced which was the slot machine with the fast pace. The simulated slot machine was programmed to operate at a rapid pace. This means that the reels on the slot machine stopped at a quicker rate than the regular paced machines. During baseline phases, the reels were spinning for a number of seconds before stopping to reveal a win or loss. The reels did not spin as long

during the B phase, meaning they operated at a rapid pace. The confederate was present and gambling during all phases of the study. Researchers observed the effects of having another gambler in the room. The participants were then brought back to a baseline session, which was the participant gambling on the regular paced and normal win rate machine. After going through the baseline phase again, the participants are reintroduced to a final B phase where they experience the rapid paced slot machine.

Participants were brought back to a baseline phase before entering the C phase. During the C phase, the researchers manipulated the win rate. There were a much higher amount of wins during this phase. During the regular baseline phase, a win was obtained only 10% of the spins whereas in the C phase, a win was obtained 45% of the spins. Researchers manipulated the win rate as winning every 2-3 spins as compared to the "normal" win rate, which varied between 7-10 spins before a win was obtained. Researchers observed the effects of winning on the participants. Again, the confederate was present and gambling during this phase, also winning at a higher rate. The participants then were brought back to a baseline phase before concluding the study on the C phase.

Two of the participants were given a counter-reversed design of ACACABAB. This was to see if the sequence of the design had an effect on the participants' gambling behavior. The phases were identical to those in ABABACAC, however, the participants were presented the high winning rate (B phase) prior to being introduced to the high speed (C phase). Again, the confederate was present and gambling throughout both participants' sessions.

After all of the phases were completed, the participants were brought to an "Exit" page. The participants were instructed to click the "End" button to conclude the study. Here, the subjects were debriefed on the study they just participated in as well as thanked for their

cooperation. After all questions the participants had were answered, the researcher provided the participants with a gift card.

CHAPTER 3

RESULTS

A total of five participants were observed during this experiment, with an average age of 24. Before the subject was able to participate in the study, they had to complete the SOGS. Results of the SOGS can be viewed in Table 1. Overall, every participant scored a 0 on the SOGS. This means absolutely none of the participants were "at risk" for being a potential pathological gambler and were able to participate in the study. Table 1 displays the SOGS as well as the GFA scores for each participant.

All of the participants completed the Gambling Functional Assessment (GFA) prior to the study. Participants 1 and 2 found that the gambling they engage in was attention maintained. This states that the participants tend to enjoy the social aspect that accompanies gambling such as having friends around. Participants 3, 4, and 5 found that their gambling behavior was maintained by tangibles. This would be the actual winnings earned at a casino. One participant scored low in the "sensory" category and none of the participants scored in the "escape" category as being the function of their gambling. See Table 1 for results of the Gambling Functional Assessment.

As previously stated, a confederate was gambling and displaying excitement when the confederate won throughout all sessions. The participants were not aware of the confederates "duty" and just assumed the confederate was another participant for the study. The confederate sat directly across the table from the subjects of the study while engaging in their slot machine.

Figure 1 displays the percentages per phase in which each participant chose to bet the maximum amount of credits. The participants' results were combined to create on graph in order to compare the percentages of bet max placed in the corresponding phases. Each phase contained

30 spins and there were a total of 8 phases. Participant 1 began the study in the A phase by clicking “bet max” only 3% of the time. Participants 2 and 3 had similar results to each other by betting the maximum credits between 23-27% of the time in the first A phase. Participants 4 and 5 appeared very similar to each other by clicking “bet max” between 50-53% of the time in the equivalent A phase. Participants 4 and 5 were the two in which experienced the ACACABAB order. Participant 1 remained at 0% for betting max during the next 5 phases (BABAC). Participant 2 increased their “bet max” slightly during the next 3 phases (BAB) and remained between 27-30%. Participant 3 ranged from betting max between 23-33% between the next three phases (BAB). Participants 4 and 5 ranged between 33-47% of betting max during the next 3 phases of BAB. When looking at the ACAC phases, participant 1 increased their “bet max” between 37-40% by the conclusion of the study while participants 2 and 3 increased from 37-40% to 77%. Participants 4 and 5 also showed an increase in betting max during these phases and ranged from 47-70%. Overall, a general increase is visible in all 5 of the participants when the higher win rate phases were introduced. See figure 1 to view the percentages of “bet max” placed per phase by each of the participants.

Figure 2 depicts the percentage of times that the participants bet the maximum amount of credits during each condition. As one would hypothesize, the higher win rate showed an increase in the number of times the participants would bet the max. This could be because the participants’ thought the win rate was influenced by their bets, which is false. The first condition of the series displays the amount of times bet max was placed for the normal speed and win rate (A phases), averaging 38.8%. The second condition was the fast reel spin phases (B phases) and averaged 28.3%. The third condition displays the high win rate (C phases), averaging the highest at 49%.

Figure 3 displays an overall mean of credits bet per phase in all of the participants' combined. This is combining the amount of "bet 1", 1 credit, and "bet max", 5 credits. During the first A phase in the ABAB series, a mean of 70 credits were placed across all 5 participants. The credits bet per phase remained steadily between 63-68 credits between the next 4 phases (BABA). To cap off the study in the CAC phases (the higher winning phases), the mean of credits bet per phase jumped to 78 and concluded the study with 108 credits. A visible upward trend it noticeable in figure 3 towards the phases in which the higher win rates were presented. Refer to figure 3 to view the overall average credits bet per phase.

When looking at the sequence effect of the study, it appears that the participants in the ABABACAC phase increased the amount of times they bet the maximum amount towards the end of the study when the win rate was higher. The participants in the ACACABAB design appeared to bet more "maximum bets" towards the beginning of the study when wins were more prevalent and less often towards the end of the study where wins were normal and the speed was manipulated. Figures 1, 2, and 3 all appear to agree with the hypothesis that the participants would choose to bet more maximum credits when there were more wins being obtained.

CHAPTER 4

Discussion

The current study chose to examine the effects of a confederate in the room gambling while the participants engaged in the simulated slot machines. The participants went through 3 different phases: regular slot machine phases, higher speed of the reels, as well as higher win rates. These phases were delivered in an order of ABABACAC. The A phase was the normal slot machine, the B phase was the higher speed of reels, and the C phase had higher win rates. The participants were also able to "bet one" or "bet max" before they clicked "spin". Data from the current study successfully proved the researchers' hypothesis. Overall, the participants tended to increase their bet amount when they were exposed to the C phase (higher amount of wins).

Prior to conducting the experiment, research was done to determine past studies on gambling behavior. Previous research have examined gambling behavior in the form of losses disguised as wins (LDW) and how that effects an individuals inclination to place bets. Losses disguised as wins are when the amount of bets placed end up being more than the actual amount won. In turn, the slot machine will sound of lights and music, indicating that the patron won, when in all reality, the individual lost. This then inclines the patrons to want to gamble more because their adrenaline is increased and they feel as if they are winning when in all reality, they're losing. As a result from the LDW, patrons may also feel the need to gamble more because they just might win the next round. Previous research suggest that the lights, sounds, and overall casino atmosphere can affect the gambling behavior and increase the amount of money or time an individual spends gambling. The results of the current study coincide with the idea that other variables affect gambling behavior.

Through visual observation, it was clear that the participants of the current study were well aware when the confederate had experienced a "win". After the participants were debriefed at the conclusion of the study, a general comment from the participants' were that they found themselves betting maximum credits after they heard the confederate win. As the participants did admit they were not exactly aware if the confederate played a part of the study or was a participant, they were aware of the sounds and winning that the confederate was engaging in. One participant stated that they assumed the confederate was a part of the study and said that they would pay attention to the excitement and sounds, particularly when they were in the higher win rate phase.

There are some limitations that accompany this study that must be discussed. The first limitation was that the study was not conducted in an actual casino. As previously stated, casinos are filled with a vast variety of games, sounds, lights, alcohol, as well as the social contingency involved. The participants in this study played slot machines created through Microsoft Visual Basic 2010 on a Macbook Pro laptop computer. This could have affected the study in that the participants were aware that they were not going to actually win the amount of money that the simulated slot machines displayed.

While the subjects were able to play on a simulated slot machine, they did not have sound for their reel spins and wins. The participants were able to visibly see the amount of credits they bet as well as the amount won. It would be beneficial for future research to have sound effects on the subjects' programs. However, the confederate's sound was working, so the subjects were able to hear every spin and when the confederate experienced a win. It would be interesting to see if everyone had sound or everyone did not have the effects of sound, how that would affect the gambling behavior of the participants'.

The behavior of the confederate may also be viewed as a limitation to the study. As stated previously, the confederate displayed excitement when a "win" was experienced. This behavior could have influenced the behavior of the participants. Previous research suggests that confederates play a large part in manipulating the behavior of other individuals present. This could go in two directions. First, the participants' may have caught on to the fact that the confederate was not actually winning or losing "real" money, resulting in the participant to not truly be affected by the confederate displaying the excitement. On the other hand, the participants' could have truly been inclined to be more interested in the simulated slot machines due to the fact that the confederate was actually displaying excitement and providing the environment with a more positive, uplifting atmosphere. In an actual casino, there are confederates that display excitement, thrill, adrenaline rushes, and other forms of enjoyment. There are also those who may cause a scene when they lose an amount of money or just sit there silently, spinning the reels with no sort of emotion on their face.

Another concern of the researchers were if the participants were carelessly clicking bets and spinning without giving thought as to how much they were betting. Due to the participants' not having to use their own money for this program, they could have completed the study strictly to earn their gift certificate at the end. This limitation may coincide with the fact that the study was not conducted at a real casino. It must be noted that it would be unethical to conduct this type of study in an actual casino. During the debriefing sessions, one participant in particular openly admitted that they were carelessly clicking the bets throughout the study since they had nothing to lose and they were not playing with real money. The data actually displays that clearly and shows that "bet one" was clicked almost every trial for the first 6 phases. The other participants did mention that they were not as stressed as they would be in an actual casino,

therefore, causing them to not be too affected by deciding whether to bet one or bet the maximum amount of credits. In an actual casino setting, patrons may show a variety of emotions: excitement, anger, stress, anxiety, depression, etc. All of these emotions revolve around the gamble of losing any amount of money. This present study showed results that were similar to the hypotheses of the researcher, assuming the fact that it did not occur in an actual casino did not have too negative of an effect.

Another limitation of this study is that the participants were from a convenience sample. Participants were recruited from graduate level classes in rehabilitation majors. It should be noted that none of the five participants scored above a zero on the SOGS (South Oaks Gambling Screening) and the highest score on the GFA (Gambling Functional Assessment) was a 20 (ranged 4-20). Not only were these participants' far from being pathological gamblers, they were not even recruited because of a love for gambling and casinos. The students simply were asked to participate in a study, therefore, we do not know if they have a past with gambling, enjoy it, or genuinely do not like slot machines.

The design in the current study is another variable to the study. Three of the participants were in the group of the ABABACAC design. In this design, the faster reel spin phases were introduced before the higher win rate phases. The other two participants went through the ACACABAB design. In this design, the higher win rates were delivered before the faster reel spins. When converting the data into graphs, it was decided that all participants be combined in order to view the overall effects of the study. The researchers chose to split up the participants into different designs to determine if the sequence had an effect on the results of the study.

Based on the results of this study, it is easy to see how casinos can keep pathological gamblers returning to slot machines. One way they do this is through losses disguised as wins

(LDW). Based on results of the current study, a higher win rate resulted in more credits bet. The win rate presented in this study was roughly 45% higher than the win rate in the other phases. Casinos can capitalize on this by using losses disguised as wins. If a gambler is betting the max credits based on a hypothetical rule that they will be more likely to win, casinos can factor in losses disguised as wins through returning a high win rate, but the gambler does not actually win back all of his wagers. For example, if a gambler bets 5 credits, the slot machine may sound its happy upbeat music with flashing lights but the gambler may have only "won" back two credits. Thus, the gambler has sacrificed 3 credits. Pathological gamblers may be blinded by this scheme, easily falling victim to the casinos ploy. Another way in which casinos keep pathological gamblers returning to the slot machines is by the simple social aspect of the environment. As previously described, flashing lights and sounds along with alcohol create a very welcoming environment for anyone. For those with an addictive personality, it is even easier to want to go back the next night to win their money back. Through spending so much time at a casino, pathological gamblers and other regular gamblers get to know each other and understand why each of them return so frequently. This creates a friendly relationship with the casino and gives pathological gamblers more reason to go back to the casino.

The implications that this current study yielded are useful for future research that could be expanded from this study. Future studies should consider using a larger group of individuals. The present study chose to use a single-subject design, however, an expanded study could benefit from using a group design. Using a larger sample size with a variety of demographics could create a stronger study by observing the gambling behavior of more people, rather than 5 individuals. Future studies should also consider using both pathological gamblers and non-pathological gamblers to compare the gambling behavior between the two groups. The current

study chose to use a sample of graduate students randomly chosen to participate in a study. These students did not particularly know prior to the study what they would be participating in. The researchers simply asked them if they would like to participate in a study and in return earn extra credit or a gift card. Thus, the students may not have had any interest in gambling whatsoever. Future studies could benefit from utilizing patrons from an actual casino that clearly have an interest in gambling and slot machines. Another way researchers could extend this research is to incorporate the use of alcohol and gambling behavior. Previous research suggests that through the use of a confederate, alcohol consumption at a bar can be controlled. In other words, the more a confederate may intake, the more the other individual may intake as well. When viewing the amount of alcohol consumed in a casino, it would be interesting to determine if the patrons would bet more loosely after indulging in a few alcoholic beverages. Alcohol tends to make individuals more relaxed and possibly cause them to make more risky decisions and bets. Branching off of the use of confederates while gambling, the future of gambling research could expand by actually utilizing patrons' close friends as confederates. Of course it would be crucial for the confederates to pretend as if they are subjects as well and not inform the participants' that they are actually a part of the study. The variables would have to be ironed out, however, it may be determined that individuals' will gamble even more with a confederate as their friend who is engaging in high gambling rather than an unknown confederate. Humans are easily influenced when individuals' of their preference are engaging in certain activities. Conducting a study in which not only the lights and noise of an actual casino are present, but the friend of the participant is also engaging in heavy gambling could be enough of a social reinforcer that the patron will increase their usual betting.

Table 1

Table 1 displays the scores on the South Oaks Gambling Screen and Gambling Functional Assessment for participants in the study

Participant	Gender	Score on SOGS	GFA Function	GFA Score
1	Female	0	Attention	20
2	Female	0	Attention	8
3	Male	0	Tangible	6
4	Female	0	Tangible	4
5	Female	0	Tangible	1

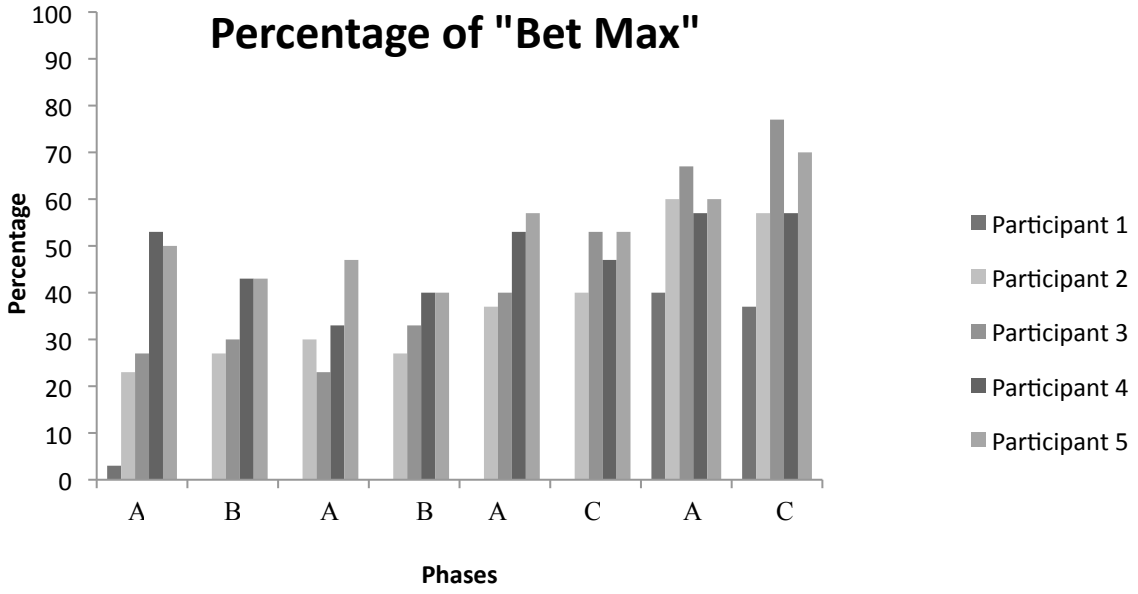

Figure 1. Figure 1 represents the percentages per phase that the participants chose to bet the maximum amount of credits. Each participant is represented separately and the key displays the corresponding color for the participants.

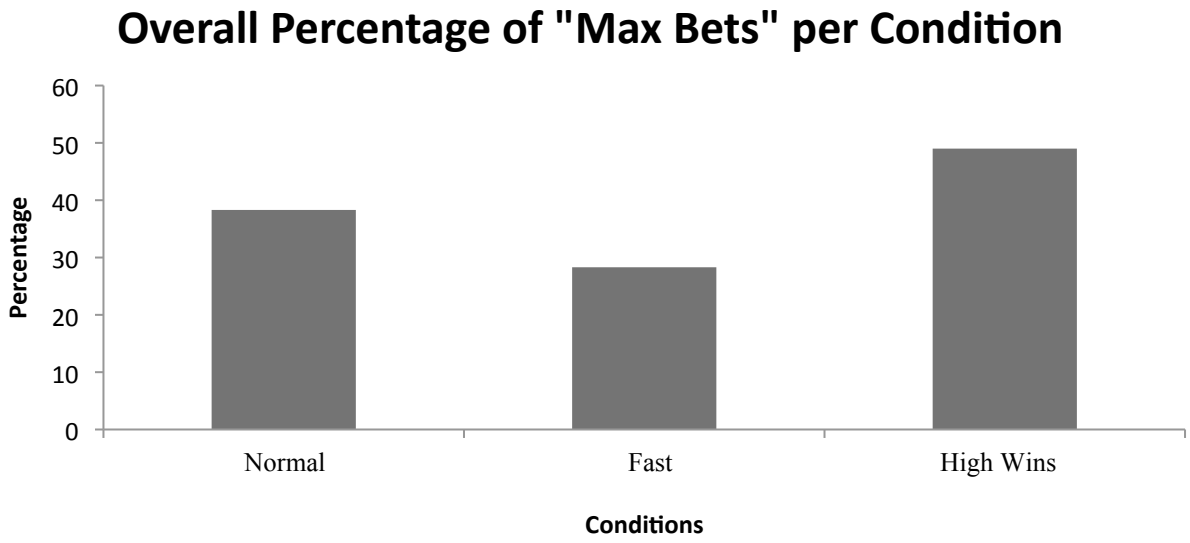

Figure 2. Figure 2 displays the overall percentage in which the participants' placed the maximum bets per condition. The first condition is the normal speed and normal win rate phase (A phase). The second condition is the fast reel phase (B phase) and the third condition is the higher wins phase (C phase).

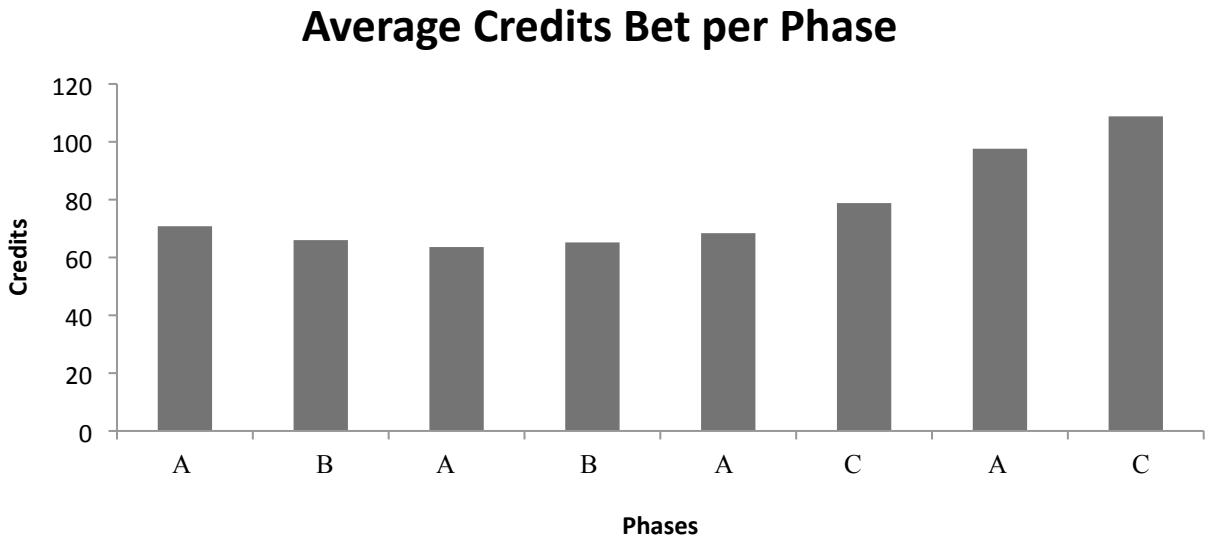

Figure 3. Figure 3 displays the average credits bet per phase by participants 1-5 combined. The total credits combined for bet one and bet max (worth 5 points) were added together and an average was discovered for each phase.

REFERENCES

Aasved, M. (2003). *The sociology of gambling* (Volume 2). Springfield: Charles C Thomas.

American Gaming Association (2013). *2012 State of the states: The AGAqaq survey of casino entertainment.* Retrieved February 1, 2013, from http://www.americangaming.org/sites/default/files/uploads/docs/sos/aga_sos_2012_web.pdf

American Gaming Association (2013). *2012 Fact Sheets: Gambling disorders.* Retrieved February 1, 2013, from http://www.americangaming.org/industry-resources/research/fact-sheets/gambling-disorders

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders (*4th ed. Text revision). Washington, D.C: Author.

Black, D.W., & Moyer, T.M. (1998). Clinical features and psychiatric comorbidity of subjects with pathological gambling behavior. Journal of *Psychiatric Services, 49,* 1434-1439.

Breen, R.B. (2004). Rapid onset of pathological gambling in machine gamblers: A replication. *International Journal of Mental Health & Addiction, 2,* 44-49.

DeRicco, D.A., & Niemann, J.E. (1980). In vivo effects of peer modeling on drinking rate. *Journal of Applied Behavior Analysis, 13,* 149-152.

Dixon, M.R. (2007). Why behavior analysts should study gambling behavior. *Analysis of Gambling Behavior, 1,* 1-3.

Dixon, M.R., Bihler, H.L., & Nastally, B.L. (2011). Slot machine preferences of pathological and recreational gamblers are verbally constructed. *The Psychological Record, 61,* 93-112.

Dixon, M.R., & Johnson, T.E. (2007). The gambling functional assessment (GFA): An assessment device for identification of the maintaining variables of pathological gambling. *Analysis of Gambling Behavior, 1,* 44-49.

Dixon, M.R., & Schreiber, J.E. (2004). Near-miss effects on response latencies and win estimations of slot machine players. *The Psychological Record, 54, 335-348.*

Eadington, W.R. (1999). The economics of casino gambling. *Journal of Economic Perspectives, 13*(3), 173-192.

Hoon, A., Dymond, S., Jackson, J.W., & Dixon, M.R. (2008). Contextual control of slot-machine gambling: Replication and extension. *Journal of Applied Behavior Analysis, 3,* 467-470.

Ladouceur, R., & Shaffer, H.J. (2005). Treating problem gamblers: Working towards empirically supported treatment. *Journal of Gambling Studies, 21,* 1-4.

Lesieur, H.R., & Blume, S.B. (1987). The South Oaks Gambling Screen (SOGS): A new instrument for the identification of pathological gamblers. *American Journal of Psychiatry, 144,* 1184-1188.

Maclin, O.H., & Dixon, M.R. (2004). A computerized simulation for investigating gambling behavior during roulette play. *Behavior Research Methods, Instruments, & Computers, 36,* 96-100.

Maclin, O.H., Dixon, M.R., Daugherty, D., & Small, S. (2007). Using a computer simulation of three slot machines to investigate a gambler's preference among varying densities of near-miss alternatives. *Behavior Research Methods, 39,* 237-241.

McDougall, C.L., McDonald, D.J., & Weatherly, J.N. (2008). The gambling behavior of American Indian and Non-Indian participants: Effects of the actions and ethnicity of a confederate. *The Journal of the National Center, 14(3),* 29-74.

McDougall, C.L., Terrance, C., & Weatherly, J.N. (2011). The effect of male confederate presence, betting, and accuracy of play on males' gambling on blackjack. *The Psychological Record, 61,* 411-424.

Petry, N.M., & Weinstock, J. (2007). Internet gambling is common in college students and associated with poor mental health. *The American Journal on Addictions, 16,* 325-330.

Shaffer, H.J., LaPlante, D.A., LaBrie, R.A., Kidman, R.C., Donato, A.N., & Stanton, M.V. (2004). Toward a syndrome model of addiction: Multiple expressions, common etiology. *Harvard Review of Psychiatry, 12,* 367-374.

Skinner, B.F. (1958). Reinforcement today. *The American Psychologist, 13*, 94-99.

Thomas, A.C., Allen, F.L., Phillips, J., & Karantzas, G. (2011). Gaming machine addiction: The role of avoidance, accessibility and social support. *US: American Psychological Association, 25(4),* 738-744.

Volberg, R.A. (1994). The prevalence and demographics of pathological gamblers: Implications for public health. *American Journal of Public Health, 84,* 237-241.

Volberg, R.A. (1996). Gambling and problem gambling in New York: A 10-year replication survey, 1986 to 1996: Report to the New York Council on Problem Gambling. *Journal of Gambling Studies,* 1-55.

Volberg, R.A. (1996). Prevalence studies of problem gambling in the United States. *Journal of Gambling Studies, 12,* 111-128.

Weatherly, J.N., Bushaw, B., & Meier, E. (2009). Social influence when males gamble: Perceptions and behavior. *Analysis of Gambling Behavior, 3,* 36-47.

Weatherly, J.N., & Dixon, M.R. (2007). Toward an integrative behavioral model of gambling. *Analysis of Gambling Behavior, 1,* 4-18.

Weatherly, J.N., Thompson, B.J., Hodny, M., & Meier, E. (2009). Choice behavior of nonpathological women playing concurrently available slot machines: Effects of changes in payback percentages. *Journal of Applied Behavior Analysis, 42,* 895-900.

Welte, J., Barnes, G., Wieczorek, W., Tidwell, M.C., & Parker, J. (2001). Alcohol and gambling pathology among U.S. adults: prevalence, demographic patterns and comorbidity. *Journal of Studies on Alcohol, 62(5),* 706-712.

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Examining Rate of Play with Varying Speed and Win Rate on Simulated Slot Machines

Major Professor: Dr. Mark R. Dixon