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ORIGINAL PAPER

# Veiled EGM Jackpots: The Effects of Hidden and Mystery Jackpots on Gambling Intensity

**Phillip Donaldson**[1] · **Erika Langham**[1] · **Matthew J. Rockloff**[1] · **Matthew Browne**[1]

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**Abstract** Understanding the impact of EGM Jackpots on gambling intensity may allow targeted strategies to be implemented that facilitate harm minimisation by acting to reduce losses of gamblers who play frequently, while maintaining the enjoyment and excitement of potential jackpots. The current study investigated the influences of Hidden and Mystery Jackpots on EGM gambling intensity. In a Hidden Jackpot, the prize value is not shown to the player, although the existence of a jackpot prize is advertised. In a Mystery Jackpot, the jackpot triggering state of the machine is unknown to players. One hundred and seven volunteers (males = 49, females = 58) played a laptop-simulated EGM with a starting $20 real-money stake and a chance to win a Jackpot ($500). Participants played for either a Hidden or Known Jackpot Value, with either a Mystery or Known winning symbol combination in a crossed design. Lastly, a control condition with no jackpot was included. Gambling intensity (speed of bets, persistence) was greater when the Jackpot value was unknown, especially when a winning-symbol combination suggested that a win was possible. While there is no evidence in the present investigation to suggest that Hidden or Mystery jackpots contribute to greater player enjoyment, there is some evidence to suggest a marginal positive contribution of hidden jackpots to risky playing behaviour.

**Keywords** Gambling · Problem gambling · Gambling intensity · EGM · EGM jackpots · Simulation

Phillip Donaldson: Deceased.

✉ Matthew J. Rockloff
m.rockloff@cqu.edu.au

[1] Central Queensland University, Bundaberg, Australia

## Introduction

Electronic Gaming Machines (EGM) have a number of structural characteristics that can potentially impact on the playing behaviour of gamblers, including the different design features of jackpots that they may offer. A jackpot is defined by McPherson as "An accumulated amount that is contributed to, and available within, the prize pool" (2007, p.316). Despite the very high prevalence of jackpots in the contemporary marketplace, there has been very limited research into relationship between jackpots and gambling intensity. However, there are theoretical grounds to expect that jackpots may lead to increased gambling intensity (Custer and Milt 1985; Rockloff and Hing 2013): a proposition with some recent empirical support (Browne et al. 2014; Rockloff et al. 2014a).

EGM Jackpots are similar to lotteries in that potentially large wins may erroneously be perceived as attainable at a relatively low cost (Griffiths and Wood 2001; Productivity Commission 1999; Rockloff and Hing 2013; Wood et al. 2004). The actual triggering of EGM jackpots is so rare as to be arguably functionally irrelevant for players in terms of behavioural reinforcement—and on this basis would be expected to be largely irrelevant for their gambling choices and playing experience (Rockloff and Hing 2013). However, EGM jackpots may provide an incentive to continue gambling following mounting losses due to cognitive factors, as the player may hope to recover their accumulated losses (chasing losses) in a single, large jackpot win (Custer and Milt 1985; O'Connor and Dickerson 2003). When jackpot values are high, players may perceive the likelihood of winning as low and consequently engage in less risk-taking behaviour than when jackpot values are low and, therefore, considered more attainable. An alternative line of reasoning, based on the theory of demand for gambles, players may persist longer when jackpot values are high as the perceived value of wagers may be greater (Nyman et al. 2008). When jackpot values are not advertised (i.e., on the machine or on overhead banners), then the ambiguity created may provide further scope for the development of irrational beliefs or erroneous cognitions regarding their perceived value. If so, then playing for a jackpot of unknown (and therefore potentially unlimited) size may result in greater EGM gambling intensity compared to when the jackpot value is known.

In the present experiment, the degree to which EGM jackpots are 'veiled' was explored, in order to determine potential impact on the gambling decisions and enjoyment of players. A *Veiled* jackpot is a jackpot in which some aspect of the triggering event mechanics or the prize outcome are purposely obscured from participants. Two types of veiled jackpot features that are explored in this study are *Hidden* and *Mystery* jackpots.

### Hidden Jackpots

In an EGM hidden jackpot, the prize amount(s) are not shown to the player, although the existence of a jackpot prize is advertised. This might cause some additional inducement to play and/or enjoyment for players due to the unknown—and therefore potentially unlimited—value of the top prize (Rockloff and Hing 2013). Thus, the potential additional impact of hidden jackpots is dependent on an overestimation of the actual jackpot prize on offer. Alternatively, the converse may also be true; if players assume the jackpot is likely to be smaller than the actual prize on offer, the attractiveness of hidden jackpots would be lower. Therefore, this experiment evaluated whether both suggestively large and small hidden jackpots are more or less motivating and enjoyable than jackpots where players know the precise value.

## Mystery Jackpots

In a mystery jackpot, the “winning state” of the machine; that is, the required combination of symbols to trigger the jackpot, is not revealed to the players. Mystery jackpots can be a natural consequence of jackpot systems that are independent of the core operation of the stand-alone EGM. Jackpot systems may be added to several different types of machines, even machines from different manufacturers, and thus each EGM bet is essentially a lottery draw for the grand prize of the jackpot system. In a non-combinative mystery jackpot, any losing sequence of symbols on the EGM is just as likely to win the jackpot prize as a winning sequence, because the jackpot system is essentially independent from the machine and uses the EGM only as a triggering device. In contrast, a combinative mystery jackpot has a winning sequence of symbols on the machine, but this combination is not shown to players prior to winning the jackpot (Rockloff and Hing 2013).

One potential impact of mystery jackpots is that each spin could be perceived as a near miss, given that the gambler does not know what the winning combination is, and therefore this could increase persistence in play behaviour (Griffiths 1993; Griffiths and Wood 2001). Additionally, it has been argued that mystery is an inherently attractive dimension of gambling (Binde 2007). If this is true, then the heighted uncertainty attached to jackpots with an unknown triggering mechanism may lead to heightened interest and thereby greater persistence.

Awareness of jackpot winning combinations may also be associated with increased illusions of control among EGM players. Illusions of control are a form of irrational belief in which players assume some degree of control over randomly determined outcomes (Langer 1975). Paradoxically, known winning EGM symbol combinations may also produce the sensation of near misses, in which the player perceives that they have narrowly missed out on a lucrative jackpot payout when a series of reels almost align in a winning combination but fall short by just one symbol. Thus, an alternative argument is that illusions of control and perceived near misses may be experienced more frequently when jackpot winning combinations are known compared to when they are hidden, resulting in greater gambling intensity.

## Veiled Jackpots Experiment

The present study sought to investigate the effects of Hidden and Mystery Jackpots in an experimental paradigm. Experiments offer a high degree of internal control, whereby the effect of Veiled Jackpots can be reliably related to aspects of player behaviour. Veiled jackpots are effective if players believe their expected value is in excess of the player contributions to the jackpot. Thus, we had no prior expectations about whether hidden and mystery jackpots should be effective in intensifying player behaviour or increasing enjoyment.

# Methods

## Participants

One-hundred and seven (107) adults (58 female, 49 male) from 2 metropolitan areas responded to flyer advertisements placed in local community newspapers. Ages of participants ranged from 20 to 86 years ($M = 47.0$, SD $= 16.4$). Cultural backgrounds of participants included: 74.8 % Australian, 10.3 % English, 3.7 % Philippine, 2.8 % New Zealander, and a further 8.4 % of people nominating another background (each less than 1 % frequency). A further 4.7 % of participants (5) also identified as being Indigenous Australians. Eighty-two percent (82 %) of the sample had gambled on a casino style game at least once within the last 12 months.

## Procedure

### *The Simulated EGM*

Subjects played a 3 reel laptop simulated EGM created in Visual Basic (see Fig. 1). The EGM was programmed with a fixed sequence of wins on trials (spins) 3, 4, 7, 12, 17, 19, 29, 36, 42, 48 and 50, and infinite losses thereafter. Reel size varied such that the six icons (banana, 4 leaf clover, watermelon, horseshow, star and grapes) appeared with a varied frequency per reel. Six icons were presented on reel 1 (once each), 9 icons on reel 2 and 12 on reel three. Consequently, we were able to ensure that the 'winning combination' icons appeared relatively infrequently compared with other icons, ensuring that the perceived probability of producing the winning combination was not artificially inflated.

Players were given $20 cash on arrival at the laboratory as compensation for their time. After completing a brief demographic questionnaire, participants were asked if they would like to play the simulated EGM using the provided $20 as a stake. If participants agreed, the $20 cash compensation was retrieved from the participants, and participant played the simulated EGM pre-loaded with 2000 1c credits. This procedure establishes an increased sense of ownership of the funds used to play and increases personal engagement and investment with the simulation. One participant opted not to continue the experiment at


**Fig. 1** Simulated EGM depicting the jackpot amount and winning symbol combination

this stage. Participants were able to bet 25, 50 or 100 cents on each spin, and all wins paid 10× the amount bet for a theoretical maximum of $120.25. The simulated EGM produced the typical sights and sounds of EGM play, including the musical sounds of spinning reals and winning bells.

Physiological measurements were also taken as potential indicators of arousal and emotional state. Physiological arousal was measured via galvanic skin response (GSR) using Biograph Infiniti (participants 1–30), and Affectiva Q-Sensor (participants 31–107) systems. Equipment availability necessitated using different measurement apparatus at each data collection site; however comparable data was collected by each system. Sensor type was included in analysis as a control variable.

### *Conditions*

Participants were assigned to conditions using a crossed design (see Table 1). Stratified random assignment based on participants' gender, age, and Lie-Bet score were used to allocate participants to play the simulated EGM in the different conditions described below. Within four of these conditions, participants were shown a potential $500 cash jackpot in a mason jar prior to play. Participants in a further four conditions were presented with a jackpot of 500 lottery tickets for a potential $25,000 prize (also shown in jar). The remaining participants in the control condition were not informed of any jackpot prize. All participants, aside from those in the control condition, were told that someone in the experiment would win the jackpot prize.

In another crossed condition, participants were assigned to either a "hidden" or "shown" jackpot dollar value. All participants, aside from those in a control condition, were informed that a jackpot could be won (cash or ticket value), but those in the hidden jackpot condition were not informed of the monetary value of the jackpot. In a final crossed condition, participants were assigned to either a known or mystery (unknown) winning-symbol combination. All participants, aside from those in the control condition, were informed that the jackpot would be won if a pre-determined combination of symbols appeared on screen, but the winning combination was only revealed to those in the known combination condition.

**Table 1** Assignment of participants to conditions

| Condition | Cash | Tickets | Jackpot $ hidden | Jackpot $ shown | Combo mystery | Combo known |
|---|---|---|---|---|---|---|
| 1 | ✔ | | ✔ | | ✔ | |
| 2 | ✔ | | ✔ | | | ✔ |
| 3 | ✔ | | | ✔ | ✔ | |
| 4 | ✔ | | | ✔ | | ✔ |
| 5 | | ✔ | ✔ | | ✔ | |
| 6 | | ✔ | ✔ | | | ✔ |
| 7 | | ✔ | | ✔ | ✔ | |
| 8 | | ✔ | | ✔ | | ✔ |
| 9 | N/A | N/A | N/A | N/A | N/A | N/A |

## Results

### Data Analysis

The primary outcomes of interest were Average Bet Size, Speed of Betting (Bets per Minute), Persistence (Total Trials Played), Self-rated enjoyment (1 item Likert 6 points), and Physiological Arousal (GSR). Sensor type was found to have to have no impact, and was excluded from further analysis. For each outcome, two models were considered: a Full Factorial ANCOVA Model and a Control ANCOVA Model. The Full Factorial Model included all potential interactions between the Hidden and Mystery Jackpot conditions, but consequently could not include the control condition (no jackpots), as this latter condition necessarily could not be included in a crossed-jackpots design. The Control ANCOVA model analysed each condition (as outlined in Table 1) in a main-effects design without crossing conditions, and included the no-jackpots control condition.

### The Full Factorial Model

ANCOVA models were run with each of these dependent measures and the crossed conditions of Jackpot Prize ($500 Cash or 500 Instant Scratch Tickets), Jackpot Value (Hidden or Shown) and Jackpot Combination (Known or Unknown) as the primary independent variables. In addition, each model used Gender, Age and Dichotomised Problem Gambling Severity Index Scores (PGSI 0, PGSI 1+) as covariates. The covariates did not show any significant interactions with the other study variables. With the exception of PGSI and GSR, the Full Factorial Models did not produce significant results and are excluded from this report in the interest of brevity [see (Rockloff et al. 2014b) for full report].

### The Control ANCOVA Model

The no-jackpots control condition could not be analysed in a factorial model, and thus an additional set of ANCOVAs models (the Control Models) were evaluated with Condition (1–9, see Table 1) as the primary dependent variable, and Gender, Age and Dichotomised Problem Gambling Severity Index Scores (PGSI 0, PGSI 1+) as covariates. No interactions were used in these models. Fisher's LSD was used to test for potential differences between conditions.

### Average Bet Size

The Control Model assessed each of the 9 conditions of the experiment (see Table 1) as the primary independent variable, with Age, Gender and Dichotomised PGSI as covariates.

**Table 2** ANCOVA predicting speed of bets, trials played, and average bet size from PGSI status (PGSI 0, PGSI 1+)

| PGSI status (PGSI 0, PGSI 1+) | *df* | MS | F^ | $\eta^2$ | Sig. |
|---|---|---|---|---|---|
| Speed of bets | 1 | 1685.04 | 3.56 | .04 | <.05 |
| Trials played | 1 | 507.66 | 1.07 | .01 | <.05 |
| Average bet size | 1 | 1799.11 | 3.80 | .04 | .055 |
| Error | 83 | 473.67 | | | |
| Total | 94 | | | | |

Fisher's LSD tests revealed no significant main effects between conditions for Average Bet Size. However, PGSI status approached significance in the Full Factorial Model, $p = .055$, with subjects experiencing gambling problems having higher average bet sizes than those with no identifiable problems (Table 2).

## Speed of Betting (Bets per Minute)

Fisher's LSD tests revealed that in the conditions where the prize was 500 tickets and the jackpot combination was shown, there was a significant higher betting speed for the hidden $-value jackpot when compared to the shown $-value jackpot, $p < .05$ (Fig. 2). Furthermore, in the Full Factorial Model, gambling problems (PGSI status) positively predicted Speed of Betting, $F(1, 83) = 6.16$, $p < .05$ (Table 2), showing that participants experiencing some problems with gambling bet at a higher rate (M = 7.76 bets per minute, SD = 1.68) than those participants not experiencing gambling problems (M = 7.16 bets per minute, SD = 1.68).

## Persistence (Total Trials Played)

The number of trials played is a measure of gambling persistence, as all trials past 50 were programmed with losses. Consistent with the results for Betting Speed, Fisher's LSD tests revealed that in the conditions where the prize was 500 tickets and the jackpot combination was known, there was a significant higher persistence (Total Trials Played) for the hidden $-value jackpot when compared to the shown $-value jackpot, $p < .05$. Moreover, this combination of the ticket-jackpot, $-value hidden and known combination had reliably higher persistence (Total Trials Played) than the no-jackpot control condition, $p < .05$; and the cash jackpot where the jackpot value was hidden and the combination was shown, $p < .05$ (see Fig. 3). In addition, there was a significant effect for PGSI status in the Full Factorial Model, such that participants experiencing some gambling problems

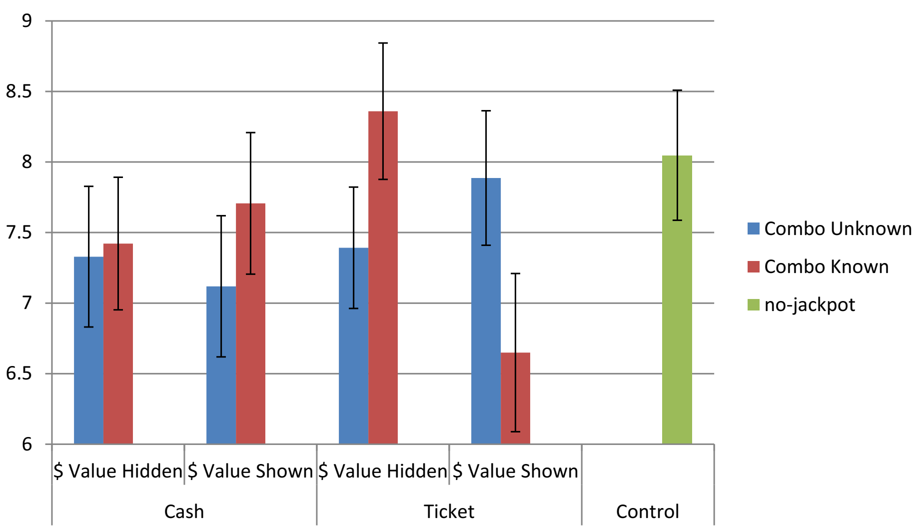


**Fig. 2** Betting speed by condition (*Error bars* show ±1 SE)

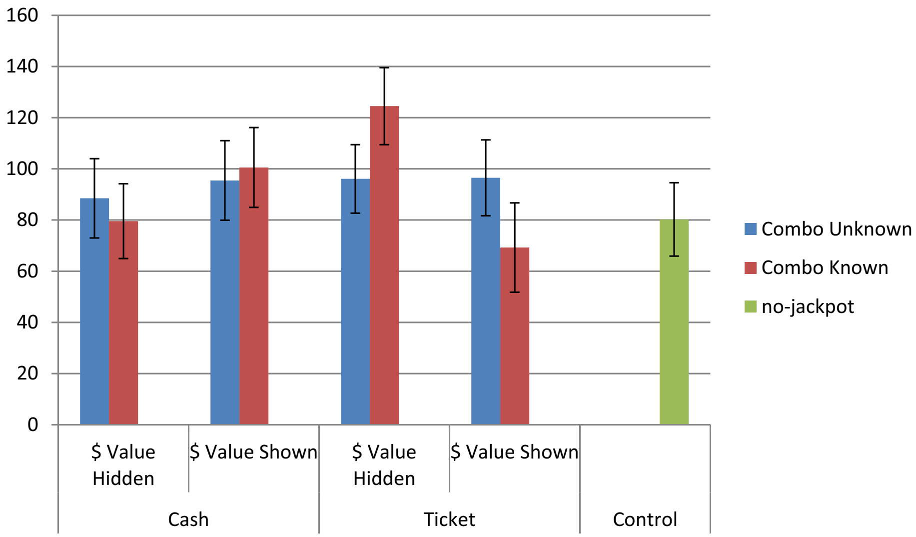


**Fig. 3** Persistence (Total Trials Played) by Condition (*Error bars* show ±1 SE)

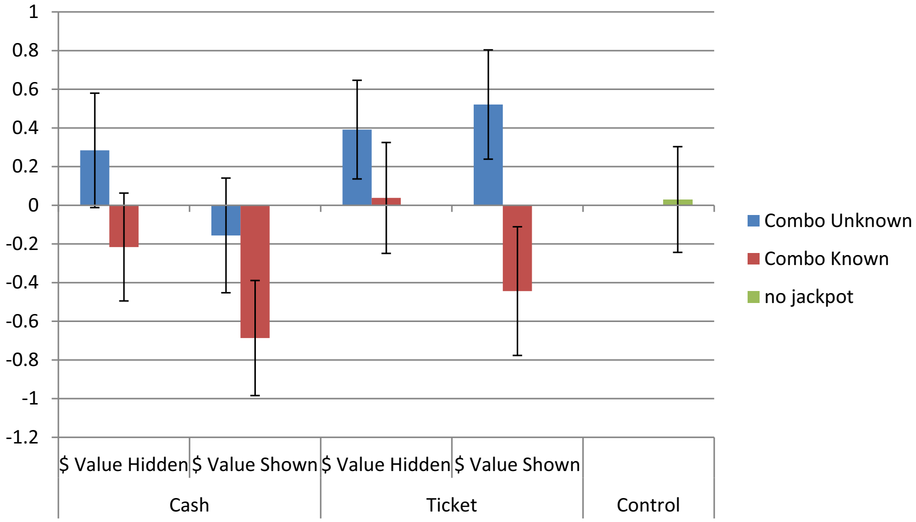


**Fig. 4** Physiological arousal (GSR) (*Error bars* show ±1 SE)

($M$ Trials = 105.4, SD = 54.0) bet for more trials than those experiencing no problems ($M$ Trials = 80.4, SD = 49.7), $p < .05$ (Table 2).

## Self-rated Enjoyment

Subjects rated their enjoyment of the EGM on a 6-point Likert scale immediately after playing. Fisher's LSD tests revealed no significant main effects between conditions for Self-rated Enjoyment, $p > .05$, ns.

### Physiological Arousal (GSR/Skin Conductance)

Physiological arousal was measured through GSR/Skin Conductance as the difference between measurements during the experiment and a baseline 2-min period immediately prior to the experiment. Fisher's LSD tests revealed that the positive change in physiological arousal (GSR) was greatest for the ticket jackpot where the jackpot $-value was shown ($25,000) but the winning symbol combination was unknown. More generally, the unknown "Mystery" winning symbol combination ($M = .273$ standardised) contributed to a greater positive change in physiological arousal than the known combination ($M = -.310$ standardised), while the known winning symbol combination contributed to a greater negative change in physiological arousal (see Fig. 4).

In addition, there was a significant main effect for the Combination (Known or Unknown) in the Full Factorial Model such that an unknown winning symbol combination ($M = .273$ standardised) produced a greater increase in Physiological Arousal (GSR) than a known combination ($M = -.310$ standardised) $F(1, 83) = 7.87$, $p < .05$.

## Discussion

The Full Factorial Models failed to show systematic effects for either Hidden Jackpots (where the value of the prize is withheld) or Mystery Jackpots (where the winning combination is not shown) on player behaviour, with the exception of the measure of Physiological Arousal (GSR/Skin Conductance). Physiological arousal changes from the baseline period to the experiment were most positive when the winning jackpot combination was a mystery. Therefore, there is some evidence to suggest that *not* showing a winning combination can contribute to physiological arousal.

However, negative changes in physiological arousal were associated primarily with the conditions in which the winning combination of symbols was known. The presentation of the jackpot winning combination provided players with a fixed objective, thereby reducing the anxiety associated with attempting to resolve an unknown variable. Consequently, this may have increased illusions of control or perceptions of skill among players in the known winning combination conditions.

The differences in changes to physical arousal levels between the two types of jackpot is of relevance with regard to potential impact on the contribution to problematic gambling behaviours. The mystery jackpots significantly increased Physiological Arousal within the laboratory environment, and a previous study (Anderson and Brown 1984) has demonstrated that laboratory increases in Physiological Arousal are an underestimate of increases in natural gaming environments. Increased physiological arousal during play has been linked to increased persistence in play (Griffiths 1991) and increased motivation to gamble (Blanchard et al. 2000), both of which are risk factors for problem gambling. The results of one study suggest that this is only the case if this experience was subjectively interpreted as a positive emotion (Rockloff and Greer 2010).

Based on previous studies, the mechanism for the increase in physiological arousal from mystery jackpots could be explained by the expectancy of winning (Ladouceur et al. 2003; Wulfert et al. 2005), the perception of each spin being a near miss (Clark et al. 2012), or a combination of both factors. However, this question cannot be resolved within the scope of the current investigation and should be examined in further detail in future studies.

The Control ANCOVA Models revealed some detail on the specific jackpot combinations that generally contributed to more intense gambling behaviour. In particular, the suggestively large "ticket" jackpots where the value of the prize was hidden from players (i.e., not shown on the EGM as the potential $25,000 top prize), but where the winning symbol combination was displayed (a non-mystery) contributed to both the fastest gambling speeds (Bets per Minute) and greatest persistence while losing (Total Trials Played). Speculatively, this may have resulted from a subjective feeling that a winning combination was possible to achieve (Clark et al. 2012; Ladouceur et al. 2003). The jackpot symbols, while rare, did occasionally fall on the win line. This seemed to be most attractive to players, however, when the top prize of the ticket jackpot was *not* known to players—and therefore potentially very large. Importantly, the persistence of play in this condition combination was greater than the control condition (no jackpot), suggesting that large hidden value jackpots can contribute to gambling intensity if accompanied by advertised symbols that suggest such a win is possible, creating expectancy within the gambler (Ladouceur et al. 2003; Wulfert et al. 2005). It is also noteworthy that, although non-mystery jackpots were generally associated with lower increases in physiological arousal, the high-value hidden jackpots still had the highest increases in arousal within that set.

An alternative explanation is that the greater gambling intensity observed among those playing for an unknown-value ticket jackpot with a known winning combination, may have been due to players assuming the jackpot value to be smaller rather than potentially larger. In this case, gambling intensity may have increased because players believed the jackpot to be more obtainable than a comparably larger value jackpot (Ladouceur et al. 2003; Wulfert et al. 2005). According to utility theory, players may weigh their decisions by the estimated value of a jackpot as well as the likelihood of winning. In the present study, players may have assumed a smaller jackpot value and gambled more intensely under the belief that the goal-distance was more obtainable compared with a larger jackpot value. Thus, veiled jackpots may be effective if players believe their expected value to be in excess of the player contributions to the jackpot. Participants in the current study were asked to estimate the value of the unknown jackpot. However, no reliable patterns were observed and, consequently, this issue could be explored further in future studies focussed on player expectancies.

## Limitations

It is important to recognise the limitations of experiments in general with regard to ecological validity. This study did not attempt to faithfully recreate all the aspects of a real gambling venue but, rather, simulated the same psychological contingencies that are presumed to act upon real world decision-making.

It is possible that the findings can be somewhat sensitive to the specifics of operation for a particular machine, as our machine occasionally (although rarely) showed the jackpot-winning symbol on the win-line. Nevertheless, these findings could be considered at least indicative of a cause for concern for hidden jackpots that suggest high-value prizes, particularly given earlier findings that laboratory measures of physiological arousal are lower than those measured in natural gaming environments (Anderson and Brown 1984).

## Conclusion

This experiment demonstrated that suggestively large (or small) value hidden jackpots (where the prize value is not shown, but might be considered either high in value or small and obtainable) potentially contribute to more intense betting in the form of gambling speed and persistence; especially when a winning-symbol combination suggests that such a win is possible. Thus, hidden jackpots may deserve further scrutiny, particularly toward determining which mechanism (near win or expectancy of winning) underpins the change in play. There is no evidence in the present investigation to suggest that such jackpots contribute to greater player enjoyment but, nevertheless, there is some evidence to suggest a marginal positive contribution of hidden jackpots to risky playing behaviour.

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**Compliance with Ethical Standards**

**Conflicts of interest** No conflicts of interest are declared.

**Ethical Standards** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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