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The Impact of Self-Awareness and Physiological Arousal on EGM Gambling Behaviour

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Contents

Executive Summary

This report describes four experimental studies investigating psychological factors that influence betting behaviour on Electronic Gaming Machines (EGMs). Findings on these psychological factors are intended to help inform governments on the impact of policies aimed at reducing gambling-related harm. The research builds on the theoretical framework of the Four Es theory of risk for gambling problems (Rockloff, M. & Dyer, V., 2006, 2007). The Four Es risk factors include *Escape*, *Excitement*, *Esteem* and *Excess*; which are hypothesised motivations underlying problem gambling behaviour. This report focuses on the Escape and Excitement motivations.

Escape

The first set of two experiments, *The Mirror Study* and *The Narrative Study*, explored the functioning of the Escape motivation. The risk construct of Escape proposes that gambling activity produces a dissociate experience, and a fundamental part of its appeal is to distract gamblers from social-adjustment difficulties outside of gambling. In support of this conception, it is common for problem-gamblers to identify arguments with family or co-workers as providing the 'urge' to gamble, and to report that gambling provides distraction and a loss of awareness of the passage of time. Evidence for the Escape motivation, however, is further supported by research on the Four Es scale (Rockloff, M. & Dyer, V., 2006, 2007). Likert-type items such as ' *I would like to just disappear*' and ' *I sometimes wish that I would not feel anything*' are positively correlated with concurrent gambling problems.

The Mirror Study. The Mirror-Study drew inspiration from a research tradition in the study of *self-awareness* (Baumeister, R. F., 1997; Silvia, P. J. & Duval, T. S., 2001). Self-awareness is a focused state of attention directed internally on the self; highlighting an individual's personal-appearance, traits, abilities and other unique characteristics. Self-focused attention is almost invariably makes us aware of our shortcomings by highlighting negative discrepancies from our real-selves and our ideal-selves (Rogers, C. R., 1980). The mirror study replicated a classic experimental design in manipulating self-awareness by exposing EGM players in 1 condition to large mirrors strategically placed such that participants were obliged to see their own reflection during play. Four Es Theory (Rockloff, M. & Dyer, V., 2006) suggests that the presence of the mirror should remove the Escape quality of the gambling experience, and thus make the experience less attractive. The predictions from this study held that participants in the mirror condition should gamble with less intensity on a range of measures than persons in a control condition with no mirror present.

Results of this study were weaker than expected, and did not confirm the general expectations of lower intensity of gambling behaviour resulting from exposure to the mirror. The largest absolute differences between conditions were observed for participants with CPGI designed gambling problems (Ferris, J. & Wynne, H., 2001). Problem gamblers were significantly faster betting in the mirror condition compared to the control. Other measures of gambling intensity failed to show significant differences between conditions.

In sum, the Mirror Study failed to support the hypotheses of generally greater gambling intensity while exposed to a mirror. This failure may have resulted from an

insufficiently strong manipulation of self-awareness. However, problem gamblers showed at least some responsiveness to the manipulation by gambling faster in the mirror condition than the control. As described below, a second study was designed with an alternate manipulation of self-awareness.

The Narrative Study. A second study was conducted to explore the hypothesized Escape motivation on EGM gambling behaviour using an alternate method for manipulating self-awareness. In theory, gambling provides an escape from preoccupation on negative self-reflection. An important component of the attraction of the gambling experience is to distract the player from an uncomfortable reflection on perceived negative aspects of the self. The Narrative Study was designed to test this proposition.

Immediately prior to gambling on an EGM, participants were asked to speak into a voice-recorded microphone to discuss either: a) Things that you DON'T LIKE about yourself, or b) Things that you LIKE about yourself. A third control-condition omitted this self-reflection task. It was hypothesized that both positive and negative self-reflection would magnify gambling intensity, and the greatest magnification in gambling would follow negative self-reflection. This prediction follows from the proposition that unpleasant self-focused attention should increase the attractiveness of the Escape quality of the gambling experience.

Results from the Narrative study showed greater gambling intensity as a consequence of self-reflection. Participants in the negative self-reflection condition placed more bets, wagered larger amounts and gambled faster than the controls. As

predicted, the gambling intensity of participants in the positive self-reflection condition was between those of the control and negative-reflection.

In sum, the Narrative study showed that manipulation of self-focused attention towards either positive or negative aspects of the self increased the intensity of gambling on an EGM. In theory, one of the attractive features of gambling is the ability to use the experience to reduce self-focused attention, and participants used the gambling task to reduce this uncomfortable state of self-awareness.

Excitement

The Loud-noise Study. Another risk-factor for gambling problems in the Four Es theory is *Excitement*. Gambling has the attractive quality of alleviating a persistent state of boredom or chronic arousal deficiency of some players. There is a large body of research to suggest that gambling produces physiological arousal. However, there has been little evidence that links arousal level to subsequent gambling behaviour. If Excitement is a risk factor for gambling, then high-levels of physiological arousal should produce an intensification of gambling behaviour.

In the test-condition, participants were exposed to a loud (80 db) 'white-noise' event while gambling on the EGM. The results showed that players with moderate-risk gambling and problem-gamblers had reduced bet-sizes as a result of the arousal-manipulation. In contrast, however, low-risk gamblers and gamblers without problems had significantly greater average bet-sizes in the test-condition as predicted. The results suggest that problem-gamblers may associate physiological arousal primarily

with losing, while gamblers without problems may interpret their arousal with winning.

In sum, the White-noise study suggests that physiological arousal has an important influence on EGM gambling behaviour, although this influence is different for gamblers with- and without identifiable problems. Gamblers with few problems associate arousal events with winning, while problem-players may be more likely to associate arousal primarily with losing.

The Croc Study. A methodological shortcoming of the Loud-noise study is the potential cognitive and meta-cognitive effects introduced by the manipulation. The presence of the loud 'white-noise' event is unusual in the context of EGM play, and the novel presentation of the stimulus may have given the subjects heightened sense of uncertainty about the task apart from the arousal induced by the manipulation. In addition, the loud-noise event induced a startle-response during play, which is arguably only one possible way to manipulate physiological arousal. The Croc study was designed to address these limitations. In the study, a saltwater crocodile was used as an alternate manipulation of arousal.

Participants in the study were recruited from the Koorana Crocodile Farm, which is situated a short distance from Rockhampton, Queensland. By random assignment, participants were selected to play a simulated EGM either: a) prior to entering the park and viewing the crocodiles, or b) at the end of the tour and immediately after holding a 1-meter juvenile saltwater crocodile. The experimental design thereby used 'exposure to crocodiles' as a manipulation of autonomic arousal.

Gambling behaviour varied by condition and the subjective interpretation of the emotions experienced by the players. Persons who indicated that they felt negative about the experience gambled with less intensity in the crocodile condition when compared to the control. In contrast, persons with gambling problems who did *not* report a negative emotional state gambled with more intensity on the EGM in the crocodile condition as predicted. The results paralleled findings of the loud noise study. When arousal is interpreted negatively, gambling on EGMs is less intense, while arousal that is not interpreted as negative leads to greater intensity of play.

Applications

The results from these 4 experimental investigations provide new information on the psychological factors influencing gambling behaviour on EGMs. Gambling behaviour is motivated in part by a desire to escape negative self-reflection. Consumer-protection measures, advertisements and therapeutic practice can discourage people from the use of gambling as an escape from their problems. Specifically, the present studies indicate that gambling in response to Escape may lead gamblers to place more bets, wager greater amounts and bet faster on EGMs with the long-run consequence of greater gambling losses for the player. Gambling behaviour is also motivated by the Excitement of the experience. Physiological arousal experienced during play may contribute to greater gambling intensity and consequent losses, particularly if an experienced gambler interprets their level of excitement as a sign that they will soon experience gambling success (i.e., *a winning feeling*). Consumer-protection measures and therapeutic practice can help at-risk gamblers

understand the relationship between their experience of excitement and potentially destructive gambling behaviour. A 'lucky feeling' does not translate into gambling success, but rather can lead at-risk gamblers to greater losses.

The Mirror Study

In this experiment, participants played a simulated poker-machine in a lab under two randomly-assigned conditions. The first condition was a control, where gamblers started with a $10 stake, and played a simulation of a traditional 3-reel EGM. The machine was programmed with a short winning sequence of 50 trials followed by an indefinite losing sequence. The second 'experimental' condition also had participants gamble on the same EGM. However, two large mirrors were positioned such that the player could not play the game without seeing their own image reflected back at them. In theory, this manipulation should create a state of objective self-awareness, where the subject is made more aware of their own self-concept. One motivating factor in problem gambling behaviour is that it allows the gambler to 'escape' objective self-awareness (Rockloff, M. & Dyer, V., 2006). As such, the introduction of the mirror removes (at least partially) the ability of the gambler to use the gambling experience as a form of escape. As a result, gamblers are predicted to be less persistent in gambling with the presence of the mirror, and consequently lose less money. In addition, the influence of the mirror on persistence should be more pronounced for persons with more severe gambling problems.

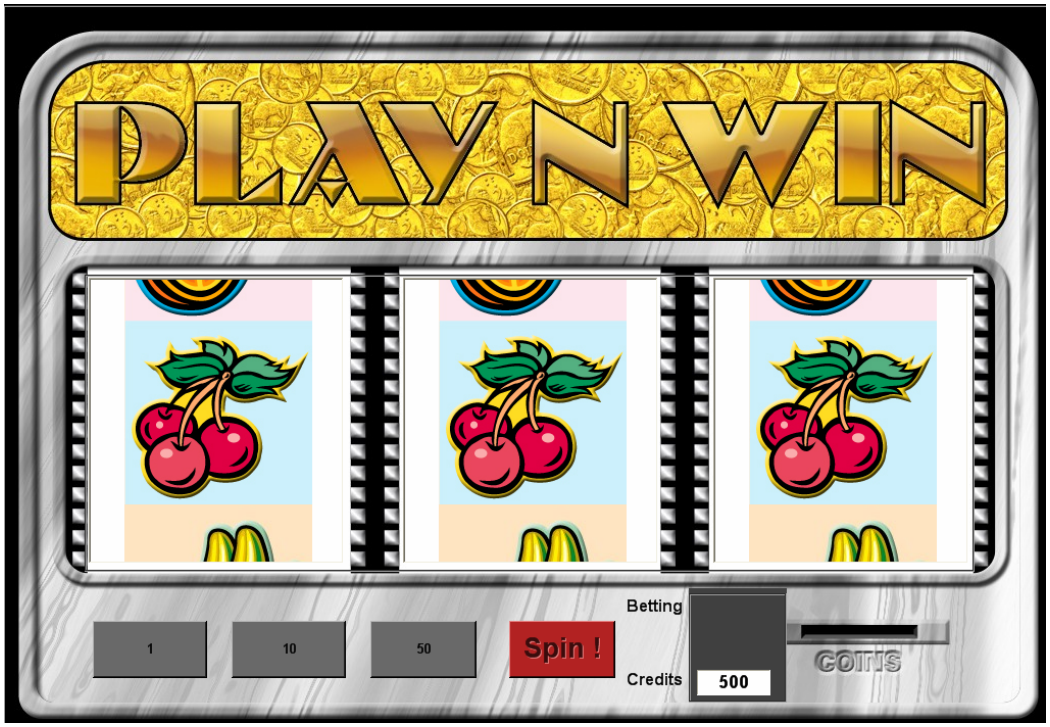
Method

Participants. One-hundred and two persons, 63 males and 39 females, were recruited from newspaper flyers in a local daily paper in Rockhampton, Australia. Recruitment was restricted to persons over age 18 with self-reported regular experience with EGMs. The average age of participants was 44.6 years (*SD* = 16.3).

The resulting sample included the following counts of persons from the four categories of the Canadian Problem Gambling Index: a) 36 (35.3%) no problems, b) 18 (17.8%) low risk, c) 32 (31.7%) moderate risk, and d) 16 (15.7%) problem gamblers.

Apparatus. The experiment utilized a traditional 3-reel EGM simulated on a laptop computer (see *Figure 1*). The EGM was programmed to payoff on trials 3, 4, 7, 12, 17, 19, 29, 36, 42, 48 and 50, with indefinite losses thereafter. Players could place bets of 1, 10 or 50 cents on each trial, with payoffs equalling 10 times the amount bet. Credits were presented in cents, with an initial bankroll of $10 (or 1,000 cents) presented on the screen at the start of play.

Figure 1. Illustration of Laptop Simulated EGM



Design and Procedure. Participants were given $10 as compensation for their arrival at the session. After receiving this money, participants filled out a basic demographic questionnaire in a waiting room. This questionnaire also included the 9-item Canadian Problem Gambling Index of Severity (CPGI), (Ferris, J. & Wynne, H., 2001).

While the participant was busy with the first questionnaire, a coin-flip was made privately by the sole-female experimenter to determine the experimental condition for the participant. Heads determined that the 'mirror' would be present during gambling, while tails determined that it would be absent (the control condition). In a private experimental room, the experimenter set-up the poker-machine with- or without two large mirrors which were positioned to reflect the image of the subject while gambling (as determined by the coin-toss).

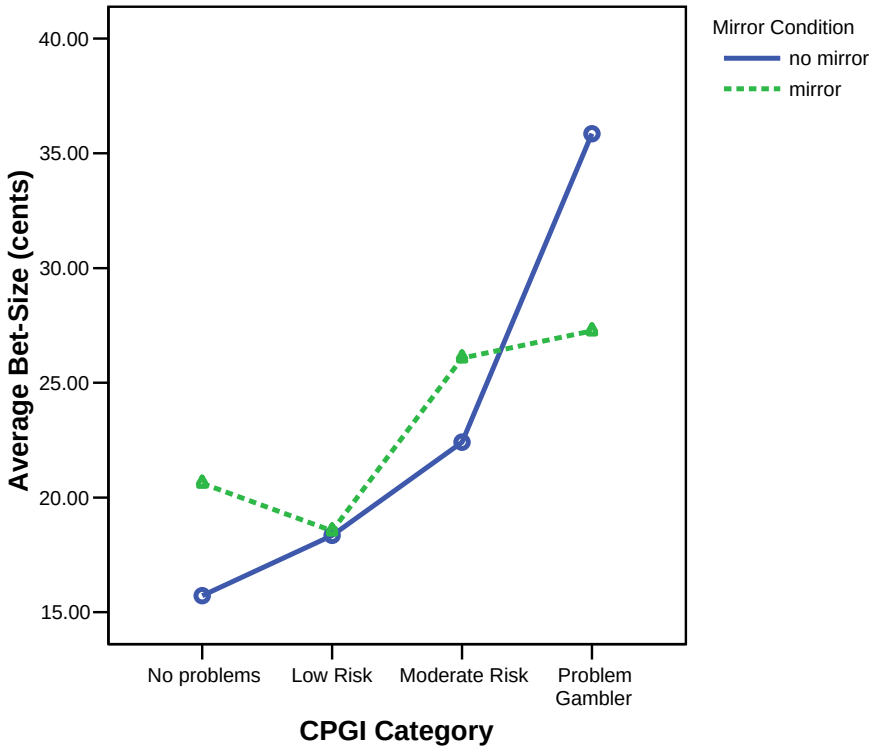
Upon completion of the questionnaire, subjects were asked if they would like to gamble with their $10 arrival fee. All 102 participants agreed to gamble with their $10 compensation. The $10 was retrieved from subjects to reinforce their perception that they were gambling with their 'own' money. Participants were led from the waiting room into the prepared experimental room containing the simulated poker-machine. Subjects were told that they could decide when to quit the game, and that they would keep the amount of money remaining on the poker-machine at the end of play.

Results

The results of the study were analysed with regard to the intensity of gambling behaviour displayed under each condition (mirror or no-mirror). Gambling intensity is operationally defined as any marker or trace of behaviour that would tend to contribute to greater gambling losses over long run play. Most forms of gambling, including play on poker machines, have a negative expected return from each dollar bet (due to house-odds). For the purposes of this study, Average Bet-size, Final Payouts (a direct measure of losses) and Speed of Play are all indicators of gambling intensity, as they would each reveal behaviour contributing to greater losses over the long-run.

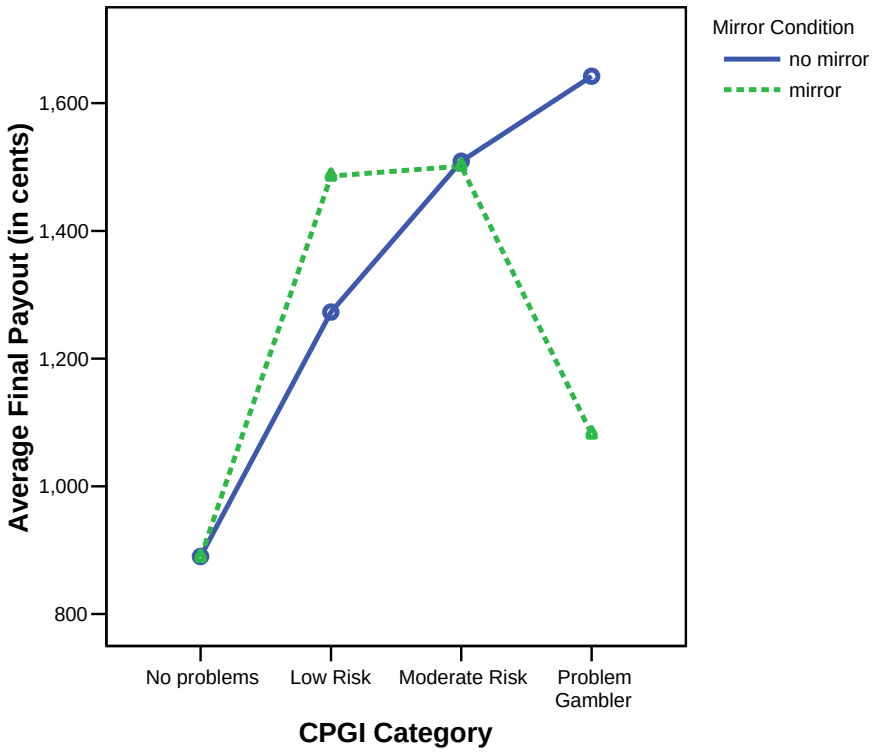
Average Bet-Size. Figure 2 shows the average bet-sizes for participants in the *mirror* vs. *no-mirror* condition across the four problem-gambling categories outlined by the CPGI (Ferris, J. & Wynne, H., 2001). A 2x2x4 ANOVA was calculated using Bet-size as the dependent variable, and Condition (mirror vs. no-mirror), Gender and CPGI category as the independent variables. The model included all possible interactions. As shown in *Figure 2*, there are significantly higher average bet-sizes for persons with more CPGI-defined gambling problems, $F(3,86) = 4.36$, $p < .01$. There were no other significant main effects or interactions in the model.

Figure 2. Average Bet-Size by Condition and Canadian Problem Gambling Index of Severity (CPGI)



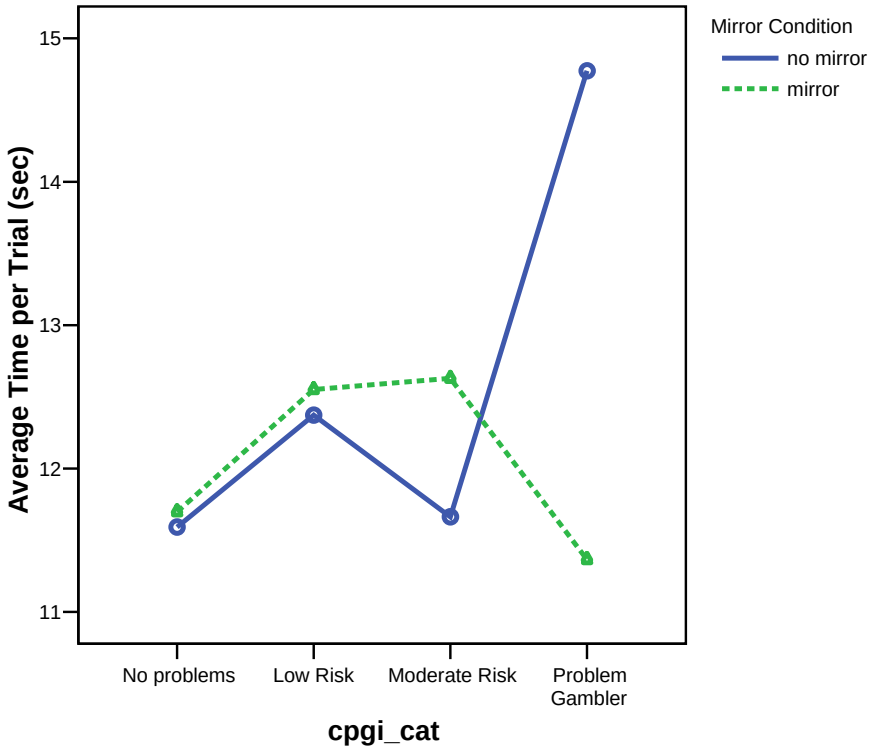
Final Payouts. Figure 3 shows the average final payouts for players at the end of the game. A 2x2x4 ANOVA was calculated with Final Payout as the dependent variable, and Condition (mirror vs. no-mirror), Gender and CPGI category as the independent variables. There was a significant main effect for CPGI category, $F(3,86) = 3.74$, $p = .01$. Gamblers with 'no-problems' received substantially lower payouts than those in the other conditions. In addition, 'problem gamblers' in the *mirror* condition ($n = 11$) received lower payouts than those in the *no-mirror* condition ($n = 5$), although this simple effect was not significant due to low subject numbers in the two cells.

Figure 3. Average Final Payouts by Condition and Canadian Problem Gambling Index of Severity (CPGI).



Speed of Betting. Figure 4 shows the average speeds at which participants played the game, as measured by the average seconds between successive spins (or trials). A 2x2x4 ANOVA was calculated with Time per Trial (speed of betting) as the dependent variable, and Condition (mirror vs. no-mirror), Gender and CPGI category as the independent variables. No main effects or interactions proved significant. However, a test of simple effects revealed a significant difference between the *mirror* and *no-mirror* conditions for problem gamblers, $p = .02$. In short, problem gamblers tended to bet faster in the *mirror* condition than the *no-mirror* condition.

Figure 4. Speed of Betting by Condition and Canadian Problem Gambling Index of Severity (CPGI).



Discussion

The Mirror Study failed to confirm the original research hypotheses. In short, we found no reliable evidence that the presence of the mirror moderates the intensity of gambling behaviour in general. However, we did find evidence that the mirror had some influence on players' behaviour, and this effect was most dramatic for persons with serious gambling problems.

Consistent with expectations, as shown in Figure 2, average bet-sizes were larger for persons with more gambling problems. In addition, problem gamblers tended to wager less in the *Mirror* condition compared to the control in accordance with our expectations, although these differences were not significant due to the low number of problem gamblers in the study (n = 16). Our theory suggested that problem gamblers use gambling to avoid self-reflection. The mirror removes - at least partially - the ability of the gambling experience to act as an 'escape' from focused self-reflection, and thus removes one of the attractive features of the gambling experience. This finding was therefore consistent, at least in direction, with our expectations.

Figure 3 illustrates that Final Payouts for problem gamblers were lower in *Mirror* condition compared to the control, although this difference was not significant due to the small number of problem gamblers in the study (n = 16). We expected; however, payouts to be higher in the mirror condition, as the problem gamblers should have 'quit early' thereby avoiding the negative self-appraisal associated with looking at themselves in the mirror.

Lastly, Figure 4 showed the speed of betting for problem gamblers was remarkably faster in the *Mirror* condition compared to the control, and this difference was significant. Again, this finding was in opposition to initial expectations, as the mirror should have moderated gambling intensity. Gambling more quickly in the presence of the mirror would tend to magnify losses over long-run play.

Post-hoc interpretation of results. The findings of this study are reasonable given a new interpretation of the motivations of problem gamblers. We had initially assumed that problem gamblers would seek to avoid the negative self-reflection resulting from the presence of the mirrors by quitting the gambling session early. This early termination of the gambling session would have resulted in lower gambling losses. We failed to consider; however, that the participants had another means to avoid prolonged self-reflection. By gambling more quickly, participants could seek to lose all their money fast and terminate the experience sooner. As evidence, four of the 16 problem gamblers in the study lost all their original money, and all 4 were in the mirror condition. In addition, it is possible that speedy gambling in the mirror condition was a consequence of intensification of focus on the gambling activity to avoid contact with the mirror.

Informal interviews with participants at the end of the study provided some insights into the psychology behind the results. First, many participants failed to notice the existence of the mirrors, despite their size and prominence. In contrast, some subjects, including some problem gamblers, remarked on the unpleasantness of viewing themselves while they gambled. One participant commented that poker-machines in a real local gambling venue which face towards a wall of mirrors are rarely used by patrons. Taken together, the formal and informal evidence suggest that the manipulation - when it was noticed - did appear to cause a negative state of self-reflection as intended. The behavioural consequences of this state; however, were not anticipated correctly.

The present study shows that the influence of the mirror on behaviour is more pronounced for persons with gambling problems. There are ethical and practical difficulties in recruiting a substantial number of problem gamblers to take part in this type of study, but larger numbers would help in achieving significant results on more measures. A more powerful manipulation may also improve the results. For example, participants might be asked to stare at their reflection for a short time prior to the start of the gambling task. In addition, the study needs to be reconceptualized given the difficulty of interpreting the intent of the problem gamblers' behaviour. It would be helpful to change the experimental design to avoid the need for the gambler to choose a quitting-time. Instead, the gambler could be told that the experimenter will tell them when they should quit, and that the quitting-time would be randomly determined. This procedure would make an interpretation of the measures of gambling intensity less ambiguous.

The Narrative Study

The Mirror Study, described above, examined the influence of heightened objective self-awareness on EGM gambling behaviour. The manipulation, however, did not specifically require participants to be consciously self-reflective. Instead, the mirror served as a subtle prompt to enhance self-awareness, with only minor influence on measured gambling behaviour. The Narrative Study was designed to make participants think consciously about either *positive* or *negative* aspects of their self-concept, with the purpose of examining its effect on EGM betting behaviour. In addition to being a potentially stronger manipulation than that contained in the Mirror Study, the experiment allows an examination of the influence of both positive and negative self-reflection.

The hypotheses for the Narrative Study were constructed around the precepts of Four E's theory. Specifically, Escape is a hypothesized motivation for gambling involvement. Gambling is a potentially dissociative experience, and EGM play provides temporary escape from adversive life-circumstances and painful self-reflection. In originally proposing this study, we had assumed that negative self-reflection would remove the attraction of subsequent gambling by interfering with its ability to provide an escape. However, the results of the Mirror Study caused us to modify this assumption prior to data collection in favour of a more direct interpretation of the theoretical proposition of the theory. The hypotheses for the study propose that self-awareness, being a generally adversive state, should increase gambling intensity as a response that helps to reduce self-awareness. Moreover, the

intensity induced by heightened self-awareness should be higher for induced negative self-reflection than positive self-reflection.

Method

Participants. Newspaper flyers were used to advertise for subject to play a 'simulated pokie machine' (EGM). Potential participants were told that they would be provided the initial gambling stake, and that they could keep any winnings. One-hundred and Five participants, including 40 males and 65 females, volunteered and successfully completed the experiment. The mean age of participants was 46.2 years (*SD* = 15.4). The cultural backgrounds of participants included: 92 (87.6%) Australian, 3 (2.9%) English and 10 (9%) other (with 2 or less persons per group). The problem-gambling status of participants included: 41 (39.0%) non-problem gambler, 32 (30.5%) low-risk, 16 (15.2%) moderate-risk, and 11 (10.5%) problem-gamblers.

Apparatus. The study used a laptop simulated EGM programmed by the principal researcher as a 3-reel traditional poker-machine (see *Figure 1*). The EGM was programmed to payoff on trials 2, 6, 8, 13 and 20. All bets placed past trial 20 were programmed as losses. Players could place bets of 25, 50 or 100 cents on each trial, and winning bets payed-off 10 times the amount bet (i.e., $2.50, $5.00 or $10.00, respectively).

Design and Procedure. Participants were given $20 as compensation for their arrival at the experimental session. After receiving their $20 compensation, subjects

completed a questionnaire which include basic demographic questions, the Four Es scale of risk for problem gambling (Rockloff, M. & Dyer, V., 2006) and the Canadian Problem Gambling Index of Severity (CPGI, Ferris, J. & Wynne, H., 2001). Using a (secret) 6-sided die toss, subjects were assigned at random to 1 of 3 experimental conditions, including: a) Negative self-reflection, b) Positive self-reflection and c) a Control condition.

In the Negative self-reflection condition, subjects made a private audio-recording using a digital recorder with instruction to talk about 'thing that you DON'T like about yourself.' This was presented to subjects as a 'memory test.' The research-assistant left the subject alone in the room to make the recording, and instructed them to retrieve the experimenter when they were finished speaking. To aid the participants in producing detailed verbal descriptions, they were asked to speak about things that they could remember regarding: a) what I have said to others, b) what I have done to/for others, c) my mood and personality, d) my importance to others (friends, family, co-workers), e) my ability to care for my appearance, f) my ability to do work, g) my ability to live-up to my own moral standards or values, h) my ability to make decisions, and i) my ability to think and reason.

In the Positive self-reflection condition, subjects made a private audio-recording with instructions to talk about 'things that you LIKE about yourself.' This task was also presented as a 'memory test,' and the same content areas for self-reflection were given as were provided in the negative self-reflection condition (see items a - i, above). Lastly, the control condition had no self-reflection task. Instead, the subjects proceeded immediately to gambling on the EGM simulation.

Participants were invited to gamble with their $20 compensation money. Five persons refused to gamble with this compensation, and are not included in the 105 person dataset and analysis. The experimenter retrieved the $20 compensation money from the participant prior to the start of the task. This retrieval of the compensation money was intended to give the (correct) impression that subjects were gambling with their own money. Participants were told that they could decide when they would like to quit the game, and they could retrieve the experimenter from outside of the room when they had finished.

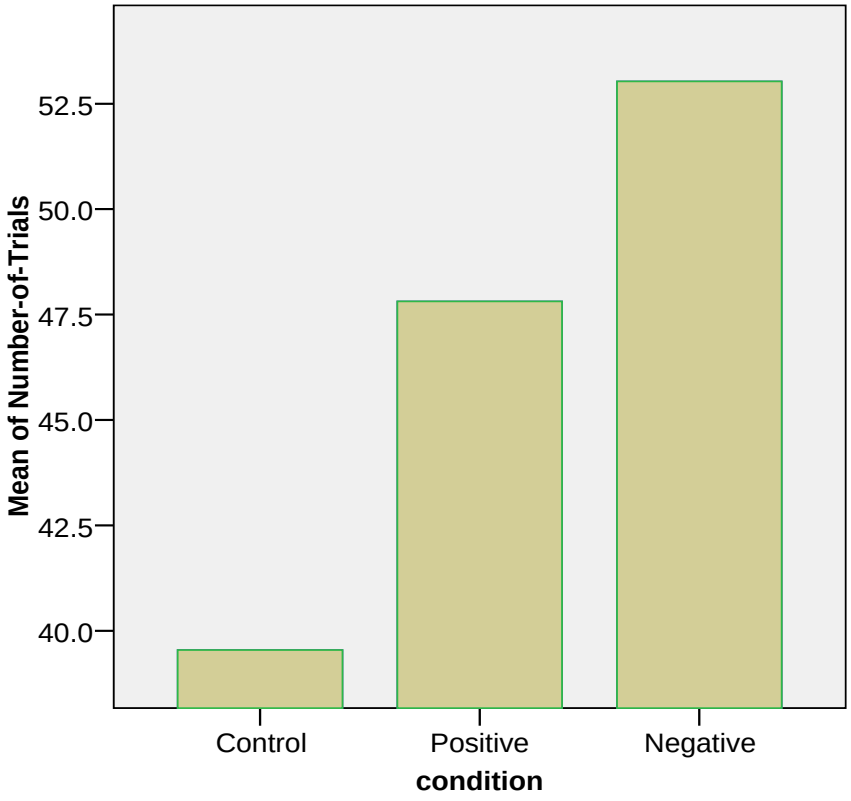
Results

The results of the study were consistent with the hypothesis of greater gambling intensity under conditions of self-reflection. The number-of-trials played, average bet-size, final payouts and speed-of-betting were all analysed as behavioural markers for the intensity of gambling during each trial.

Number-of-trials played. *t*-tests were conducted to compare the 3 experimental conditions (see *Figure 5*). As hypothesized, participant in the Negative self-reflection condition gambled for a greater average number of trials (M = 53.0, SD = 27.7) than persons in the control condition (M = 39.5, SD = 30.8), $t(66) = 1.90$, $p = .03$ (one-tailed). In addition, the average number of trials for participants in the Positive self-reflection condition (M = 47.8, SD = 29.8) was greater than the control t(68) = 1.14, p = .13 (one-tailed), but less than the Negative self-reflection condition, t(70) = 0.77, p

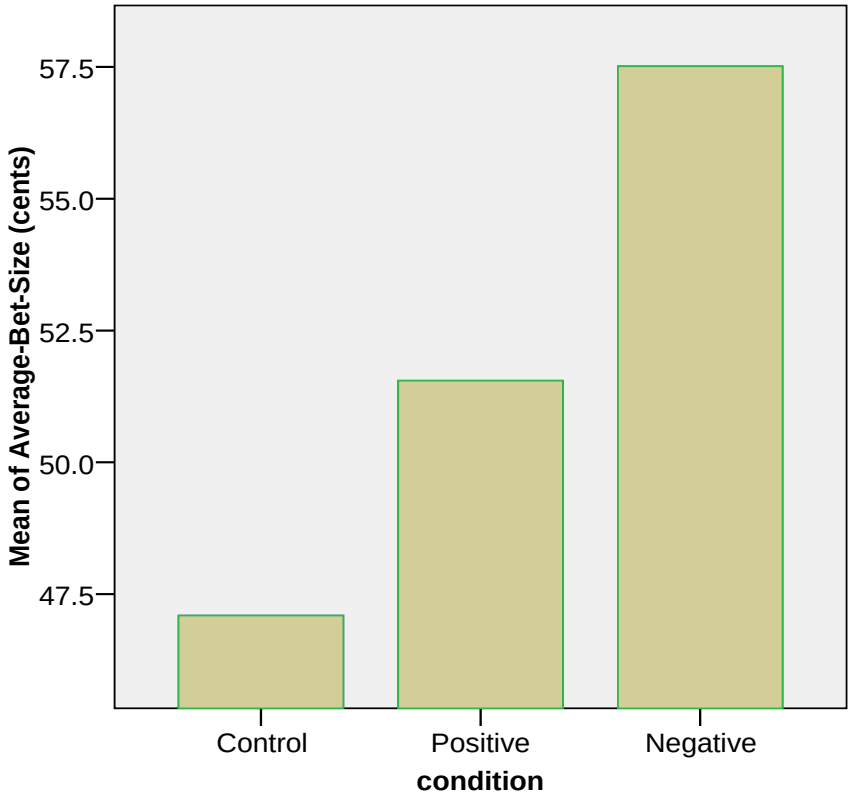
= .22 (one-tailed), as hypothesized, although these comparisons failed to achieve significance.

Figure 5. Number of Trials Played by Condition



Average Bet-Size. *t*-tests revealed a similar pattern of results for Average-Bet-Size by condition (see *Figure 6*). As predicted, Average-Bet-Size was larger in the Negative self-reflection condition compared to the control, $t(66) = 1.76$, $p = .04$ (one-tailed). The pattern of results for the Positive self-reflection condition was also consistent with predictions, although the examined differences were not significant. The Average-Bet-Size in the Positive condition was higher than the control, $t(68) = 0.90$, $p = .19$, *ns*, and lower than the Negative condition, $t(70) = 1.01$, $p = .16$, *ns*.

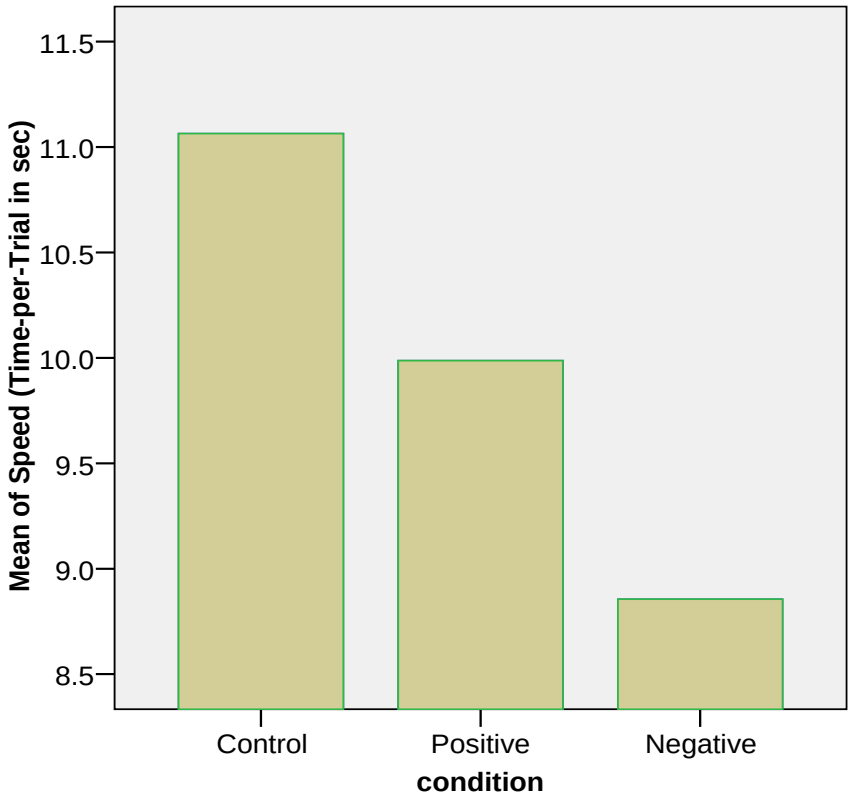
Figure 6. Average-Bet-Size by Condition



Final Payout. Slightly more than 1/5th of participants (21%) ended the EGM experiment by gambling away their entire initial $20 stake. As such, the analysis of this variable required the use of non-parametric statistics, although none of the resulting comparisons proved significant. The Negative self-reflection (*M* = $20.69, *SD* = 15.26) condition had *non*-significantly lower final-payouts than the control condition (*M* = $24.13, *SD* = 13.54), *Mann-Whitney U* = 470.5, *p* = .09, *ns* (one-tailed). The Positive self-reflection (*M* = $19.21, *SD* = 15.69) condition also had *non*-significantly lower final-payouts than the control, *Mann-Whitney U* = 494.5, *p* = .08, *ns* (one-tailed). Lastly, the Positive self-reflection condition had *non*-significantly lower Final Payouts than the Negative self-reflection condition, *Mann-Whitney U* = 631.5, *p* = .44, *ns* (one-tailed).

Speed of Betting. The last measure of gambling-intensity was the Time-per-Trial, or speed of betting. The time-per-trial variable measures the average number of seconds between bets or spins of the EGM, with larger mean-values equating to slower speeds (see *Figure 7*). As predicted, the Negative self-reflection condition had faster mean betting than the control condition, $t(66) = 2.60$, $p < .01$ (one-tailed). The Positive self-reflection condition was *non*-significantly faster than the control, $t(68) = 1.07$, $p = .14$, *ns* (one tailed), and *non*-significantly slower than the Negative self-reflection condition, $t(70) = 1.45$, $p = .07$, *ns* (one-tailed).

Figure 7. Speed of Betting by Condition.



Discussion

Results from the Narrative Study were consistent with a priori predictions. Four Es theory holds that Escape is an attractive feature of the gambling experience. Gambling provides temporary relief from an aversive state of self-focused attention. The current experiment assigned persons at random to conditions in which they were made to reflect on their self-concepts prior to the gambling task. In theory, gambling intensity on the EGM should be magnified by this self-focused attention as participants use the gambling experience to escape the self (Baumeister, R. F., 1997). In addition, this motivation to escape self-reflection should be more intense when reflecting on negative aspects of self-concept when compared with positive aspects.

In accordance with expectations, participant in the negative self-reflection condition placed more bets, wagered larger amounts, and gambled faster than participants assigned to the control condition. All three markers of behaviour are indicators of gambling intensity, as these factors are apt to magnify gambling losses over long-run play. Final Payouts did not show reliable differences across condition due to the high variability of final payouts across participants, and only modest absolute differences between conditions.

In sum, the results of the experiment were consistent with the theory that motivations for gambling are linked to self-focused attention. Negative states of self-reflection lead to greater intensity of gambling on EGMs. Many problem gamblers indicate that gambling allows them to temporarily escape unpleasant reflections on social adjustment difficulties, such as arguments with friends, family and co-workers. The current experiment shows that negative self reflection has a strong impact on gambling behaviour, causing people to gamble with greater intensity and thereby magnify the ultimate financial losses that they experience in the long run. Making gamblers aware of the link between their negative views about themselves and their potentially destructive behaviours may help inoculate them from what is likely an unconscious process controlling behaviour. Bringing gambling behaviour under the conscious control of players is consistent with an industry view of gambling being a deliberate expenditure on an entertainment product.

The Loud-Noise Study

The present experiment explored the influence of physiological arousal on gambling behaviour. Unsurprisingly, gambling has been shown to contribute to physiological arousal, particularly through winning bets. Physiological arousal in high frequency gamblers has been demonstrated after imagined participation in gambling (Freidenberg, B. M., Blanchard, E. B., Wulfert, E., & Malta, L. S., 2002; Sharpe, L., 2004); from mere exposure to cues associated with gambling; and across a range of gambling activities (Anderson, G. & Brown, R. I., 1984; Coventry, K. & Constable, B., 1999; Sharpe, L., 2004). In past studies, however, arousal has only been shown to be a consequence of gambling, rather than a motivating influence on gambling behaviour.

The study of the influence of arousal on gambling behaviour presents a unique challenge. In the natural context of gambling, it is difficult to observe the causal influence that arousal may have on gambling as separate from the betting behaviour that contributes to arousal. The present study solves this problem by introducing a manipulation of autonomic arousal that is separate from the usual gambling experience.

A common manipulation of arousal employs the so-called Startle Paradigm, which involves an adversive white noise event played at 80 db or louder (e.g., Gooding, D. C., Davidson, R. J., Putnam, K. M., & Tallent, K. A., 2002). White noise is a combination of sounds produced at all frequencies in the audible range. Subsequent arousal is measured using physiological reactions that are not under the

conscious control of the participant. One of the most common of these measurements is skin conductivity, or Galvanic Skin Response (Groeppel-Klein, A., 2005), which reveals changes based on the amount perspiration within the epidermis. Increasing levels of conductivity, or GSR, are associated with high levels of autonomic arousal.

In short, the aims of the present study are to explore the influence of autonomic arousal on gambling behaviour. Prior research has suggested that gambling produces arousal, but the current study seeks to show whether arousal in-turn influences gambling behaviour. A white-noise event was used to manipulate arousal. As with prior experiments, the study uses the concept of *gambling intensity* to analyses the results. Gambling intensity is any trace or marker for behaviour that tends to contribute to long-run gambling losses. As the odds for EGM gambling normal incorporate a house advantage, larger average bet sizes, smaller final payouts and faster betting speeds all contribute to greater losses in long run play. Hypotheses for the study included the expectation that white-noise induced arousal should lead to greater gambling intensity on all aforementioned measures. In addition, participants with more gambling-problems should have a greater intensification of their gambling behaviour as a result of the manipulation compared those with few problems.

Method

Participants. Flyers in a daily Rockhampton, Queensland newspaper were used to recruit 69 subjects for the study, including 37 males and 32 females. Inclusion criteria required that subjects were 18+ years of age (M = 47.8 years, SD = 17.7) and had self-reported regular EGM gambling experience. Exclusion criteria included

persons who suffered from heart conditions, which eliminated 11 potential participants. Based on responses to an initial questionnaire, participants were classified into the following gambling-problem categories using the 9-items scoreable portion of the Canadian Problem Gambling Index (CPGI, Ferris, J. & Wynne, H., 2001): 13 no problems, 18 low-risk, 27 moderate-risk and 11 problem-gamblers. The majority of participants identified their cultural background as Australian 61 (88.4%).

Apparatus. The study used a traditional 3-reel EGM simulated on a laptop computer and programmed by the principal researcher (see *Figure 1*). The EGM was programmed to payoff at random time intervals, with an average payoff frequency of 2-minutes (120 sec). Each second the computer would calculate if the 'next' spin of the EGM would payoff with a probability of 1/120. Players could bet amounts of 1, 10 or 25 cents on each trial. Every payoff returned 10 times the amount bet. At the start of the session, participants were given a bankroll of $20 (or 2,000 cents).

The EGM simulation-program randomly assigned each subject to experimental condition (*noise* or *control*), and the experimenter remained blind to condition. In the white-noise condition, an 80 db, 2-sec white-noise event sounded every 2 minutes for the 5-minute fixed duration of play (i.e., at 120 sec and 240 sec). No white-noise event was programmed for the control condition. Normal EGM sounds, including spinning reels and winning bells, sounded in both conditions during play.

Skin conductivity (or GSR) was measured using a ProComp+ unit and output was processed with Biograph software. The ProComp+ unit was attached to each subject using a finger-sensor.

Design and Procedure. Participants were given $20 cash compensation on arrival at scheduled appointments. Informed consent forms and a basic-demographics questionnaire were completed by the subjects in a waiting room. After completing these forms, subjects were asked if they would like to gamble with their $20 compensation payment. After agreement, the $20 payment was retrieved by the lone female experimenter, and participants were led to the experimental room where 2,000 cents in credits were displayed on the EGM apparatus. Participants were told that they would play the game until informed by the experimenter that the task was over, and that they could retain any amount remaining on the machine at the end of play. Lastly, participants were informed that they 'may' hear a loud noise during the course of their play and this was 'normal.' A finger-clip measurement device (ProComp+) was attached to the non-dominant hand immediately prior to play. The experimenter left the room for the 5-minute session. At the end of the session, participants completed a second questionnaire containing the 9-item scoreable portion of the Canadian Problem Gambling Index (CPGI, Ferris, J. & Wynne, H., 2001).

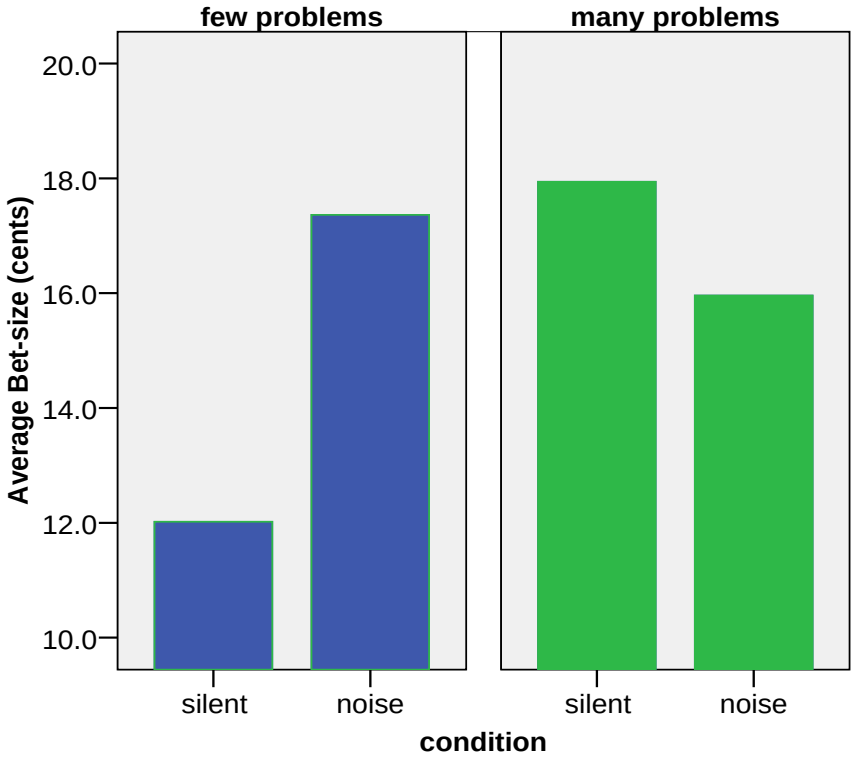
Results

The Manipulation Check. Two mean scores of Galvanic Skin Response (GSR) were computed for each participant, including the average GSR for the 1 minute prior to the first white-noise event (60-120 sec *baseline*) and the 1-minute after

the start of the white-noise event (120 sec-180 sec *test*). An independent samples t-test showed highly significant differences in mean GSR change (baseline and test) between the white-noise condition (M = 0.26 μm) and the control conditions (M = -.015 μm), $t(66) = 3.25$, $p < .01$. As predicted, there was a positive change in GSR for the white-noise condition, but no positive change for the control.

Average Bet Size. The effects of Condition, Gender and CPGI-gambling-severity on Average bet size were analysed using a 2x2x2 ANOVA model. For convenience, CPGI-severity was dichotomised using a median split into: (1) no and low-risk gambling problems (n = 31) and (2) moderate and high-risk gambling problems (n = 38). *Figure 8* shows the significant interaction found in this model between Condition and CPGI-severity, $F(1,61) = 5.36$, $p = .02$, $\eta^2 = .08$. As predicted, participants with few gambling problems made larger average bets in the White-noise condition compared to the control. In contrast, however, participants with many gambling problems made smaller bets in the White-noise condition compared to the control. There were no other significant main effects or interactions in the model, $p > .05$.

Figure 8. Average Bet-Size by condition and dichotomized CPGI problem gambling classification.

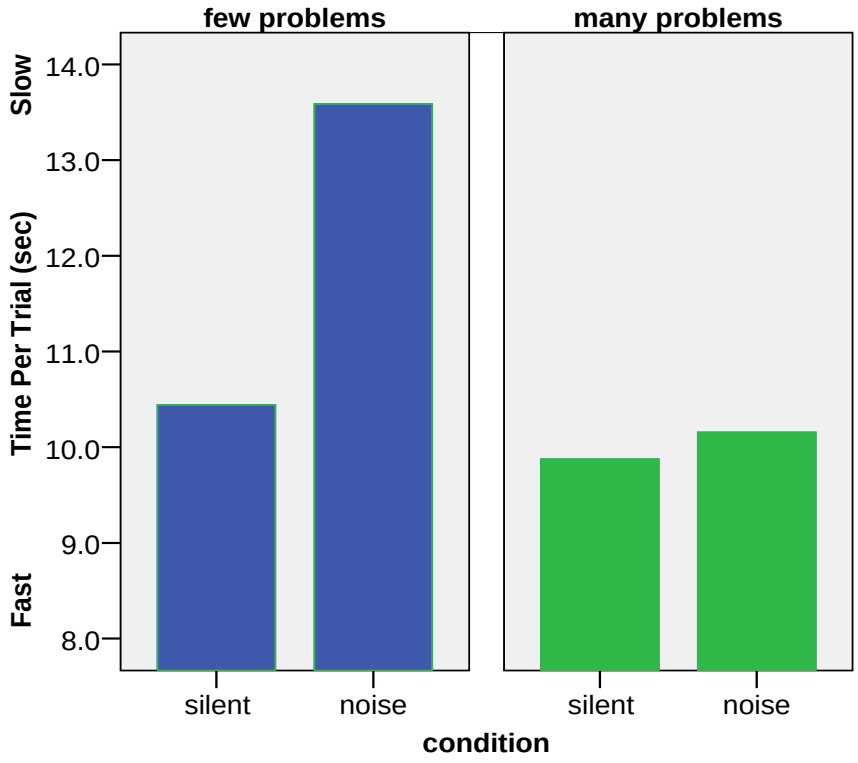


Final Payouts. The effects of Condition, Gender and CPGI gambling-severity on Final Payouts were explored with a 2x2x2 ANOVA model. The model failed to reveal any significant main-effects or interactions for the independent variables, $p > .05$.

Speed of Betting. The effects of Condition, Gender and CPGI gambling-severity on Speed of Betting (as operationalized by time-per-trial in seconds) were computed using a 2x2x2 ANOVA model. *Figure 9* shows a significant interaction between Condition and CPGI gambling severity on Speed of Betting, $F(1,61) = 4.78$, $p = .03$, $\eta^2 = .05$. For participants with many gambling problems, there was little

change in the speed of betting between conditions. However, for participants with few gambling problems, betting was slower in the White-noise condition compared to the control. Also revealed in *Figure 9*, a main-effect of CPGI gambling-severity, $F(1,61) = 9.31$, $p < .01$, $\eta^2 = .10$, showed that gamblers with few problems bet slower on average than gamblers with many problems. Likewise, as shown in *Figure 9*, a main-effect for Condition revealed that persons in the White-noise condition bet slower on average that the control group, $F(1,61) = 6.83$, $p = .01$, $\eta^2 = .07$.

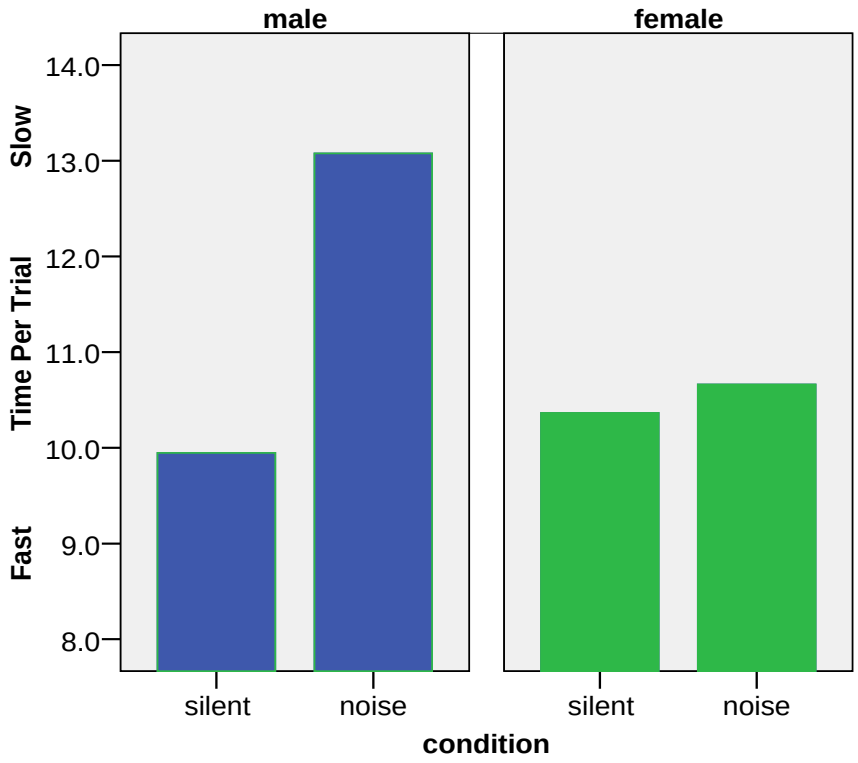
Figure 9. Speed-of-Betting by condition and dichotomized CPGI problem-gambling classification.



Lastly, *Figure 10* shows a significant interaction found in the model between Condition and Gender on Speed of Betting, $F(1,61) = 4.67$, $p = .04$, $\eta^2 = .05$. The faster pace of betting in the White noise condition compared to the control resulted

largely from the behaviour of male participants, with relatively little difference in speed between the conditions for female participants.

Figure 10. Speed-of-Betting by condition and gender.



Discussion

Predictions for the study hypothesized that autonomic arousal induced by the White-noise event should lead to greater intensity of gambling than the control-condition, as measured by average bet-size, final payouts and speed of betting. Furthermore, predictions held that this magnification of gambling intensity should be greater for persons with more gambling problems. However, the results revealed a more complicated picture of behaviour than outlined by these predictions.

The manipulation check revealed that the White-noise event was successful in raising autonomic arousal in the test condition. The results of the arousal were different, however, largely based on the prior history of gambling problems experienced by participants.

For gamblers with few problems, the average bet-size was larger in the White-noise condition compared to the control as predicted. However, gamblers with many problems had unexpectedly lower average bet sizes in the White noise condition when compared to the control. Related results were obtained by Sharpe (2004). Social gamblers in Sharpe's study became physiologically aroused (as measured by GSR) to imagining past situation in which they had won money, but not as aroused by imagining past losses. In contrast, problem gamblers tended to be equally physiologically aroused by imagining both winning and losing situations. Sharpe's study gives one possible explanation for the differences in average bet size by condition across gamblers with few versus many problems. Gamblers with few problems may have developed a consistent association of physiological arousal to episodes of winning (the 'winning feeling'), while gamblers with many problems may also associated arousal with episodes of losing money. As a result, gamblers with few problems are more likely to associate arousal levels as an indicator that they will soon experience gambling success (*a winning feeling*), whereas gamblers with many problems are apt to associate arousal as an indicator that they may soon lose. The pattern of average bet size observed in the present study is a least consistent with this explanation.

Final payouts showed no reliable relationship to any of the independent variables, including Condition, Gender and CPGI gambling-severity. Final payouts, however, are strongly affected by the size of the bet that participants place on winning trials, and are therefore highly variable across participants. A relatively brief (5 minute) gambling session also tended to contribute to high error-variance associated with this measure.

The speed at which participants placed bets was influenced by their level of gambling severity, gender and condition. In contrast to study predictions, the White-noise condition generally slowed the pace of betting when compared to the control. This slow-down was particularly evident among persons with few gambling problems and also male participants. It is possible that placing large bets (a risk-taking activity) requires more cognitive effort than placing smaller bets, which would account for the observed differences. It is also possible that people with fewer gambling problems put more effort and time into making their gambling decisions than persons with more problems.

In sum, the present study showed that autonomic arousal has a strong influence on gambling behaviour, and is not just an epiphenomenal consequence of gambling. The sample size was modest (N = 69), which may have limited our ability to discern some effects, and it is important to note that the startle-paradigm is only one way to induce arousal. Nevertheless, the present study is the first attempt to experimentally link arousal to subsequent gambling behaviour. It suggests that the arousal produced by gambling may have a reinforcing effect on behaviour that can lead to greater gambling involvement and consequent harm.

The Crocodile Study

The Loud Noise Study (above) provided evidence that physiological arousal has a strong impact on EGM gambling behaviour. Like all experiments, however, there are limitations inherent in its design. Most importantly, the manipulation of arousal using the startle-paradigm may create some uncertainty in the participant. Since loud-noises are not usually associated with EGM play, the manipulation was likely to contribute to an environment of uncertainty as well as heightening physiological arousal. A climate of uncertainty may contribute to changes in gambling behaviour beyond the contribution of physiological arousal alone, although there is little theory to guide expectations.

The Crocodile Study was designed to compensate for the limitations of the Loud-noise study by using a different manipulation of arousal. By manipulating arousal prior to the start of the task, the current study avoided producing differences in uncertainty within the EGM session between the test-condition and the control. Additionally, the manipulation was subtle enough that it was unlikely to be consciously recognised as a contributing factor to participants' behaviour on the EGM.

The current study draws on a research tradition of studies in so-called *misattribution of arousal*. Schachter and Singer (1962) introduced a two-factor theory of emotion, which proposed that the experience of emotion starts with undifferentiated autonomic arousal. In a second step, people look to the environment to help interpret the emotion that they are experiencing. The theory predicts that if the source of the arousal is sufficiently subtle or ambiguous, the resulting experience of

emotion can be misattributed to another (incorrect) environmental source. Schachter and Singer (1962) demonstrated this effect by injecting people with either adrenaline (epinephrine) or a saline placebo. Participants who were injected with adrenaline (raising arousal) were placed with an experimental confederate who acted either angry or playful. Those participants who were *not* informed of the influence of the drug on their arousal-level tended to misattribute their emotional state to be the same as that displayed by the confederate (i.e., either angry or playful).

Another classic experiment in *misattribution of arousal* provided a model for the present experiment. Aron and Dutton (1974) conducted a study demonstrating that arousal produced from travel across a high suspension-bridge can be misattributed as sexual attraction. Male participants in the test-condition were interviewed by an attractive female experimenter on a fear-inducing 70-meter wire-and-plank suspension bridge over Capilano Canyon in Vancouver Canada. Following the interview, the attractive female experimenter gave the male subjects her phone number, and offered to explain the study in more detail at a later date. As a control, other interviews by the same attractive experimenter took place over a 3-meter high bridge of sturdy construction. The results of the study showed that subjects who were interviewed over the high suspension-bridge were more likely to call the experimenter than subjects who were interviewed on the low sturdy-bridge. In short, participants on the high bridge misattributed the physiological arousal resulting from fear of the high bridge to feelings of sexual attraction to the female experimenter.

Saltwater-crocodiles are fearsome ambush predators that remain largely unchanged from their first appearance over 240 million years ago. There have been

over 60 unprovoked attacks in Australia from Crocodiles since 1974 resulting in death and injury (Caldicott, D. G. E., Croser, D., Manolis, C., Webb, G., & Britton, A., 2005). The current study uses saltwater crocodiles to manipulate arousal prior to play on an EGM. The Koorana Saltwater Crocodile Farm is a Rockhampton Queensland area tourist attraction that served as the study location, and a subtle means of manipulating arousal prior to gambling.

Method

Participants. One-hundred and six subjects, 64 males and 42 females, were recruited during February to May 2007 from Koorana Saltwater Crocodile Farm in Central Queensland, Australia. Recruitment criteria included all persons over the age of 18 years. Three persons were excluded from the final data analysis, including 2 for non-completion of the experiment, and 1 for early withdrawal. The final sample consisted of 103 subjects, 62 males and 41 females, who ranged in age from 18 to 66 years with an average of 34.2 years (*SD* = 13.3). Participants were categorised into the following groups based on a 9-item scoreable portion of the Canadian Problem Gambling Index (Ferris, J. & Wynne, H., 2001): a) 81 (78.6%) no problems, b) 13 (12.6%) low risk, c) 8 (7.7%) moderate risk, and d) 1 (1%) problem gambler. Of the 81 participants categorised as having no gambling problems, 76 had not gambled in any form during the last 12-month period. The cultural background of subjects included: 50 (48.5%) Australian; 13 (12.6%) English; 8 (7.8%) German; 7 (6.8%) Irish; 4 (3.9%) Swiss; 3 (2.9%) New Zealander; 3 (2.9%) Scottish; 3 (2.9%) Dutch; 2 (1.9%) American; and 9 (8.73%) Other (each representing only 1 unique cultural idenitity).

Apparatus. The experiment utilised a traditional 3-reel EGM simulated on a laptop computer (see *Figure 1*). The simulated EGM was programmed to payoff on trials 2, 6, 8, 13 and 20, with no more 'wins' after the 20th spin. Players could place bets of 25, 50, or 100 cents on each trial, with payoffs equalling 10 times the amount bet. Credits were presented in cents, with an initial bankroll of $20 (or 2,000 cents) presented on the screen at the start of play. The EGM produced typical noises of play including the spinning of the reels and winning bells.

Galvanic Skin Response (GSR) was recorded using a ProComp+ unit and Biograph Software for data processing. The measurement device was clipped to subject's left hand using a finger sensor.

Measures. The *Positive and Negative Affect Schedule* (Watson, D., Clark, L. A., & Tellegen, A., 1988) was completed by all participants after they completed play on the EGM as an indicator of current affective state. Participants were asked to rate 10 positive and 10 negative emotions on a 5-point Likert type scale according to how they felt at the 'present moment.'

The 9-item scoreable portion of the *Canadian Problem Gambling Index* (CPGI, Ferris, J. & Wynne, H., 2001) was used to categorise participants according their gambling severity. The categories included: no gambling problems, low-risk gambling problems, moderate-risk gambling problems, and problem gambler.

Participant's psychological risk for the development of problem gambling behaviour was measured using *The 4 Es Scale* (Rockloff, M. & Dyer, V., 2006). This 40-item measure asked participants to rate on a 5-point Likert-type scale the extent to which they either disagree or agree with statements according to how they have felt in the past 12-month period. Scores determine the extent to which subjects are predisposed to each of the four constructs of Escape, Esteem, Excess, and Excitement; which place an individual at risk of developing problem gambling behaviour.

Design and Procedure. The first six tourists to arrive for each crocodile tour were assigned by the experimenter to potentially participate in the study either: 1) prior to their participation in the crocodile tour (control condition), or 2) after participating in the crocodile tour and holding a 1-metre long crocodile (experimental condition). As a method of random assignment, the first 6 tourists arriving for the tour were conceptually organised into 3 pairs according to their order of entry. One person in each pair was assigned by coin-flip to the control condition, and the second member to the test/crocodile condition.

The crocodile tour involved first watching a 10-minute video describing the seasonal activities of the crocodile farm. Tourists were taken outside for approximately 1-hour for the main part of the tour. This involved educating tourists on the predatory behaviour of saltwater crocodiles. Tourists stood within a metre from the crocodile enclosures as the animals leapt out of water-filled pools to be fed. The final section of the tour involved an opportunity to hold a 1-metre juvenile crocodile. Although the crocodile's jaw was taped shut, tourists were cautioned that it

could still harm them due it its strength and the protruding teeth on the outside of its mouth.

Based on random assignment criteria (as described above), tourists were asked to participate for the experimental condition directly after holding the crocodile. The majority of tourists opted to hold the crocodile at the conclusion of the tour. Potential control-condition subjects were recruited immediately after their arrival at the Farm and prior to any contact with crocodiles. If a tourist refused participation in the experiment, the next potential participant was approached from previously identified pairs (as described above). The overall the participation rate in the study was 33.3%. Refusal reasons included: not interested (45.9%), spoke a foreign language (19.1%), wanted to have lunch (16.5%), wanted to leave (8.8%), 'other' reasons (5.7%), and no reason given (4.1%).

In both conditions, recruited study subjects were led to a table in the dining area, and were given $20 compensation for their participation. Participants then read an information sheet, filled out informed consent, and had the GSR device attached to a finger on their non-dominant hand. Subjects were then asked if they would like to gamble with the $20 compensation. As an incentive, participants were also guaranteed to receive 1 lottery ticket for each dollar left on the EGM at the end of play towards one $500 grand-prize. All 106 participants agreed to gamble with their $20 payment. The $20 was retrieved from participants, and 2,000 1-cent credits were displayed on the simulated EGM. This procedure was intended to reinforce the (correct) perception that participants were gambling with their own money. Subjects were told that they

could leave the game at any time and that they would keep any amount that was remaining on the EGM.

At the end of their gambling session participants completed the following questionnaires: 1) Positive and Negative Affect Schedule (PANAS, Watson, D. et al., 1988), 2) basic demographic questionnaire, 3) The Four Es Scale (Rockloff, M. & Dyer, V., 2006), and 4) the Canadian Problem Gambling Index (Ferris, J. & Wynne, H., 2001). Participants were debriefed at the end of the experiment and were paid the greater of either their remaining EGM bank or $20 dollars. The $20 minimum compensation was a consolation prize, although participants were not made aware of this minimum in advance.

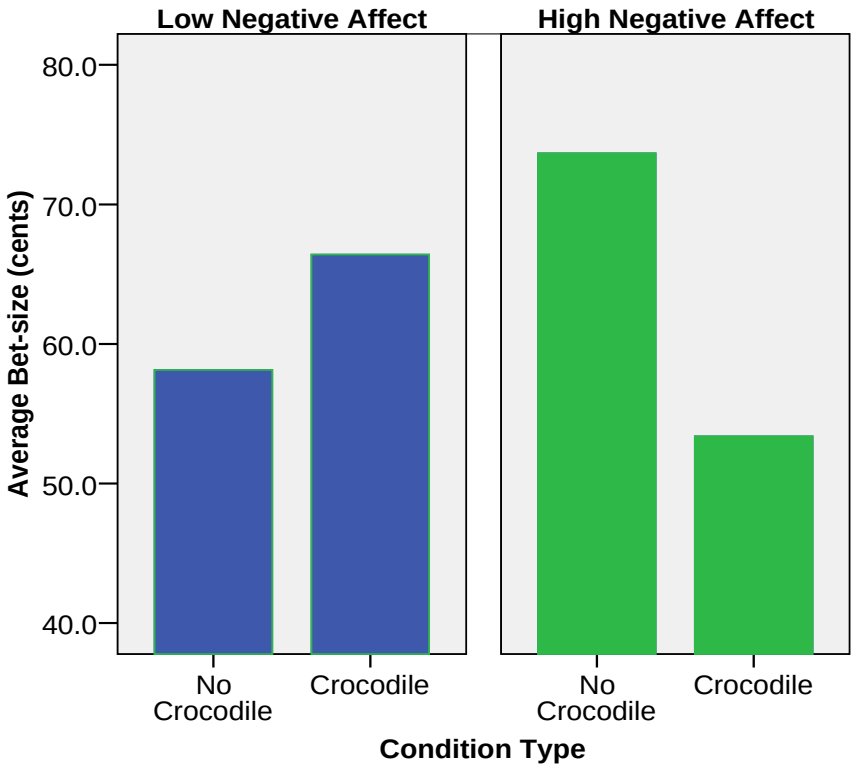
Results

Manipulation Check. Galvanic Skin Response (GSR) was used as a manipulation check for arousal differences between the crocodile condition and the control. Measurements were computed for the 30 seconds prior to the start of the EGM task and the 30 seconds after the beginning of wagering. As predicted, there was a significantly larger increase in GSR for the Crocodile condition (M = 11.1 μm) than for the control condition (M = 0.62 μm), $t(97) = 2.18$, $p = .03$.

Average Bet-Size. The effects of Condition, Negative-Affect Level (PANAS) and Problem-gambling Status (CPGI) on Average Bet-size were analysed using a 2x2x2 ANOVA model. Gender was excluded as a potential independent variable from this model (and subsequent models) due to its failure to contribute as a significant

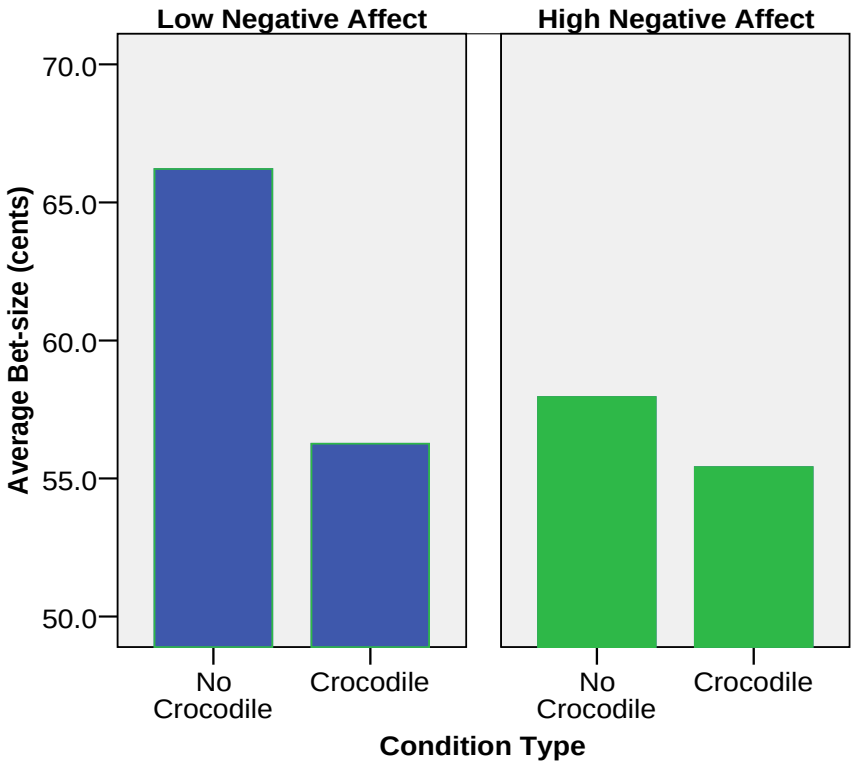
explanatory factor. As shown in *Figure 11*, the analysis found a significant interaction between Condition and Problem-gambling status, $F(1,89) = 5.60$, $p = .02$. As expected, participants who reported low negative affect had higher bet-size in the Crocodile condition compared to the control condition. However, persons with high negative affect had lower bet sizes in the Crocodile condition compared to the control.

Figure 11. Bet-size by Condition and Negative Affect Level (All Participants)



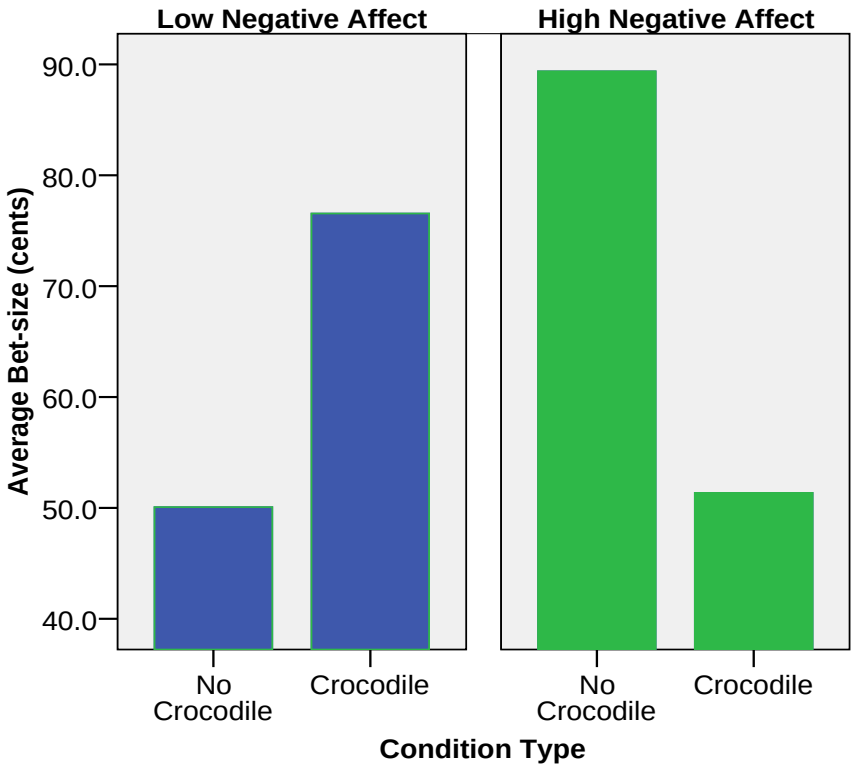
The model also revealed a significant 3-way interaction between Condition, Negative Affect Level and Problem-gambling Status on the outcome of Average Bet-size. *Figure 12* shows that for the subset of persons with *no* identifiable gambling problems (CPGI = 0), there was a consistent reduction in bet-size in the Crocodile condition when compared to the control.

Figure 12. Bet-size by Condition and Negative Affect Level (No Gambling Problem Participants ONLY)



In contrast, *Figure 13* shows that for the subset of persons with 1 or more CPGI gambling problems, the effect of condition was dependent on the level of negative affect. Persons who were *low* in negative affect showed the expected pattern of more intense gambling, as measured by bet-size, in the crocodile condition when compare to the control. However, persons who were *high* in negative affect showed a pattern of results similar to people with no gambling problems. The crocodile condition had lower average bet-sizes when compared to the control.

Figure 13. Bet-size by Condition and Negative Affect Level (Participants with 1 or more gambling problems ONLY)



Final Payouts. The effects of Condition, Negative-Affect Level (PANAS) and Problem-gambling Status (CPGI) on Final Payouts were analysed using a Mann-Whitney U test. Non-parametric statistics were appropriate as 13 (12.6%) participants ended the EGM session with no credits remaining. There was *no* significant difference in Final Payouts by Condition, *Mann-Whitney U* = 1184.5, p = .35, ns. In addition, there was *no* significant difference in Final Payouts by Negative Affect Level, *Mann-Whitney U* = 1147.5, p = .99, ns, or by Problem-gambling Status, *Mann-Whitney U* = 785.0, p = .39, ns.

Speed of Betting. The effect of Condition, Negative-Affect Level (PANAS) and Problem-gambling Status (CPGI) on Speed of betting (average time-per-trial in

seconds) was analysed using a 2x2x2 ANOVA model. A significant main-effect was found for Problem-gambling status, $F(1,89) = 5.74$, $p = .02$, such that participants with some identifiable gambling problems bet faster ($M = 12.3$ sec) than persons with no gambling problems ($M = 14.9$ sec). No other main-effects or interactions in the model proved significant, $p > .05$.

Total Trials. The effect of Condition, Negative-Affect Level (PANAS) and Problem-gambling Status (CPGI) on Total Trials Played was analysed using a 2x2x2 ANOVA model. A significant main-effect was found for Problem-gambling status, $F(1,89) = 6.82$, $p = .01$, such that participants with some identifiable gambling problems placed more bets ($M = 48.1$ trials) than persons with no gambling problems ($M = 35.5$ trials). No other main-effects or interactions in the model proved significant, $p > .05$.

Discussion

As measured by Average Bet-size, the crocodile condition generally reduced the intensity of gambling when compared to the control for people with high negative affect. This result seems to indicate that a climate of caution carried over from the interaction with the crocodile into the gambling experience. However, participates with at least some gambling problems and *low* negative-affect placed larger bets in the crocodile condition when compared to the control. In agreement with Schachter and Singer's (1962) two-factor theory of emotion, the influence of autonomic arousal on gambling behaviour appears to be moderated by the cognitive interpretation of the state of arousal. For those gamblers with problems (see *Figure 13*), the influence of

the arousal on average bet-size was dependent on whether they interpreted their feeling as negative. Participants who did *not* feel negative after holding the crocodile misattributed their arousal to the gambling experience and placed larger bets than the similarly composed control condition.

Other measures of gambling-intensity explored in this study included Final Payouts, Speed of Betting and Total Trials Played. No significant effects for Final Payouts were found. Speed of betting was generally faster for participants with some gambling problems, but the experimental condition showed no reliable effects. Lastly, the Total Number of Trials Played was higher for subjects with gambling problems. The lack of significant results for these other measures of gambling-intensity is likely due to the greater amount of between-subjects variability for these outcomes.

The results of this study provide further evidence that physiological arousal has an influence on EGM gambling behaviour (see Loud Noise Study, above). The influence of arousal on gambling behaviour; however, is dependent on the cognitive interpretation of that feeling-state. For reasons that are not entirely clear, some participants have a negative feeling associated with arousal induced by the crocodile, while others do not experience this negative affective-reaction. Regardless of affective state, participants with no gambling problems reliably reduced their bet sizes in the crocodile condition when compared with the control. This *cautious shift* shows a misattribution of arousal from the crocodile that led participants to believe they were going to experience relatively less gambling success. Gamblers with some problems and a negative affective state also exhibited the cautious shift. Lastly, however, gamblers with some problems and *no* negative affective-state demonstrated a *risky-*

shift in response to the crocodile condition in accord with expectations. Understanding how people create cognitive interpretations of their affective reactions is critical in understanding how arousal can lead to harmful gambling behaviour.

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