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Given the high rates of gambling in the United States and the growing population of problem and pathological (disordered) gamblers, there is a need for effective interventions which will eliminate or reduce disordered gambling, or, at minimum, reduce harm resulting from disordered gambling. High-risk populations for development of disordered gambling include college students and online poker players. This study sought to develop and test a brief behavioral intervention for decreasing monetary loss, time spent gambling, and risky betting for college-aged self-identified problem gamblers who play online poker. This study included four participants in a multiple baseline across participants. Post-intervention, all participants gambled fewer days overall, and three of four participants lost less money overall. The fourth participant was never at a net monetary loss.

Keywords: Poker, Online gambling, Disordered gambling, Experimental intervenetion, Behavior analysis

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"If you're going to play the game, boy,
you've got to learn to play it right."
-Don Schlitz; *The Gambler*

Gambling is a popular form of recreation in the United States, where 86% of adults have admitted to gambling in their lifetime (see National Gambling Impact Study Commission [NGISC], 1999). Some form of gambling is legal in most states in the USA, as well as in much of the Western world. As the availability of legal gambling has increased, the prevalence of pathological and problem gambling has also increased (Shaffer, Hall, & Vander Bilt, 1999).

Pathological gambling is defined as a persistent pattern of recurring maladaptive gambling behavior, as evidenced by the presence of five (or more) of the 10 specified symptoms (DSM-IV TR, American Psychiatric Association, 2000). Problem gambling is a sub-diagnostic condition considered less severe than pathological gambling, and typically includes fewer symptoms than does pathological gambling. Together, pathological and problem gambling have been labeled "disordered gambling" (see Petry, 2009).

Not only is disordered gambling prevalent, but also it has a well-documented social and financial impact. Disordered gambling has been linked to criminal activity, other psychological problems, financial problems, and suicide (Meyer & Stadler, 1999; Petry & Armentano, 1999; Phillips, Welty, & Smith, 1997).

Research suggests that online gamblers are more likely to have disordered gambling behavior patterns than live (in-person) gamblers (Ladd & Petry, 2002). There is evidence that college students, who are online poker players, are at particular risk of developing disordered gambling behavior (e.g., Wood, Griffiths, & Parke, 2007). Given the popularity of poker (e.g., televised tournaments) and the increasing access to poker via casinos and local fund-raising events, it is im-

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portant to develop and evaluate treatment options that are specific to poker.

Abstinence from gambling is difficult to achieve even with disordered gamblers who voluntarily seek treatment. Harm reduction strategies, such as interventions targeting responsible gambling, have the potential to reach and help gamblers for whom abstinence is not a preferred treatment goal. Gambling experts have suggested that treatment goals other than abstinence are viable options for some disordered gamblers (e.g., Ladouceur, Lachance, Fournier, 2009).

Treatment packages for disordered gambling have been described, some of which require a considerable investment of time and resources (Petry, 2009). Brief interventions may be attractive treatment alternatives for disordered gamblers who are not motivated to commit to lengthy, abstinence-focused treatment programs (e.g., Petry, Weinstock, Ledgerwood, & Morasco, 2008). It is estimated that a very small portion of disordered gamblers (3%) seek treatment, and of those who do, 50% drop out (Ladouceur, Gosselin, Laberge, & Blazcynski, 2001; Ladouceur, Lachance, & Fournier, 2009). Thus, there is need for the development of brief and effective interventions that do not incur high drop-out rates.

One approach that does not require abstinence but does focus on harm reduction is a strategy to reduce risky betting and the accompanying financial losses. For example, Xuan and Shaffer (2009) have shown that betting on longer odds (i.e., probabilistically unlikely outcomes) may contribute to the maintenance and adverse impact of disordered gambling. This suggests the need for interventions that are designed to alter betting patterns so that disordered gamblers consider the odds before placing a bet, thus reducing the risk of monetary loss.

The purpose of this study was to examine a brief intervention for online poker players who self-identify as problem gamblers with no interest in abstinence from gambling. Brief interventions have potential to be effective for problem gamblers (Petry et al., 2008). The intervention reported herein consisted of two sessions delivered over one day: one session of education about rules regarding pot-odds and poker betting (explained below) and one session of practice with performance feedback in applying these rules to various poker scenarios. In general, the participants learned to state the betting rules and calculate pot-odds before risking money on a bet. Performance feedback has previously been shown to reduce errors in video poker play among casual gamblers (Dixon & Jackson, 2008); we hypothesized that performance feedback similarly could reduce risky betting among disordered gamblers in this study. This intervention was evaluated for its effects on: 1) time engaged in online gambling, 2) the pattern of pot-odds betting, and 3) the impact on monetary loss/gain from gambling.

METHOD

Participants

Participants were recruited from flyers posted in campus buildings or from announcements in undergraduate Psychology classes. The flyers and announcements described a research study for online poker players. Interested students were given instructions on how to contact the first author to confirm interest and set up an initial meeting to review the purpose of the study. In the initial meeting the first author explained and read through the informed consent document with potential participants. There was no compensation offered to participants. The Human Subjects Institutional Review Board at Western Michigan University approved the study.

Nine people consented to participate in this study, of which four met inclusion criteria (explained below) and subsequently completed the study. The four participants were assigned the pseudonyms Joe, Sam, Jane, and

John. They were aged between 19 and 26 years, and all played Texas Hold-Em Poker (For a summary of Texas Hold-Em rules and terms, see Appendix.). Joe played primarily no-limit tournaments. Sam played primarily no-limit tournaments and occasional cash games. Jane played primarily limit cash games. John played primarily limit cash games with varying blind levels (see Appendix for terms).

Materials and Setting

Participants completed a questionnaire to assess inclusion eligibility, and a modified version of the South Oaks Gambling Screen to assess disordered gambling (SOGS; Lesieur & Blume, 1987), which is explained below.

To be included in this study, participants were required to:

1) already play for real money on active accounts on at least one online gambling website that tracks hand history (hand history is a record of activity from the online poker website, including hands played, time of hands, and bets made),

2) be willing to share the hand history with the researchers,

3) agree to play online poker exclusively on a single site that tracks hand history,

4) indicate either that: a) they were at a net loss in terms of their gambling bankroll for the year, or b) they typically lose when online gambling, and

5) report that they were not interested in abstinence training.

The inclusion questionnaire also asked participants about their knowledge of strategies associated with poker success including pot-odds, poker-odds, and expected value (see below in Intervention Procedures). In addition, participants reported if they typically used any of the aforementioned strategies while playing poker.

The SOGS is frequently used to identify potential disordered gamblers. Originally developed as a measure of lifetime pathological gambling, SOGS has been validated as a gambling measure over more finite time frames (Wulfert et al., 2005), including a past month version of the SOGS (e.g., Petry et al., 2008). The past month version of SOGS was used in this study to assess severity of disordered gambling and to document changes in gambling across the course of the study. Scores on the past month SOGS range from 0 to 20, with scores between a 1-4 indicating problem gambling, and scores of 5 or higher indicating pathological gambling.

Participants who met the inclusion criteria tracked their hand histories for their online poker account and sent daily or weekly data to the experimenter via e-mail or flash drive. Participants were scheduled for their intervention sessions after a review of their hand history revealed relatively stable levels of monetary gains/losses over time. A total for money won or lost via gambling per day, was calculated as the primary dependent variable.

The research was conducted in a session room in the Behavioral Medicine Laboratory on Western Michigan University campus. The room contained one large desk and one small personal desk attached to a chair, a personal computer with a keyboard and mouse, a monitor, a calculator, two chairs, and a few bookcases. The computer contained a customized program, written by the first author, with a variety of card and bet combinations able to be displayed.

Procedure

Sessions were run individually for each participant. The intervention consisted of two sessions over one day. The sessions took 20-30 minutes each. Participants had a short break (approximately five minutes for restroom use or to consume a refreshment) between the sessions.

Participants provided hand history for a month after the intervention sessions, and then completed the SOGS for a second time.

Participants also completed a questionnaire that required them to calculate pot-odds to assess if the calculation skill was still in participants' repertoire.

Intervention Procedures. Participants completed two sessions with the first author or trained research assistants as described below.

In the first session the experimenter trained participants regarding pot-odds, poker-odds, and expected value (EV). The experimenter explained that poker is a chance game, and introduced the concept of EV. EV in the context of poker is the amount of money to be won or lost in the long term. A simple version of EV consists of pot-odds and poker-odds. Pot-odds are readily calculable. The amount of money a player must bet to continue in a game is compared to the amount of money that could be won. The less money a player must invest to win a bigger pot, the better. If a player has to bet only $10 into a $100 dollar pot to continue (10 / 100 = .01), he or she can be wrong nine times out of ten and still have money to continue. Poker-odds are the odds of a hand being a winning hand. These are not readily calculable because the hands of the other players cannot be known in Texas Hold-Em poker. Thus, poker-odds depend on a player's ability to "read" an opponent to determine hand strength. Reading is a skill set with which poker players guess hands of opponents based on body language and experience with betting patterns and previous hands of opponents. Reading is not reliable or easily defined as a skill set, so reads can often be wrong. However, if a player reads what cards an opponent has, the player can then calculate the poker-odds. For example, in a deck there are 52 cards, but 2 cards are accounted for right away (the player's hand). So there are 50 unknown cards, and this number shrinks as the flop, turn, and river occur (See Appendix for terms). So, if a player is holding a pair (say a pair of tens), and the opponent bets such that the player reads accurately that the opponent may be holding a higher pair, there are two tens in the deck that could help the player's hand. For the sake of simplicity, we will limit the cards that can help to the two tens. So there are two cards that will help the hand and 48 cards that will not. The chances of improving from the pair to three-of-a-kind are 24 to 1 (48 / 2 = 24). To conservatively call the bet, the pot-odds should indicate that there is 24 times the amount required to call in the pot. The EV formula here is:

[(The bet) * {cards that will not help/remaining cards}] + [(the pot) * {cards that will help/remaining cards}] = EV

The experimenter explained that every time a participant is going to bet, call, or raise, he or she should assess how risky a move that is with a pot-odds calculation, and not depend on poker-odds, as poker-odds cannot be known due to reading not being a reliable skill.

The experimenter presented hand examples step by step, and explained the pot-odds in each example using a formula sheet (given to participants to keep) and a calculator. The experimenter then presented poker examples to the participant and asked the participant to: 1) identify how to assess the pot-odds and 2) calculate the pot-odds. When the participant successfully calculated the pot-odds in two consecutive examples, the experimenter then discussed poker-odds. Poker-odds cannot be known because they depend on knowing other players' hands, so participants were encouraged to generally play strong starting hands such as those on poker experts' top-ten hands lists or successful hands in online poker lists.

In the second session (after the short break), participants practiced applying pot-odds calculations. During the break the experimenter prepared the computer so that participants were presented with an image of a poker table similar to online poker user inter-

faces. Multiple betting scenarios in poker were presented for participants to practice calculating pot-odds. At each round of betting, the experimenter prompted participants to state the pot-odds rule and prompted participants to calculate and vocalize the current pot-odds. If participants successfully paraphrased why to calculate pot-odds and successfully calculated the pot-odds, then the next betting scenario was presented on the monitor. If participants did not state the rule or did not state the pot-odds correctly within one minute, the hand was checked or folded. Though it never occurred, if a participant had gone four rounds of betting (equivalent of a full hand in Texas Hold-Em) without stating a rule or correctly stating pot-odds, the experimenter would have halted the simulated poker and reviewed pot-odds examples and rules again, as in the first session. When participants correctly identified pot-odds and stated the rule during the simulated poker play, the experimenter provided praise. When participants incorrectly identified pot-odds or rules, the experimenter would provide prompts to recalculate.

When participants correctly stated the rule and the pot-odds 24 consecutive times (the equivalent of six hands, each with four rounds of betting), the simulated portion ended.

Experimental Design

The current study utilized a non-concurrent multiple baseline across subjects design. The multiple baseline was chosen for the advantages of closely examining data in this study and to rule out general time effects.

RESULTS AND DISCUSSION

Figure 1 shows the participants' dollars gained/lost per day while gambling as reported in the hand history. The baseline was characterized by variable monetary outcomes with a number of participants reporting winnings (scores above 0) and others reporting losses (scores below 0). In most cases, the implementation of pot-odds training and calculations is associated with a reduction in monetary losses.

Table 1 shows the participants' net dollars gained and lost per phase, average pot-odds played per phase, the mean number of minutes spent gambling per day in each phase, and the pre- and post-intervention SOGS scores.

During training in the second session, all participants demonstrated mastery of pot-odds calculations for 24 consecutive attempts. Jane made no errors on any trial. John, Joe, and Sam made one, two, and three pot-odds calculation errors respectively but still met mastery criterion.

The participants in the study all showed a post-intervention decrease in one or more gambling measures. More specifically, all participants saw reductions in their SOGS scores, amount of time playing, and number of days with dollars lost.

Shortly after intervention for Joe (day 22) was "Black Friday" as dubbed by the online poker community (day 24; marked with an asterisk in Figure 1). The United States Department of Justice indicted the owners of three major poker sites and seized the .com domains associated with the poker sites (United States Attorney, Southern District of New York, 2011). The poker site that Joe played on was one of the seized websites. Joe tried two other functional websites and settled on one. Joe reported that he was not able to save the data from the new sites when trying them, but that he had winning sessions on each. Day 39 was the last day we received data from Joe, which was the second highest gain of all his days. We stopped data collection on day 49. Black Friday did not affect other participants.

Interestingly, the intervention produced only relatively minor changes in the pot-odds of hands played. It is possible to obtain significant outcome improvements (e.g., dollars

Participant	Net $ gained/lost	Average pot-odds played	Average min gambling/day	SOGS scores pre, post
Jane	-154.33, +9.99	18.68, 19.78	91.88, 14.69	6, 0
John	-107.84, -.14	21.4, 16.91	68.9, 14.23	3, 0
Joe	+36.21, +98	27.87, 27.17	22.86, 3.5	6, 0
Sam	-730, -20	25.47, 23.91	19.44, .98	4, 0

Table 1. Results for each participant. All data are formatted X(baseline data), Y(post-intervention data) except SOGS scores pre, post which are X(beginning of data collection), Y(end of data collection)

lost) by changing the playing strategy for only a small number of low probability hands and produce only very modest changes in the pot-odds when averaged across multiple hands. In addition, the calculation of pot-odds increased the time involved in playing a poker-hand. The calculation and possible covert rule stating may have increased response effort for, or competed with, betting behavior. These are variables that may have deterred impulsive gambling responses and decreased overall levels of gambling. Unfortunately, we did not include measures of impulsivity, response effort, or other behavioral processes. Our measures were selected to evaluate effects related to harm reduction, of which money lost and time spent playing were of use. However, these measures are behavioral products (money won/lost) and topographical as opposed to functional aspects of behavior (time spent playing, pot-odds played). Future research could test effects of this kind of intervention at a more behavioral process level.

This study has several limitations. The intervention tested here did not involve a functional assessment or analysis of each individual's gambling behavior (i.e., we did not identify the controlling variables for gambling for each individual). While it is true that each of the participants reported 1) to primarily play poker, and 2) little or no pre-intervention use of calculated pot-odds, it is possible that the identification of additional motivational variables for each gambler (e.g., social reinforcement, absence of competing recreational activities) might allow for the development of more effective interventions that are tailored to the controlling variables for each gambler.

Another limitation is that the disordered gamblers in the study were self-identified. The authors postulate that the participants in this study, although they had some problems with gambling, did not have severe problems. An additional limitation is that while dollars gained/lost over days was tracked and SOGS scores were evaluated, we had to rely on self-report to verify that participants had not shifted their gambling to other forums (e.g., other websites or live games), which were not open to data collection. Additionally, there is the possibility that the participants returned to previous gambling behavior after data collection when potential reactivity to demand characteristics of the experiment ended. A related limitation is the possibility of participants tampering with their hand histories; the hand histories are text or spreadsheet files. Participants could have changed information

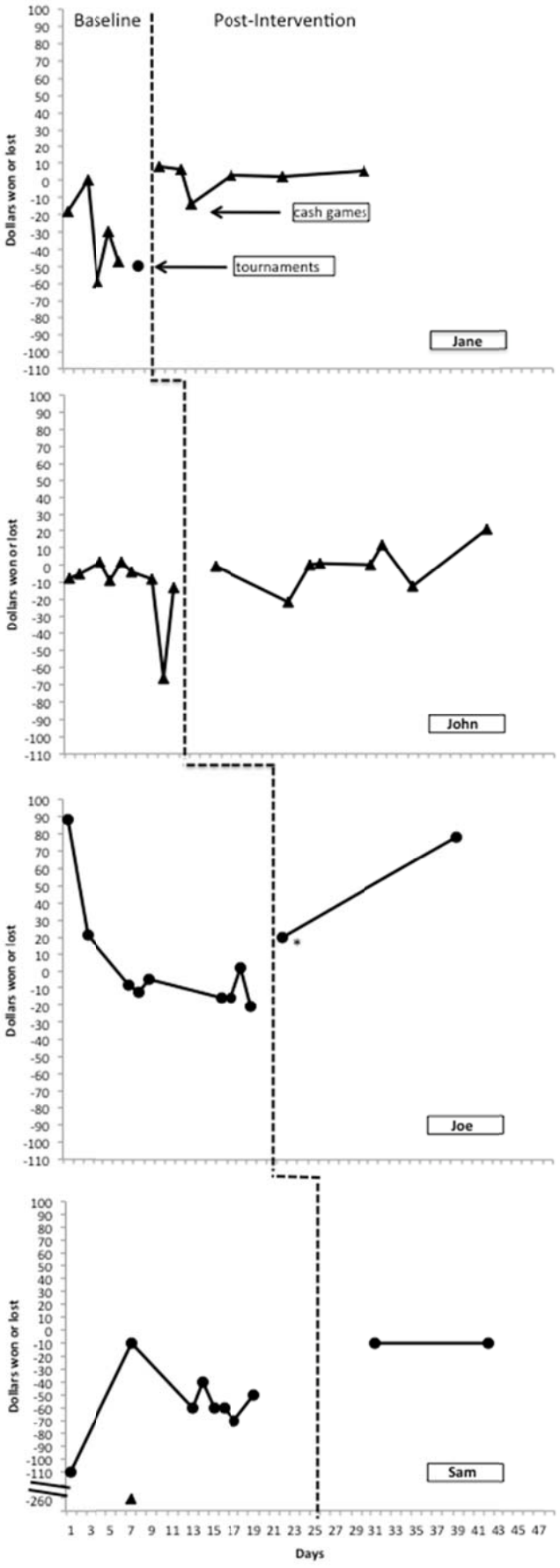

Figure 1. The multiple baseline graph of all four participants' dollars gained/lost per day gambling occurred. Not all days include gambling. The triangle points indicate days made up of cash games, the round data points are made up of tournaments. The asterisk (*) in Joe's graph indicates "Black Friday" for Joe. Sam's graph includes an ordinate axis break between -110 and -260 for an outlier cash game.

in the files, though doing so without causing inconsistencies in the data would have been a response-heavy task simply to hide some of the data from the researchers. Nevertheless, the possibility remains. When they were turned in, hand histories were checked for modification history and no inconsistencies in time stamps were found. However, this does not eliminate the possibility that entire files were omitted from being turned in to the researchers. Despite the potential integrity issues with hand history, they provide detailed information on behavior and are perhaps more reliable than pure self-report.

In conclusion, the intervention described herein, (calculation of pot-odds) appeared to produce one or more positive results for all four of the gamblers in this study. Future research should examine long-term effects of such interventions, behavioral processes involved, and perhaps find more systematic ways to tailor interventions to the unique controlling variables for each gambler.

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Appendix

Poker Rules and Terms

In Texas Hold-Em Poker, a hand consists of four rounds of betting. A hand begins with each player being dealt two face-down cards (i.e. hole cards), followed by a round of betting. Then three cards are dealt face-up, which everyone may use (i.e. the flop), followed by another round of betting. A fourth face-up card is dealt (i.e. the turn), followed by another round of betting, then the last (i.e. the river) face-up card is dealt, followed by a final round of betting. If more than one player is left after the final round of betting, the players turn over their face-down cards, and the player with the best five card combination wins the money bet throughout the hand (i.e. the pot).

Players can buy-into either cash games or tournaments. In a cash game a player buys in with a set amount of money that is directly transformed into chips for play. The player can play for as long or as short as he or she wishes or until his or her chips are gone. In a tournament the buy-in money is transformed into some set amount for all players (e.g. buy-in for $10 and receive 100 chips for play) and the game continues until a winner is decided when all but one player loses his or her chips.

Texas Hold-Em Poker can be played in a limit or no limit version. In the limit version, betting is capped at a particular amount each round. In no limit, players may bet as much of their money as they wish in a round of betting.