

The Impact of Jackpots on EGM Gambling Behavior: A Review

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Abstract This paper reviews literature on how jackpots influence Electronic Gaming Machine (EGM) gambling behaviour. Most of the available evidence addresses the motivational effect of the mere presence of EGM jackpots on play, as actual wins are relatively rare for individual gamblers. The review identifies a distinction between rational, biased and irrational motivations that attract people to EGM jackpots. The evidence suggests that EGM jackpots should generate additional consumption on EGMs above machines that do not have such lottery-like features. Rational motivations are likely to lead to consumer surplus, whereas biased and irrational motivations are likely to contribute to excessive consumption. Moreover, there is evidence that excessive gambling consumption is strongly associated with gambling-related harm. Future research should identify how the structural features of different types of jackpots; such as progressive, deterministic, hidden, mystery, linked and wide-area jackpots; may differentially appeal to rational, biased and irrational gambling motivations. Jackpots are common feature of EGM games, and therefore it is important to have a better understanding of how jackpot features influence play on the machines.

Keywords Jackpot · EGM · Poker · Slot · Big win · VLT

The purpose of this paper is to review literature on what is known about the influence of jackpots on gambling behavior. More specifically, the review will analyze literature that focuses on jackpots and so-called “big wins” on Electronic Gaming Machines (EGMs; including, fruit, slot and VTL machines) (Kassinove and Schare 2001). Furthermore, this review will assess evidence relating jackpots to risky behaviors on EGMs (e.g., gambling

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persistence, bet size, speed of betting, etc.). Lastly, the paper will also document evidence that these so-called “risky” behaviors are associated with identifiable harms.

In structuring the review in this way, the results are intended to provide an evidence base for understanding what features of jackpots may be important in relation to problematic play; and further generate an understanding of what behaviors and features need to be measured in future studies to inform evidence-based policy decisions in gambling.

Lotteries and EGM Jackpots: Similarities and Differences

Much of the literature that is relevant to EGM jackpots is drawn from lotteries (see Ariyabuddhiphongs 2011). Lotteries prizes are structurally similar to EGM jackpots because they share the features of potentially large payouts for comparatively small bets. In fact, simple jackpot schemes might be considered as conceptually equivalent to lotteries, as each bet on an EGM is the purchase of a virtual lottery ticket for a draw of the major jackpot prize. This is not to suggest, however, that the motivational influence of EGM jackpots is entirely analogous to motivations for lottery play. In fact, one fruitful avenue of inquiry is to explore how lotteries and EGM jackpots differ despite their structural similarity.

Ariyabuddhiphongs (2011) conducted a review of the literature on the psychology underlying lottery play. This review is instructive to understanding EGM jackpots due to the structural similarities of lotteries to EGM jackpots. EGMs that have jackpot features might be considered a composite product, where regular play on the machine (with nominal small wins and losses) is supplemented with the potential for the extraordinary wins associated with lottery products. A noteworthy observation is that instant scratch tickets (a type of lottery product) mimic some of the structural features of regular EGM play, and have been described as a “slot machine on paper” (Ariyabuddhiphongs 2011, p. 2). Scratch tickets have typically modest payouts and provide instant feedback on wins and losses, much like regular EGM play. EGMs can be considered a composite product that contains features similar to scratch tickets and lotto, but packaged into a repetitive and electronic betting medium (Griffiths and Wood 2001).

Importantly, however, EGMs are more often associated with gambling problems compared to lottery and instant scratch tickets (Productivity Commission 1999). Therefore, while these games are structurally similar to EGM Jackpots in terms of amounts bet and potential payoffs, the motivational influences may be entirely different. EGM jackpots are typically not separable from regular play, and thus a player cannot normally engage in the lottery component without also playing a rapid paced game that provides many small wins in a short span of time. In this way, the subjective experience of consuming lotteries, scratch tickets and jackpot EGMs is different; particularly with regard to speed of play and repeated small wins. Moreover, EGMs are often played in public venues, such as casinos, where wins are visible to others. In contrast, lottery and scratch tickets are often played in private, with fewer people able to share in the excitement of winning. Social motivations have been implicated as important factors in determining gambling intensity (Rockloff and Dyer 2007; Rockloff and Greer 2010a; Rockloff et al. 2010, 2012).

There are two essential elements to understanding the influence of EGM jackpots on player behavior. First, jackpots can influence EGM gambling behavior by providing a “potential” for a large prize. Few people will ever realize a large jackpot win, and thus the impact of this feature of EGMs is largely psychological rather than actual. In other words, people are influenced by the possibilities of a win rather than the actuality of winning. Second, for a lucky few, the actual experience of a jackpot win can influence their subsequent gambling behavior.

In fact, the presence of a big win—but not necessarily a jackpot win—is often noted as a motivating factor in the gambling careers of problem players (Custer and Milt 1985).

Potential EGM Jackpot Wins

Relatively little direct literature addresses the influence of potential EGM jackpots on behavior, although some experimental research is outlined below. The literature on lotteries, however, provides important and relevant information. Moreover, economists outside of the specific literature on gambling have long shown an interest in people's decision making under risk (Kahneman and Tversky 1979) of which gambling is a prototypical example. The demand for jackpot EGMs is therefore understandable both from literature on economics and the gambling-specific literature.

Definition of EGM Jackpots

By one definition, a jackpot is the largest prize possible on a gamble (Webster 2006). However, there are schemes of jackpots on EGMs that offer more than one “top prize”, and yet by their absolute magnitudes each prize on offer is considered a jackpot win. As a term therefore, jackpots are hard to define, even if jackpots have concrete definitions in legislation and regulation. In short, jackpots are distinguished from ordinary wins by their magnitude rather than other structural features, although regulation about what might be considered a jackpot varies by jurisdiction and may include structural features (e.g., such as the means by which a jackpot sum accumulates) (cf., The State of Queensland 2010).

Structural Features of Jackpots

Jackpots can vary according to some structural features that determine the payoffs. Research evidence is unclear, however, how these features might affect people's valuations of prospective gambles or the attractiveness of the games. Common structural features include progressive versus non-progressive; deterministic versus non-deterministic; hidden jackpots; mystery jackpots; linked versus standalone jackpots; and local-area versus wide-area jackpots (e.g., The State of Queensland 2010).

Progressive Versus Non-Progressive Jackpots

McPherson provides a definition of jackpots as “An accumulated amount that is contributed to, and available within, the prize pool” (2007, p. 316). Ultimately, all jackpots are funded by an accumulation of player expenditures (losses), but progressive (aka cumulative) jackpots incrementally grow in value as players make additional bets. In contrast, non-progressive jackpots are for a fixed prize amount—even though that amount is funded by an accumulation of losses from other players.

Deterministic Versus Non-Deterministic Jackpots

Deterministic jackpots have a guaranteed payout after a fixed number of gambles (the target), which is determined at random and concealed from the player's view. As a result,

the likelihood of winning necessarily grows as players continue to bet, although the interval until the next payoff is not known. It is difficult for the player to capitalize on this continuous improvement in the likelihood of winning, however, as the interval until the next jackpot win could be very long. As a possible exception, Hing (2007) reported on syndicates of players that attempted—with some apparent success—to dominate play on machines that draw near to an inevitable payoff. Non-deterministic jackpots, in contrast, have a constant probability of winning. Potential awards are assessed at random with every bet. While the probability of winning the jackpot is fixed in non-deterministic jackpots, this probability of winning may be based on each bet placed or the cash value of each bet. If the chance of winning is based on each bet placed then, perversely, a series of small bets has a greater likelihood of winning a jackpot than one large bet of equal cash value.

Hidden Jackpots

In a hidden jackpot, the prize amount(s) is not shown to the player, although the existence of a jackpot prize is advertised. This may cause some extra excitement and/or enjoyment for players due to the unknown—and therefore potentially unlimited—value of the top prize.

Mystery Jackpot

In a mystery jackpot, the “winning state” of the machine (e.g., combination of symbols) is not shown 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.

Linked Versus Stand-Alone Jackpots

Linked jackpots draws can be won on several machines (often a bank of machines located in close proximity) and the trigger of a jackpot win on one machine necessarily precludes a win on another. Stand-alone jackpots, in contrast, are tied to one machine, where the prize can only be claimed on that machine.

Local-Area Versus Wide-Area Jackpots

Linked jackpots might be either shared only within the same venue (or local area), or shared across multiple venues (wide-area). Multiple venues that share a jackpot often belong to the same organization, but jackpots can also be shared across organizations though a common relationship with the EGM manufacturer or other contracting agency that administers the jackpot scheme.

Theories Applied to Jackpots

Ariyabuddhiphongs (2011) outlines some major theories that attempt to explain the purchase of lotteries, and by extension, at least some of the purchase value of EGMs with jackpots. EGMs can be considered a bundled product that combines regular play and accompanying modest wins with a potential (but highly improbable) major prize or prizes. EGMs without jackpots typically have higher payouts on regular play, as the machines do not need to contribute to funding the rare jackpot prizes. If these higher payouts can be recognized by players, they may contribute to a relatively more attractive playing experience. Given the large short run variability in outcomes on EGMs, however, it is far from certain that the actual payout differences between jackpot and non-jackpot EGMs are detectable. Instead, the lottery-like component of the machine, in the form of the jackpot prize, may improve the attractiveness of the machines despite the lower long run payouts during regular play. It is this “added value” of the potential jackpot that must be assessed. Both economic theory addressing decisions under risk and the gambling-specific literature are addressed in this review.

Rational, Biased and Irrational Views of EGM Jackpots

As will be demonstrated below, some common themes underlie the explanations and theories that potentially explain the attraction of EGM jackpots. One theme is the rational approach that assumes the games are an economic activity that people undertake in pursuit of economic gain and an entertainment experience. Another theme suggests that people have a rational basis for valuing EGM jackpots, but also have systematic biases that cause them to misunderstand and improperly overvalue EGM jackpots. Lastly, other theories suggest that people have an *irrational* basis for placing value on EGM jackpots. Rather than simple biases or deviations from rationality, these are emotional reactions and/or superstitious beliefs that explicitly do not reflect a thoughtful process. In sum, these means to explain why people value EGM jackpots span what can be termed *rational*, *biased* and *irrational* motivations. Of course, none of these themes are mutually exclusive, but a future research agenda can explore which explanations for valuing EGM jackpots predominate, and what persons or situations contribute to rational, biased or irrational views of EGM jackpots.

Rationality: Utility Theory and Expected Utility Theory

Utility Theory attempts to quantify happiness or satisfaction derived from consumption of a good or service. For any consumption experience, the theory posits that people can derive a unique “utility” from that experience. People attempt to maximize the utility associated with their consumption, and thus their purchase decisions are always consistent with an invariant assessment of the utility of the goods and services on offer (Smith 2003).

Expected Utility Theory (Bernoulli 1954; Von Neumann and Morgenstern 1947) takes into account that many choices provide only an uncertain payoff. People must weigh the utility of a potential consumption opportunity by the estimated probabilities of receiving various outcomes. The consumption of gambling products is an example where consumers must weigh their decisions by their estimates of the probabilities of winning.

The expected value of gambling in a commercial environment, assessed in pure monetary terms, is almost invariably negative (Turner and Horbay 2004). However, gamblers can be risk seeking. Gamblers are also purchasing entertainment—as well as the possibility of winning—thus it is possible to understand gambling through the lens of Expected Utility Theory without the need to consider biased perceptions (Marfels 2001).

Bias: Alternatives to Expected Utility Theory

There are several limitations to Expected Utility Theory that are discussed at length elsewhere (Camerer 1995). Expected Utility Theory has been shown to be violated in many experiments using real money (Kahneman and Tversky 1979), and also appears to be violated in real world examples as well (List 2005). Alternatives to Expected Utility Theory have been proposed, but there is no consensus on an ideal replacement. Most germane to this discussion is the frequent feature of these alternative models that recognize that people generally become more risk averse as their prospects of winning get better, and conversely become more risk seeking as their prospects are more remote. Since EGM jackpots are a remote possibility, a common assumption is that people will positively overweight (or bias) the remote possibility of a win in their judgments of value.

As one example of such an alternative model, Kahneman and Tversky (1979), Tversky and Kahneman (1981, 1992) sought to provide a psychological theory that explained some of the departures from rationality observed in the real world compared to expectations from the standard economic model. In a manner consistent with Expected Utility Theory, Prospect Theory (Kahneman and Tversky 1979) focuses on the probability weighted outcomes from alternative consumption decisions. However, the value function in Prospect Theory is more complex. Instead of goods and services being evaluated according to a fixed value (utility) for consumption, people evaluate the “prospect” of a decision based on heuristics (or rules of thumb) that can depart from rationality. In fact, the original formulation of prospect theory referred to the “prospect” of winning a lottery, as this is perhaps the simplest example of a consumption decision.

According to Prospect Theory (Kahneman and Tversky 1979) and later Cumulative Prospect Theory (Tversky and Kahneman 1992), decisions on whether to make a lottery purchase or likewise gamble on an EGM are made by selecting a “reference point” that serves as a demarcation line for evaluating whether a potential decision outcome is a gain or loss. The reference point is chosen based on a heuristic, many of which are described in past research by Tversky and Kahneman (1974). Many of the heuristics that Tversky and Kahneman (1974) proposed are relevant to considering how jackpots may influence EGM gambling.

Representativeness Heuristic

Tversky and Kahneman (1974) noted that people tend to judge probabilities of a win based on similarities to a perceived parent population. Thus, for instance, a player who observes that one particular club or casino paid a jackpot may perceive that the probability of winning at that venue is better than at other venues. Likewise, a jackpot win on one particular machine or type of machine can create a positive reference point for that machine or machine type that exceeds the objective probabilities of winning.

Availability Heuristic

One common way by which people evaluate likelihoods, or prospects, is by the ease with which similar examples of outcomes come to mind (Kahneman and Tversky 1979). Therefore, an EGM gambler may recall a person winning a jackpot at a local venue or nearby, and thereby wrongly overestimate their personal probability of winning a similar jackpot amount.

Anchoring and Adjustment Heuristics

People will often fixate (or anchor) on an initial value in ordering preferences, even if these have no rational basis. Subsequently, people may alter their initial estimates from this anchor value to account for more information (adjustment), but fail to completely break free from the initial faulty estimate (Kahneman and Tversky 1979). Thus, advertising slogans such as “you have to be in it to win it” and “wouldn’t it be nice” may not be completely trusted, but can nevertheless form a basis for an anchor by creating the impression it is at least possible to win. People may subsequently revise their estimate of their own probability of winning the jackpot downward, but nevertheless do not properly revise them to “virtually impossible”—as would be warranted by a more objective evaluation.

The heuristics described above should not be considered exhaustive of all possible means by which people choose a reference point. In fact, there may be other heuristics that have not yet been discovered. Nevertheless, these three heuristics clearly could influence people’s perceptions of the likelihood of winning EGM jackpots.

The S-Shaped Value Function

After choosing a reference point against which a prospective gamble might be considered either a gain or loss, people must evaluate the gamble according to a value function. Kahneman and Tversky (1979) suggested that a sigmoid (S-shaped) value function gives rise to the fourfold pattern of risk orientation in decision making. This fourfold pattern (Table 1) is consistent with many empirical observations (Thaler et al. 1997).

The fourfold pattern of risk suggests that people do not have strictly rational judgments among alternative choices (or gambles) as posited by Expected Utility Theory (Von Neumann and Morgenstern 1947), but rather weight these valuations according to whether they are perceived as high or low probability outcomes. Thus, importantly, a person who is influenced to play EGMs because of the jackpot feature is seeing the “gain” of the jackpot as a “low probability” event. However, the valuation function suggests that people are risk-seeking with respect to this decision (see Table 1). In more descriptive language, the EGM gambler sees the potential of a large jackpot prize as a “possibility”, when instead it should more accurately be considered a “near impossibility”.

Confirmation of the motivating influence of large prizes can be found in the gambling literature (Cook and Clotfelter 1993). There is a strong increase in per-capita lotto sales as the population base increases and consequently jackpots grow; showing the predicted motivating

Table 1 The fourfold pattern of risk in prospect theory

	Gains	Losses
Low probability	Risk seeking	Risk averse
High probability	Risk averse	Risk seeking

influence of large, low probability prizes. Cook and Clotfelter (1993) use the above described *availability heuristic* to explain how people may overestimate the value of a lottery.

Irrationality: Faulty Cognitions About EGM Jackpots

Rogers (1998) provides details on effects that can influence the attractiveness of EGMs that describe more than simple biased judgments, but instead demonstrate irrational thinking. Many of the irrational cognitions reviewed by Rogers (1998) could be usefully applied to understand the motivating influence of EGM jackpots on gambling participation.

Gambler's Fallacy

The *gamblers fallacy* is a consequence of the tendency to see chance events as somewhat evenly distributed across time, and as such, deviations from an expected sequence tend to correct themselves by making recently infrequent outcomes more frequent in the future. A common example of the fallacy is to believe that a long dry spell on one particular EGM makes that machine “due” to payout sooner than other machines. The gambler's fallacy can also apply to fixed-probability (non-deterministic) EGM jackpots. For instance, a jackpot that has not paid out recently may be seen to be “due” to payout soon, and thus encourage more EGM play to capitalize on the perceived improvement in odds.

Entrapment

Escalation of commitment in gambling results from gamblers taking personal responsibility for losing outcomes, and continuing to invest in their gambling to justify their sunk investment (in time and money). More generally, researchers have long recognized that people fail to understand sunk costs as irrelevant to current decisions, and often inappropriately cling to losing courses of action (Knox and Inkster 1968). Entrapment may be relevant to the influence of EGM jackpots on gambling behavior, because problematic players can continue to justify their gambling in the face of mounting losses by rationalizing that a jackpot win would bring them back past even money.

In support, Hare (2010) found that problem gamblers preferred to sit around machines with the best features or jackpots compared to other players with less severe or no gambling problems. The availability of large linked jackpots was one of the top triggers for players who exceeded their precommitment decisions on EGMs. Moreover, both moderate risk gamblers and problem gamblers more often played linked jackpot machines and machines with higher jackpot prizes compared to other players. Lastly, prior to playing, problem gamblers were also more likely to think about what jackpots were available at the venue. Similarly, Hing and Haw (2010) found a positive association between problem gambling severity and prioritizing the availability of linked jackpots when choosing where to gamble amongst people in treatment for gambling problems ($N = 186$). These observations are at least consistent with problem players becoming entrapped by losses which they hope to recuperate through a large jackpot win.

Optimism

People generally expect more positive outcomes for themselves than others, and yet in aggregate these predictions, of course, cannot be met. Similar to *belief in good luck* (Darke

and Freedman 1997), which imagines luck as a personal attribute that some people may possess, the *optimism bias* is a descriptive explanation for how people believe that they are likely to win a jackpot prize when objective consideration of the odds would show such an outcome to be virtually impossible. Optimism may add to the appeal of EGMs, particularly if people consider that their odds of winning a jackpot are better than those of other punters, and thus they irrationally overvalue this feature of the machines.

Hing and Breen (2005) found that jackpots—and particularly wide-area linked jackpots—were helping to entice venue staff to gamble. Hing (2008) later found a statistical association between problem gambling severity amongst gaming venue staff and being tempted by the big jackpots on offer that they see at work. Although many gaming venues have rules that prohibit staff from gambling at their workplace, the availability of wide-area jackpots (encompassing other venues) as well as the experience of seeing others win jackpots may lead to unrealistic optimism for workers and thus boost their motivation to gamble.

Superstitious Beliefs

Some gamblers hold superstitious beliefs that logically unrelated events or objects can influence the probability of wins (Joukhador et al. 2004). Although likely of only minor relevance to EGM jackpots, superstitious beliefs that improve the perceived likelihood of winning the jackpot prize (such as a lucky day or advertising symbol) may increase the attractiveness of EGM play.

Illusion of Control

Illusion of control (Langer 1975) is a phenomenon where players believe they can exert some control over randomly determined events. Although probably only a minor contributor to the influence of EGM jackpots on gambling, players may believe they can have some control over the award of jackpot prizes by playing in venues or on machines that have won before.

Near Miss

The near miss is a motivating factor in gambling where a player perceives that they just missed out on a winning event (Reid 1986). Most commonly, a near miss on EGMs is when a series of reels almost provides a winning payout, but falls short by just one errant symbol. Near misses may also be relevant to EGM play if, for example, a player observes that someone else wins a jackpot on a day where they did not gamble. Having a near miss can increase commitment to gambling, as the player perceives that increased commitment could transform a near win into an actual win in the future. Thus, for instance, the gambler who did not play on the winning day for a jackpot may commit to play on more days (or all days) to avoid falling short again.

Roll Over Effects

Progressive EGM jackpots may have an extra motivating effect. Roll over effects are predicted based on the observation that rolled over lotteries tend to attract greater sales than original lotteries (Rogers 1998). Progressive EGM jackpots can be seen as a type of

lottery that is continually rolled over until won. In the case of deterministic jackpots, the odds of winning increase as the jackpot nears the trigger. In the case of non-deterministic jackpots, the lack of winning outcomes over time may instead make a payout only appear due (in accord with the gambler's fallacy). Moreover, roll overs simply increase the prize pool of EGMs over time, and therefore should directly contribute to demand as prize amounts become large.

Theory of Demand for Gambles

Nyman et al. (2008) outline a Theory of Demand for Gambles that usefully highlights another motivating feature of gambling. Beyond the expected monetary gain from engaging in gambling, Nyman et al. suggest that people also perceive value in getting “something for nothing”. That is, not only is there utility gained in winnings, but also utility gained in not having to work for those winnings. The theory suggests that gambling should be particularly attractive to those who are vulnerable in the labor market, because it gives people a perceived means of earning income without having to work for it. The Theory of Demand for Gambles likewise suggests that economically vulnerable people will be particularly attracted to EGM jackpot winnings, because these represent a substantial form of potential income that one does not have to work to get. This demand is irrational, however, considering the poor likelihood of winning.

Advertising

While many jurisdictions place limits on EGM jackpot advertising (e.g., The State of Queensland 2010), even straightforward signage may have an effect in promoting EGMs as a lottery vehicle. Thus, people can be drawn to EGMs by prominent advertisement of the top prize (the jackpot), even though other subsequent factors, such as intermittent wins, keep them playing.

Ignorance of Probability

Kahneman and Tversky's (1979) Prospect Theory, outlined above, gives one coherent account for how people distort probabilistic reasoning; however, a simpler proposition is that people have an ignorance of true probabilities of winning a jackpot prize (Toneatto 1999). Even objective odds that are clearly presented may not have an impact on a person's subjective judgment of the likelihood of winning. Thus, for instance, a 1 in 14 million chance of winning may not have as much impact as “if you gambled every day from birth and lived to be 100, it would take you 383 lifetimes to win the jackpot.” (Ariyabuddhiphongs 2011). It is likely that people focus on the prize amount, rather than the probability of winning—as the probabilities are far outside of common place likelihoods, and therefore bear no great weight on decisions (Griffiths and Wood 2001). This ignorance of probability is more in line with what we have termed as an ‘irrational’ means of valuing EGM jackpots. Whereas Prospect Theory (1979) suggests a biased view of EGM jackpots where the small probability of a win is over weighted, ignorance of probabilities provide no rational means for evaluating why a person might want to take part in the gamble. In fact, many of the irrational motivations described above are simply means by which people make ignorant estimates of the probabilities of winning.

Evidence on Big Wins Affecting Behavior

Most of the evidence discussed thus far addresses how the prospect of winning an EGM jackpot may motivate gambling involvement. This focus is most important, since very few gamblers—even regular gamblers—win large jackpots. Nevertheless, smaller jackpot amounts may be within the aspirational reach of regular gamblers. As such, it is also helpful to understand whether a jackpot, once won, further stimulates EGM gambling involvement.

A frequent observation is that many problem gamblers experience a “big win” early in their gambling careers that is subjectively felt to be a motivating factor in their continuing gambling involvement (Custer and Milt 1985). In particular, it may create the impression that reasonably large wins are fairly common, and thus gambling could represent a net economic gain over time. Therefore, anecdotally, winning jackpots seems to have the potential to exacerbate, or even cause, gambling problems (Custer and Milt 1985).

Weatherly et al. (2004) conducted a simulated EGM experiment with real money outcomes and subjects who were not experienced gamblers. In a between-subjects design, the authors included both small and large wins that were triggered at different times during play. A control group had no wins. Participants who experienced a big win on the 1st play quit earlier than other participants who experienced the same win on the 5th play. Although the results appear consistent with behavior theories related to gambling (as extinction is delayed along with the delayed win), the authors also stated that the result appeared to question the “big win” as a motivating factor in continuation of behavior. In another experiment, Pisaniello (2003) also failed to find remarkable effects from so-called “jackpot” wins on motivating persistence at gambling. Of course, the big wins in these experiments were necessarily much smaller than typical jackpot payouts, and thus may not be entirely instructive for an understanding of how behavior is influenced by winning larger amounts.

Lottery winners may be instructive to explaining the effects of large EGM wins on subsequent gambling. A survey of 1986 Ohio millionaire lottery winners (Kaplan 1988) showed that recipients spent relatively little money on tickets, did not appreciably increase their expenditures on tickets, and rarely engaged in other forms of gambling either before or after they won. These results, of course, may simply reflect differences in the types of people who typically engage in lottery play as opposed to EGM gambling; with the latter more likely to be engaged in several forms of gambling and having greater gambling involvement overall (Holtgraves 2009). Nevertheless, the results of this lottery study run counter to the stereotype of the gambler who fritters away their winnings on additional gambling products (Business Pundit 2009). Moreover, research shows that lottery winners are often better off after winning (Kaplan 1987, 1988); and these gains in life satisfaction are relatively long lived—extending over a period of up to 3 years.

Despite the structural similarity to EGM jackpots, lotteries are unlikely have the same psychological appeal. Jackpots on EGMs are inseparable from the fast-paced repetitive electronic betting medium used to purchase the chance at winning. Most importantly, realized EGM jackpot wins may temporarily justify the long investment in play, whereas monetary investment in lotteries is often so small as to be inconsequential.

Some Evidence for Gambling Motivation from Jackpot Wins

Young et al. (2008) conducted an EGM experiment in which players experienced either a large win or a series of small wins, and were permitted to continue gambling thereafter for

as long as they wanted. All subsequent trials were programmed as losses. A single item measured subjects' desire to continue gambling. The results showed that high-risk gamblers who experienced a big win were more motivated to continue with their gambling than other players. Therefore, this experiment showed at least some evidence that winning modestly large amounts stimulates the desire to continue gambling for at risk players. That does not necessarily suggest, however, that these same players would return to gamble on another occasion if they left a venue with a large win. Furthermore, like all EGM experiments, the amounts won were relatively modest and not comparable to the jackpot amounts typical of EGMs in real venues. As such, the results must be interpreted with caution.

Lastly, Wilkes et al. (2010) showed evidence that big wins reliably produce changes in electrodermal response that are associated with physiological arousal. Moreover, Rockloff and Greer (2010b) and Rockloff et al. (2007) have further shown that arousal during EGM play is associated with risky gambling behaviors; including increases in gambling speed, bet size and gambling persistence; particularly for players with pre-existing problems.

In summary, some evidence exists that modest wins within experimental paradigms increase gambling excitement and desire to continue playing. Moreover, excitement has been associated with traces of behavior indicative of gambling intensity; including betting speed, bet size and persistence. However, follow-ups with Ohio lottery winners did not show evidence of increased gambling involvement after large, million-dollar-plus wins. Thus, the best evidence currently is that there may be motivational effects due to the mere presence of EGM jackpots, whereas the damaging effects of actual jackpot wins are more equivocal. Importantly, the experience of winning lotteries is not directly comparable to winning EGM jackpots, because play on EGMs is also connected with an electronic betting medium encompassing rapid play and intermittent small wins.

Connection Between Risky Behavior and Harm

Since few EGM gamblers will experience a large jackpot win, it is most important to understand whether the mere presence (or promise) of outsized jackpots leads to risky behaviors that are implicated in producing harm. Measures of gambling intensity, such as betting speed, bet size and persistence, are functionally related to harm because these behaviors tend to increase losses during long term play. However, there is also evidence that such behaviors are symptomatic of problematic play.

Braverman and Shaffer (2010) analyzed a sub-sample of customer data from the Internet betting service provider “bwin” of all people who opened an account in February 2005 ($N = 21,996$). The sub-sample consisted of 599 people who gambled more than 3 times with the service, and subsequently closed their account for a stated cause within a 1 month to 2 year timeframe. Seventy-three percent (73 %) of the members of this subgroup eventually closed their account due to gambling-related problems. When compared to the other respondents, the characteristics of this self-identified high-risk subgroup included: (1) frequent betting, (2) intensive betting, (3) high variability across wager amount, and (4) an increased bet size during the first month of wagering (p. 1). These markers of gambling intensity, therefore, are also manifestly associated with self-identified harms from gambling.

Consumption as an Indicator of Harm

Other evidence points to excessive consumption of gambling products as indicators of the harms associated with problem gambling. Rockloff (2011) developed a Consumption

Screen for Problem Gambling (CSPG) that reliably predicts the presence of gambling problems based on 3 questions regarding the frequency, amount and duration of gambling. This research showed that excessive consumption of gambling was strongly associated with gambling problems. A cut-off value of 4+ on the scale accurately identified all 14 problem gamblers in the 1,396 person sample (100 % sensitivity). In contrast, 7.3 % of non-problem gamblers scored at the 4+ level (specificity = 92.7 %). Lastly, a more narrow 3 % of gamblers without any self-reported gambling problems scored over 4+ on the scale. Although the scale showed a high number of false positives, high levels of consumption nevertheless proved strongly associated with gambling problems.

In a Canadian survey ($N = 19,012$), Currie et al. (2006) found that the risk for gambling problems increases with the frequency of gambling and amounts spent. Receiver operating characteristics analysis showed a cut-off for low risk participation in gambling to include: (1) betting no more than 2–3 times per month, (2) spending no more than \$501–1000 CAN a year (in net losses), and (3) spending no more than 1 % of gross family income on gambling. Moreover, Currie et al. (2008) replicated these findings in three independently collected Canadian gambling surveys, gathering further evidence that validated these cut-off values for harmful levels of gambling. Currie et al. (2006, 2008) thus provide additional evidence to suggest that any feature that increases consumption puts people at greater risk for gambling-related harm. Therefore, EGM jackpots logically at least have the potential to increase gambling consumption to harmful levels.

Harm Associated with Rational, Biased and Irrational Views of EGM Jackpots

Understanding whether gambling consumption is excessive, and therefore is likely to lead to harm, must take some consideration of how people value EGM jackpots. If people value EGM jackpots on a strictly rational basis, including the expected value of the awards and the entertainment value of imagining a jackpot wins, then consumer surplus is created. In contrast, bias in valuing the EGM jackpots may cause some people to overvalue the EGM jackpots and therefore invest too much time and money in playing EGMs. There may be avenues to correct these biases, however, though consumer advertising or structural reforms to maintain a more rational commitment to gambling. Lastly, some means by which people value EGM jackpots may be entirely irrational, and the only avenue to reducing consumption below harmful levels is to combat these irrational means of valuing EGM jackpots.

An important part of the future research agenda is to evaluate which of the available explanations for EGM jackpots (rational, biased and irrational) predominate, and what explanations are more valid for whom—such as those vulnerable to or already experiencing gambling-related problems. Efforts needed to fix any biases or irrational motivations need to be targeted appropriately.

Summary

This review has provided an overview of the current literature that contributes to an understanding of the motivating influence of EGM jackpots on gambling behavior. The specific evidence from EGM jackpots is sparse, but research and theorizing has implicated explanations that can be broadly characterized as rational, biased and irrational motivations. In particular, theoretical perspectives; including the rational approach of Expected Utility Theory (Von Neumann and Morgenstern 1947), various alternatives to Expected Utility Theory that assume some bias (Kahneman and Tversky 1979), and other more

strictly irrational motivations (Rogers 1998); generate expectations that EGM jackpots should motivate additional consumption on EGMs above those machines that do not include such lottery-like features.

Experimental evidence suggests that modest wins may stimulate greater excitement and desire to continue gambling, although this effect may be particular to problem players and is bound within a gambling session. In contrast, there is little direct evidence yet to suggest that large wins generate increases in gambling involvement (Kaplan 1987, 1988), but this may simply reflect that no direct evidence is yet available exploring EGM winnings as opposed to lottery winnings. Lotteries and EGMs are likely to have different clientele and motivations for gambling involvement.

The mere presence of jackpots in EGMs, rather than winning a jackpot, is likely to stimulate gambling consumption. There is evidence that excessive consumption is indicative of gambling problems, and likewise, the harm associated with gambling problems (Currie et al. 2008, 2006; Rockloff 2011). Problem players show evidence of behaviors that contribute to higher rates of consumption, such as frequent betting, intense betting, and larger bet sizes (Braverman and Shaffer 2010).

An important distinction was made between rational, biased and irrational motivations attracting people to EGM jackpots. Rational motivations alone suggest few problems from EGM jackpots, because people engage in EGM gambling to obtain monetary rewards and entertainment that provide consumer surplus. In contrast, biased motivations that instead lead people to overinvest time and money in gambling might contribute to the experience of gambling problems. Nevertheless, there may be some opportunity to correct the bias through education or regulation, and thus more closely align EGM gambling with desirable levels of personal expenditure. Perhaps most troubling, however, is irrational motivations that tend to overvalue EGM jackpots. These motivations are not simply biased deviations from rational reasons for engaging in gambling, but instead represent forces that are separate from the enjoyment and reward of the activity. It is important for future research to understand which of these broad classes of motivations predominate, and how these motivations might differ between people who are vulnerable to problems and others who gamble without problems. Moreover, it is also important to understand how the structural features of jackpots; such as progressive, deterministic, hidden, mystery, linked and wide-area jackpots; might differentially appeal to rational, biased and irrational motivations to engage in EGM gambling.

Much more research is needed to fully understand the effects of EGM jackpots on gambling behavior (Livingstone et al. 2008, p. 154). Although there are reasons to expect large jackpot prizes will have an outsize influence on behavior, these reasons need to be tested in context of venue-based EGMs. Moreover, little is known about how the structural features of how jackpots are awarded might similarly affect player behavior. As jackpots are an integral and important feature of many—if not most—EGMs, it is important to understand their value to players, and likewise their potential influence on excessive consumption and by extension problematic patterns of gambling.

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