Commentary on Dixon et al (2014): Understanding the abuse liability of modern EGMs

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Modern Electronic Gaming Machines (EGMs) including slot machines are regarded as among the more high-risk forms of gambling (e.g. 1), but given the array of structural characteristics that these games offer, isolating where any 'addictiveness' comes from is a significant challenge for gambling researchers. The new paper by Dixon and colleagues focusses on 'Losses disguised as wins' (LDWs) in multi-line slot machines. LDWs occur when a player wins a smaller amount than their initial wager. While these events are accompanied by the traditional 'bells and whistles' of a jackpot win, they in fact constitute an overall loss.

The first experimental study of this effect used psychophysiology to show that LDWs in the commercial game 'Lobstermania' increased arousal to a similar extent as true wins (2). Subsequent work has confirmed that players experiencing LDWs over-estimate the number of true wins in a session(3). The latest paper develops this story in two important ways. First, this game feature is linked to a behavioural measure, the 'post-reinforcement pause' (PRP), which is a delay in the latency to initiate an instrumental response (i.e. the spin press) following a consummatory reward. Their participants played 250 spins on a multi-line game (betting 1 credit each on the maximum 20 lines) and 250 spins on an equivalent single line game (betting 1 credit on a single line). The games were exceptionally realistic simulations, and the order of the two games was counter-balanced across participants. On both games, participants showed a PRP to the true wins compared to the 0-credit outcomes. Critically, a gain of 2 credits constituted a true win for the single-line group, but an LDW for the multi-line, but across both groups, the clear step in the PRP latencies occurred from 0 to 2 credits. In fact, the PRP data show exquisite sensitivity to the outcome magnitude (see also 1) and this is valuable proof-of-concept data. PRPs can also be elicited in experimental animals on operant schedules, paving the way for translational work looking at structural characteristics in rodent models of gambling (5).

The second important advance is the demonstration of these effects in regular and problem gamblers. Twenty-two of 102 gamblers were classified as high-risk / problem gamblers. In the overall group, these regular slots players overwhelmingly preferred the multi-line game and over-estimated the win frequency in the multi-line game, corroborating key effects from the prior studies in university students. The high-risk / problem gamblers found the multi-line game more absorbing, and felt more skilful at the game, compared to the single-line game. These data provide provocative links to the recent hypothesis by Dow-Schull (6) that EGMs may be particularly potent at inducing the 'machine zone' or psychological flow, and the wider literature on cognitive distortions including the illusion of control.

While these results link the absorption and competency effects in problem gamblers to multi-line slot machines, their data fall short of the more tempting link to the LDWs as a specific game feature. In order to equate their two conditions as best as possible, the multi-line game demanded higher bets and offered higher jackpots than the single line game, as well as delivering LDWs. This serves to highlight the profound difficulties in isolating specific structural characteristics in gambling games. Disambiguating these effects can often require somewhat contrived experimental manipulations, which can then be criticised for lacking ecological validity. We also note that the regular gamblers recruited by Dixon et al were mostly seniors with a mean age of 61, which is considerably older than the peak age of gambling involvement and problem gambling onset. Older adults are classically regarded as risk averse (7) but may also be more susceptible to the cognitive distortions that occur during gambling (8).

From reading this elegant series of papers by Dixon and colleagues, one might erroneously conclude that the LDWs were somehow specific to multi-line slot machines. This is not the case. The most common form of gambling in a British sample of treatment-seeking pathological gamblers was electronic roulette played on Fixed Odds Betting Terminals (FOBTs) (9). These machines also offer an array of bets that can be placed simultaneously (e.g. colour, number), creating a high frequency of LDWs, which can also occur even in non-electronic forms, such as a 'Yankee' or a 'Canadian' accumulator in sports betting. Studying form in sports betting, or previous number runs in roulette can instil a feeling of skill or predictive control, which may be reinforced by LDWs. We also recognise that the LDW is a gambling event and not a discrete cognitive process in itself. The bells and whistles of winning constitute powerful Pavlovian conditioned stimuli that will certainly contribute to their mechanism, but LDWs may also draw upon additional effects from psychology, such as the 'framing' effect (10) that a net loss is flipped into a 'gain frame'.

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