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USING UNSOLVABLE ANAGRAMS TO INDUCE ESCAPE: WILL IT INCREASE GAMBLING BEHAVIOR?

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Previous research has found an association between gambling as a means of escape and pathological gambling. Likewise, previous laboratory research has found an association between gambling as a means of escape and participants' gambling behavior. The present experiment had 41 participants play video poker in two sessions. Prior to one session, participants were asked to solve a series of solvable word puzzles. Prior to the other, they were asked to solve a series of unsolvable word puzzles. Consistent with previous research, results demonstrated that participants' video-poker play was associated with their overall tendency to endorse gambling as a function of escape. However, their behavior did not vary as a function of whether the word puzzles were or were not solvable. These results may suggest that the different word puzzles used in the present procedure were similarly aversive. However, they may also suggest that gambling as an escape represents a general behavior pattern that is not necessarily sensitive to brief environmental manipulations.

Keywords: Gambling, Escape, Video Poker, Anagrams, University students

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The *Diagnostic and Statistical Manual of Mental Disorders* lists gambling "as a way of escaping from problems or of relieving a dysphoric mood" as a symptom of pathological gambling (American Psychiatric Association, 2000, p.674). Dixon and Johnson (2007) developed the first behavioral questionnaire with a specific category intended to measure if someone is gambling as a way of escaping from something. The Gambling Functional Assessment (GFA) is a 20-item questionnaire designed to identify four possible maintaining contingencies of gambling behavior: tangible, social attention, sensory experience, and escape.

Miller, Dixon, Parker, Kulland, and Weatherly (2010) had participants complete the GFA and the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987). The SOGS is a screening tool used to identify the potential presence of pathological gambling. These researchers found escape scores on the GFA were often predictive of SOGS scores of 5 or greater, which indicates the potential presence of pathological gambling.

Weatherly, Montes, and Christopher (2010) tested whether escape contingencies would be related to certain aspects of gambling behavior in a laboratory environment. Participants completed the GFA and played a 15-min session of video poker. The behavioral measures during video-poker play were the number of hands played, the number of coins bet, and the accuracy of play (i.e., whether the participants held/discarded the cards that gave them the highest percentage chance of winning). Participants with higher escape scores on the GFA bet significantly more credits during video-poker play than participants with lower escape scores. Weatherly et al.'s findings suggest people who endorse gambling as an escape may take more risks than people who do not gamble as an escape behavior.

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Although the GFA has been a successful research tool, researchers have also evaluated its reliability and construct validity (Miller, Meier, & Weatherly, 2009; Miller, Meier, Muehlenkamp, & Weatherly, 2009). Overall, measures of internal consistency and test-retest reliability were good. However, the test-retest reliability for the category of escape was less than ideal. Another potential limitation of the GFA was found when factor analyses yielded a two-factor model, suggesting that the GFA measured gambling maintained by positive and negative reinforcement. The GFA was originally constructed to measure four different contingencies.

Because of these issues, Weatherly, Miller, and Terrell (2011) attempted to modify the GFA. They had 1,060 undergraduates complete a revised version that had 22 items, 11 each measuring positive and negative reinforcement contingencies. The exploratory analyses ultimately led to a 16-item questionnaire, with 8 items measuring gambling maintained by positive reinforcement and 8 measuring gambling maintained by negative reinforcement. A confirmatory factor analysis validated the new GFA-R. To test the reliability of the GFA-R Weatherly, Miller, Montes, and Rost (2012) had 87 of the 1,060 undergraduates complete the GFA-R a second time after 4 weeks, and 98 undergraduates completed the GFA-R again after 12 weeks. Internal consistency and test-retest reliability ranged from good to excellent.

The present study was designed as an attempt to replicate the finding of Weatherly et al. (2010) that gambling in a laboratory environment would be associated with participants' endorsement of gambling as an escape as measured by the GFA-R. A second goal was to see if increased gambling could be induced by setting up an aversive situation. That is, would participants display increases in their gambling behavior if gambling served as a possible escape from a potentially aversive task?

In order to accomplish this second goal, we had participants attempt to solve unsolvable anagrams, which they could discontinue doing at any time to play video poker. In the past, unsolvable anagrams have been used in studies as a way of inducing stress in participants. Zellner et al. (2006), for instance, had participants sit in a room with four bowls of food on a table and presented half of participants with solvable anagrams and the other half with unsolvable anagrams. The participants who were given the unsolvable anagrams reported being significantly more stressed than participants given the solvable anagrams. Participants who were given the unsolvable anagrams also ate significantly more of the unhealthy choice of food, and significantly less of the healthy choice of food, than participants who were given the solvable anagrams. Weidner, Friend, Ficarrotto, and Mendell (1989) had participants complete unsolvable anagrams and found an increase in diastolic blood pressure, systolic blood pressure, and heart rate. Their participants also reported frustration, helplessness, and anxiety as a result of the unsolvable anagrams.

However, it may not be legitimate to expect the response to solving anagrams to be uniform. For instance, Gavurin (1967) found a significant and positive correlation between "mental ability" and anagram solving. Specifically, general mental ability, spelling achievement, verbal and abstract reasoning, numerical ability, and 2- and 3- dimensional spatial ability were correlated with solving anagrams. Similarly, anagram solving has been found to correlate with SAT performance (Gavurin, 1972). Thus, it would seem reasonable to expect that the aversiveness of anagrams might also vary with these abilities.

If aversive situations promote gambling, then one would expect that people will gamble more when gambling serves as an escape from something aversive than when gambling is serving another purpose (e.g., to gain some-

thing). In the present study, participants were put in two situations to test gambling as an escape: one in which they were asked to solve solvable anagrams and one in which they were asked to solve unsolvable anagrams prior to playing video poker. In both situations, participants had 10 minutes to solve the anagrams, but could quit at any time and play video poker. Hands played (i.e., the number of hands participants chose to play), credits bet, and the percent of hands played correctly when playing video poker were used to measure gambling behavior. We hypothesized that video-poker play would change on any number of the three measures between sessions as a result of being put in (and escaping from) the aversive situation (i.e., the unsolvable anagrams). However, based on Gavurin's (1967, 1972) findings, we also hypothesized that this outcome would be related to participants' intellectual abilities, which were measured by the participants' overall grade point average (GPA).

METHOD

Participants

Participants of the study were 41 (23 male and 18 female) undergraduate students attending the University of North Dakota. The mean age of the participants was 21.24 years (SD = 5.02 years). Thirty six of the participants reported being Caucasian (87.8%) and the remaining five reported being American Indian, Asian, or Other. The self-reported mean GPA was 3.21 out of 4.00 (SD = 0.57). Participants received (extra) course credit in return for their participation.

Apparatus and Materials

The study took place in 1.5- by 4.0- m room furnished with a table, two chairs, and file cabinet. A computer with a dual-screen monitor was located on the table. The software WinPoker 6.0 (see Jackson, 2007) was used to simulate gambling during the video-poker sessions. Within the software program, a "coin slot" displayed a value of 25 cents per credit.

Six paper-pencil instruments were used. The first was the informed-consent form, which provided information regarding the study including possible risks and benefits of participating in the study as approved by the University of North Dakota's Institutional Review Board. The second was a demographic questionnaire that asked about information provided in the Participants section. The third was the GFA-R, which is a 16-item self-report survey with 8 items measuring gambling maintained by positive reinforcement contingencies and 8 items measuring negative reinforcement (i.e., escape) contingencies. Participants rated each question on a scale of 0 (never) to 6 (always). Scores were summed across the 8 items for both contingencies. The fourth was the SOGS, a 20-item survey designed to identify a probable pathological gambler. Scores of 5 or higher indicate a potential pathological gambler.

The fifth and sixth paper-pencil instruments were two sets of 16 anagrams; one of them with solvable anagrams and the other with unsolvable anagrams. The solvable anagrams had multiple correct solutions under the premise that they would be easier to solve than anagrams with only one correct solution. The anagrams in both sets can be found in the Appendix.

Procedure

Participants first completed the informed-consent process. After doing so, they engaged in two different sessions. At the start of the first of these sessions, the researcher read the participant the following instructions:

> To start this session, you will be given a list of anagrams (i.e., word jumbles) in which you will have up to 10 minutes to solve as many as you can. When you can't solve any more, or give up, please inform the researcher and you can begin playing video pok-

> er. The average person solves 3 in a 10-minute period.

After 10 minutes had passed, the participant had solved every anagram (if they were solvable), or the participant informed the researcher that s/he wanted to stop, the researcher oriented the participants toward the computer and the read the participant the following instructions for video-poker play:

> You will now be given the opportunity to play a computer generated, five-card-draw poker game. You will be staked with 100 credits. We ask that you treat these credits as if they had monetary value. You may bet up to five credits per play and your goal should be to end the session with as many credits as you can. How you play the game is up to you. You can quit (i.e., end the session) at any time by informing the researcher that you wish to end the session. The session will end when you a) quit playing, b) you reach 0 credits, or c) 15 minutes have elapsed. Do you have any questions?

Questions were answered by repeating the above instructions.

Participants played Jacks or Better, which is a five-card-draw game in which a pair must be jacks or higher for it to be a winning hand. Participants did not receive the same order of outcomes, and each play was independent of the others. When one of the criteria was met for the poker period to end, the session ended and participants were given a packet that contained three items. The first was the demographic questionnaire, the second was the GFA-R, and the third was the SOGS.

The second session was then initiated, which was identical to the first with the exception that the anagrams were either solvable or unsolvable. That is, the order of the solvable- and unsolvable-anagram sessions was counterbalanced such that 20 participants experienced these sessions in one order and the remaining 21 participants experienced them in the reverse order.

Once the second session was completed, the participant was debriefed and dismissed. The researcher scored the demographics questionnaire, GFA-R, and SOGS by hand. The dependent measures of the study were calculated by the video-poker software, and recorded for each session by the researcher once the participant was dismissed.

RESULTS

Participants' mean SOGS score was 1.05 (SD = 1.18; range = 0-5). Mean scores on the GFA-R were 2.15 (SD = 3.41; range = 0-16) for escape and 25.66 (SD = 9.68; range = 0-40) for positive reinforcement. Participants spent slightly more time on the unsolvable anagrams than the solvable anagrams (M = 7.90 min vs. M = 7.53 min). A paired-samples t-test revealed this difference was not significant, $t(40) = 1.23$, $p > .05$. The amount of time spent gambling was also slightly greater following the unsolvable anagrams than the solvable anagrams (M = 11.13 min vs. M = 10.35 min). This difference was also not statistically significant, $t(40) = 1.02$, $p > .05$. Results from these analyses, and all that follow, were considered significant at $p \leq .05$.

Comparisons were made on participants' behavior in the two different video-poker sessions. The data were analyzed using a series of repeated measures analyses of covariance (ANCOVA), which addressed three measures of gambling behavior: the total number of hands played, the total number of credits bet, and the overall percentage of hands played correctly in each session. Participants' escape score on the GFA-R[1] and their self-reported GPA served as covariates.

[1] GFA-R escape score was used as a covariate for two reasons. First, it allowed us to determine whether the association between escape score and video-poker play reported by Weatherly et al. (2010) was replicated. Second, it allowed us to assess the ability of the anagrams to promote video-poker play independently of

After controlling for the effects of escape score and GPA, the number of hands played was greater in the sessions following the unsolvable anagrams (M = 84.42; SD = 42.53) than the solvable anagrams (M = 80.22; SD = 51.38). However, this difference failed to obtain statistical significance, $F < 1$, $p = .833$, $\eta^2 = .001$). The main effect of GFA-R escape score was significant, $F(1, 38) = 4.42$, $p = .042$, $\eta^2 = .104$, indicating that the number of hands played increased as a function of endorsing gambling as an escape. Hands played did not vary significantly as a function of GPA, $F < 1$, $p = .667$, $\eta^2 = .005$.

Participants also tended to bet more credits following the unsolvable anagrams (M = 299.61; SD = 195.69) than the solvable anagrams (M = 278.66; SD = 191.08), although this difference was again not statistically significant, $F < 1$, $p = .938$, $\eta^2 = .000$. The main effect of GFA-R escape score on number of credits bet was not significant, $F(1, 38) = 2.23$, $p = .144$, $\eta^2 = .055$. Likewise, the number of credits bet did not significantly vary as a function of GPA, $F < 1$, $p = .867$, $\eta^2 = .001$.

The percentage of hands played correctly was somewhat smaller following the unsolvable anagrams (M = 57.17%; SD = 14.63%) than the solvable anagrams (M = 58.07%; SD = 14.50%), but the main effect of the anagram was again not significant, $F < 1$, $p = .766$, $\eta^2 = .002$. Neither the main effect of GFA-R escape score, $F < 1$, $p = .664$, $\eta^2 = .005$, nor GPA, $F < 1$, $p = .926$, $\eta^2 = .000$, was significant.

DISCUSSION

Previous research has found a relationship between endorsing gambling as an escape and video-poker play. The present study was designed to see if video-poker play (i.e., hands played, credits bet, and the percent of hands played correctly) would increase as a result of escaping from an aversive situation. Participants attempted to solve anagrams that were unsolvable and anagrams that had multiple correct solutions. Participants were presented with the opportunity to stop (and escape from) solving the anagrams to play video poker. The results did not demonstrate that video-poker play varied as a function of the type of anagram the participants attempt to solve prior to playing. However, the number of hands played did vary as a function of the participants' endorsement of gambling as an escape.

These findings partially replicate those of Weatherly et al. (2010) in that escape scores were related to video-poker play. However, escape scores in the present experiment were associated with the number of hands participants played. Weatherly et al. reported an association between escape scores and the number of credits bet, not number of hands played. Thus, while there appears to be a relationship between escape and gambling behavior in the laboratory, the exact nature of that relationship is not perfectly clear. More research is needed to fully understand the relationship between escape and gambling behavior.

With that said, it should be noted that in the present sample, positive reinforcement scores were higher than negative reinforcement scores on the GFA-R. This outcome was to be expected (see Weatherly et al., 2011), as even individuals who might qualify as problem or pathological gamblers tend to attain higher absolute scores for positive, than for negative, reinforcement. Absolute scores notwithstanding, however, previous research (e.g., Miller et al., 2010; Weatherly et al., 2010) has shown that escape scores, although smaller than positive reinforcement scores, are superior predictors of potential problem or pathological gambling, at least as measured by the SOGS. The findings of the present study further support this notion. It was hypothesized that hands played and coins bet

participants' general tendency to gamble as a means of escape.

would increase (and the percentage of hands played correctly would potentially decrease) as a result of escaping from an aversive situation. The data trended in the predicted direction. However, these trends did not reach statistical significance. There are at least two possible explanations for this finding. One explanation is that the anagrams used in the different sessions were similarly aversive or perhaps were not aversive at all. Participants spent a similar amount of time on the solvable and unsolvable anagrams. In fact, if anything, participants spent more time on the unsolvable, than the solvable, anagrams. One limitation of the present study was that no data were collected as to whether participants found the anagrams aversive and, if so, how aversive. If the present procedure was to be replicated, ideally such data would be collected.

A second potential explanation for the failure to observe a significant difference is that gambling as an escape represents a consistent behavior pattern that is not necessarily sensitive to brief environmental manipulations. In the present study, there was a main effect of GFA-R escape score. Participants who tended to endorse gambling as an escape gambled differently than other participants, but their gambling behavior did not vary as a function of the type of puzzle they had been asked to solve. The GFA-R escape score may measures a person's general pattern of behavior rather than their response to momentary environmental changes. If so, it may not be surprising that a 10-min anagram task did not alter video-poker play.

An additional potential limitation of the study was that participants were not playing for actual money. Participants were told to play "as if" the credits had monetary value and the video poker display did indicate that the credits were worth a fictitious 25 cents each. However, given that previous research has found that gambling behavior in the laboratory varies as a function of whether or not the credits participants are betting have monetary value (e.g., Peterson & Weatherly, 2011; Weatherly & Brandt, 2004; Weatherly & Meier, 2007), one cannot assume that the same results would have been observed had participants been betting actual money.

Also, the sample of the current study was rather homogenous; participants were college students and not treatment-seeking pathological gamblers. In fact, participants' SOGS scores would suggest that many participants did not have extensive experience gambling. Next, the study was designed so that playing video poker could serve as a potential escape response for solving the word puzzles. However, it could be the case that video poker (or possibly gambling in general) was aversive to some participants, which was not measured. This possibility is potentially bolstered by the fact that many participants were likely not experienced gamblers.

Next, as noted above, no systematic data were collected on the participants' affective response to the anagrams. Several participants did display informal verbal responses that were consistent with the idea that the anagrams were frustrating. However, there is no guarantee that all participants found the anagrams aversive, either when they were solvable or unsolvable. Future research might be well served to use a strongly aversive situation rather than anagrams, as well as measuring its level of aversiveness.

Until now, research on gambling and escape has been correlational in nature. This study served as the first experiment to see if escaping from an aversive situation would directly affect gambling behavior. While the results trended in that direction, they failed to obtain statistical significance. But the results of this study replicated the finding that endorsing gambling as an escape is correlated with video poker play. Thus, these findings will hopefully encourage future research on gambling as an escape.

Another major contribution of the current study is that it denotes a new line of research

on using aversive conditions in the laboratory. Establishing aversive stimuli and empirical methodology to study escape can have important implications for the study of gambling behavior as well as any other behavior maintained by negative reinforcement. The questions raised by this study are possibly its greatest asset in that they may give impetus to further research. In the future, it will certainly be worthwhile to explore other situations that may be aversive to determine if gambling behavior can be altered as a result. For example, loud sounds, foul odors, or social criticism may be more effective to induce escape in a laboratory setting than unsolvable anagrams. Once the methodology has been established, researchers can then focus on devising interventions to eliminate gambling as an escape. Possible treatment approaches could include teaching strategies to cope with aversive stimuli and/or exploring behaviors other than gambling that would be beneficial, or at least not as detrimental, to the individual.

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APPENDIX

Solvable Anagrams and Correct Responses

ACILPOT	(CAPITOL, OPTICAL, TOPICAL)
AELPST	(PALEST, PASTEL, PETALS, PLATES, PLEATS, STAPLE)
EILNST	(ENLIST, INLETS, LISTEN, SILENT, TINSEL)
ADEPRS	(DRAPES, PADRES, PARSED, RASPED, SPARED, SPREAD)
CDEERSU	(RECUSED. REDUCES, RESCUED, SECURED)
EFORST	(FOREST, FORTES, FOSTER, SOFTER)
ADEILT	(DETAIL, DILATE, TAILED)
AERRST	(ARREST, RAREST, RATERS, STARER)
BELSTU	(BLUEST, BLUETS, BUSTLE, SUBLET, SUBTLE)
EADICNOTU	(EDUCATION, CAUTIONED, AUCTIONED)
AMEGINRST	(EMIGRANTS, MASTERING, STREAMING)
DCEINOSTUR	(DISCOUNTER, INTRODUCES, REDUCTIONS)
AELPRSY	(PARSLEY, PARLEYS, PLAYERS, REPLAYS, SPARELY)
AEGLLRY	(ALLERGY, GALLERY, LARGELY, REGALLY)
ADERRW	(DRAWER, REDRAW, REWARD, WARDER, WARRED)
AEMNS	(MANES, MANSE, MEANS, NAMES)

Unsolvable Anagrams

OLWGFNA	_____
KDNITE	_____
VDAOCO	_____
GEIDLH	_____
ALLRGON	_____
UTAFIE	_____
DNOEIG	_____
EYEHLK	_____
COMEPR	_____
ICIRMOSCC	_____
AINNTRTSO	_____
OFFCIITECN	_____
AESIDUD	_____
IUTRUCE	_____