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Do EGMs have a Stronger Association with Problem Gambling than Racing and Casino Table Games? Evidence from a Decade of Australian Prevalence Studies

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Abstract

Although it is often assumed that electronic gaming machines (EGMs) are associated with the highest level of risk, it has proved difficult to find reliable evidence in support of this proposition. In this paper, we analysed statistics from major Australian community prevalence studies for the period 2011–2020 to investigate whether EGMs (in comparison to racing and casino table games) have a stronger association with problem gambling. All prevalence studies reviewed used telephone sampling and the Problem Gambling Severity Index to assess problem gambling. In this paper, we examine the principal hypothesis using several lines of evidence, including whether problem gamblers are more likely to gamble and gamble regularly on EGMs as opposed to racing and casino games and if the EGM-problem gambling association was maintained after controlling for other forms of participation. Results showed that of all gambling activities, EGMs do appear to have the strongest association with problem gambling. Despite having a disproportionately higher level of participation on racing and casino games as compared with other gamblers, problem gamblers are more likely to report regular or weekly participation in EGM gambling and this may be the reason why this activity emerges most strongly as a predictor of problem gambling in multivariate models. This finding is particularly salient, given the very high prevalence of EGM participation, compared to other risky gambling forms. The findings underscore the importance of survey reporting that presents results in a form that can inform policy relevant research relating to the potential impact of different gambling activities.

Keywords Electronic gaming machines · Problem gambling · Risk · Racing · Casino table games · Prevalence studies

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Introduction

One of the fundamental issues of interest in gambling research is whether certain activities are more likely to contribute to problem gambling and gambling-related harm than others (Blaszczynski et al. 2015, 2013; Parke et al. 2016). This question has been posed for over two decades and it has generally been concluded that there are certain features of gambling activities that are more problematic or 'risky' than others. Some of the recognised structural features of games that may contribute to differential risk include: the continuity of the activity or the brevity of the interval between the stake and outcome (event frequency); the ability to play continuously or for long periods; the level of immersion (Dixon et al. 2017); the accessibility of opportunities to gamble (Doran and Young 2010); and the extent to which players can vary their stake amount to gamble larger amounts in short periods of time (Blaszczynski et al. 2013; Dickerson et al. 1992; Griffiths 1993). Many of these characteristics have been identified as risk factors in commercial tools such as *Gamgard* (www.gamgard.com), or theoretical tools such as *ASTERIG* (Blaszczynski et al. 2013) to measure the relative harmfulness of different gambling products. Electronic Gaming Machines (EGMs) are of particular interest. A first reason is because they satisfy many of the features thought to contribute to risk (Dowling et al. 2005; Livingstone et al. 2008; Parke et al. 2016). A second reason is because of the high rates of accessibility and participation in many jurisdictions (Ziolkowski 2016). A third reason is because they are associated with 60% of total gambling net revenue in Australia (Queensland Treasury 2019).

There appears to be general consensus that a clear distinction can be drawn between activities based upon broad differences in continuity (Parke et al. 2016). For example, non-continuous activities such as lotteries or bingo are rarely associated with gambling harm (Productivity Commission 1999). However, it is less clear whether EGMs present a measurably greater risk than other forms of continuous gambling, such as table games or live wagering. Some researchers (e.g., Dow-Schull 2012; Livingstone et al. 2008) have argued that gaming machines are likely to be the most problematic form of gambling because they possess all the highest risk characteristics. They offer rapid event frequencies, allow continuous play, are highly accessible in many countries such as Australia and New Zealand, and offer a myriad of micro features (tokenisation, jackpots, near misses, lights and sounds) to maintain player interest. Another important feature is a self-contained electronic environment that acts to mesmerise players into losing track of time and money invested (often described as 'going into the zone') (Dowling et al. 2005; Dow-Schull 2012; Griffiths 1993).

The views of these researchers would appear to be borne out by evidence conducted around the world and particularly in Australia, the jurisdiction that is the focus of this paper. Australia has just under 200,000 machines that typically allow $5–10 bets with 3.5 s minimum intervals between spins, with most states allowing these machines to be located in easily accessible suburban venues as well as larger casinos (Productivity Commission 1999). Overwhelmingly, the evidence from Australia suggests that treatment seeking gamblers are more likely to report that EGMs are the cause of their problems than other forms of gambling (Dowling et al. 2005; Productivity Commission 1999). For example, in Australia, the Productivity Commission (2010) found, in a survey of help-seeking gamblers, that 82% of problem gamblers identified EGMs as the source of their problems, with racing listed second (13%). A similar study conducted by the Productivity Commission in 1999 of treatment seeking gamblers showed that EGMs were found to be the most significant cause of problems in NSW (72%), Victoria (81%), South Australia (74%) and in the Australian

Capital Territory (ACT), Northern Territory (NT), and Tasmania (65%), and Queensland (QLD) (48%), whereas racing was responsible for around 12–15% of problems, with casino games causing between 7 and 15% of problems. Similar figures were presented by Jackson et al. (1997, 1999) in a report based on help-seeking data in Victorian gambling services. When asked on what activity they had most recently gambled, 81% of clients identified EGMs, compared with only 15% for racing, and 5% for table games. More recently, Blaszczynski et al. (2015) showed that, within a sample of 14,000 cases of help-seeking in NSW, EGMs were identified as the primary form of gambling by 77% of clients; racing was identified by 12% of clients; and, casino table games were identified by 3.3%.

Similar evidence supporting these Australian findings can also be observed in New Zealand, in which there is a similar style of high intensity machine and distribution of machines. Paton-Simpson et al. (2001), for example, examined data from 1467 gamblers seeking assistance from New Zealand's gambling services. Approximately 71% of gamblers reported non-casino EGMs was the cause of their problem, with 94% of female gamblers indicating that this was their preferred form (male percentage = 77%). Men, on the other hand, were significantly more likely to identify racing as the source of their problem (13% vs. 1.2% for women). Another study by Adams et al. (2004) found that 90% of people who sought assistance for gambling problems identified EGMs as their primary mode of gambling (see also Ministry of Health 2005, 2006, 2007).

Although such findings are persuasive, one problem with help-seeking data is that it does not control for potentially confounding factors. Women and older people are statistically more likely to seek help for gambling problems than younger males (Baxter et al. 2016). Since the former is more likely to identify EGMs as their principal form of gambling, it is not then surprising to find an over-representation of EGM gamblers in treatment populations. A more fundamental problem is that participation in EGM play is far more common. The very high proportion of help-seeking gamblers identifying EGMs speaks to the high probability of EGMs being the cause, *conditional on the individual having problems*. However, evaluating whether EGMs are a particularly dangerous form, is better understood as the risk of problems, *conditional on EGM participation*. Due to high EGM participation rates relative to other forms, even the relative risk of products was equal, they would still account for more cases of help seeking.

An influential paper by Dowling et al. (2005) considered whether EGMs lived up to their popular reputation as the 'crack cocaine of gambling' based on both associations with gambling problems, as well as structural and environmental features of the product. The general conclusion from this paper, which is often less commonly cited than its title, is that ascertaining which form of gambling is most risky is more difficult than it initially appears. Thus, while data on treatment seekers is often advanced as evidence for risk, it needs to be complemented by other lines of evidence that avoid the biases inherent in the selective nature of help-seeking samples. Some examples include: (a) Participation rates for different activities for problem gamblers; (b) The prevalence of problem gambling among users of different activities; (c) The proportion of problem gamblers who report that particular activities are their dominant or favourite one as compared with other activities; (d) The extent to which general participation converts into regular play; (e) The proportion of people reporting harm from a particular form of gambling; and (f) How fast people progress from recreational to problem levels of participation on different forms of gambling (Dowling et al. 2005). Some of these lines of evidence are difficult to support because not many studies have reported gambling harm by gambling type (argument e) or tracked the progression of gambling over time (argument f). Ascertaining which activity is a person's dominant is also difficult because a person might rate lotteries their favourite, but spend

more on EGMs, but play most often on racing. Although this example is somewhat artificial, it does illustrate the point that any estimate of risk for forms should be robust to various means of capturing a person's dominant activity. Furthermore, comparing bivariate estimates of the relationship between forms to problems neglects the fact that many gamblers engage in more than one activity. For example, it might be that the rate of problems of 2.75% associated with lottery tickets (Productivity Commission 1999) might be entirely explained by the subset of lottery ticket buyers who also used EGMs, or some other form.

Clearer evidence in support of arguments (a)–(d) (above) could be obtained by examining which activities appear to engage problem gamblers to a greater extent than others or which highlight differences between problem gamblers and the behaviour of other gamblers. A further line of evidence that was not available to Dowling et al. (2005) was evidence regarding how well degree of participation in different activities predicts problem gambling, when mutually controlling for other forms.

The Present Study

Dowling et al. (2005) concluded that it was difficult to compile convincing evidence that EGMs were any more risky as a class of activities than other activities (e.g., racing or casino table games). However, relatively little evidence was available at the time in Australia to allow a detailed examination of the lines of evidence which they proposed. Accordingly, the aim of this paper was to examine the findings from a decade of large prevalence studies (2010–2019) that have been conducted in Australia using very similar methodologies and which present similar data presentations. We examine whether problem gamblers are relatively more likely to gamble on EGMs than other activities; the prevalence of problem gambling in different activities; whether EGMs appear to encourage more frequent play than others; and if there is multivariate evidence to support the dominance of EGMs as a predictor of problem gambling. We focused specifically on racing and casino table games because these have often been identified as the other classes of activity most identified after EGMs in help-seeking populations (Sproston et al. 2012). Sports betting was not included because it was generally less common in surveys conducted more than five years ago and has been an activity which has grown in popularity only in recent years.

Method

Data sources

Summary information for this paper were drawn from 12 major prevalence studies conducted in the period 2011–2019 in Australia and these are summarised in Table 1. All surveys were conducted using a telephone survey methodology, used probability based sampling from the adult population and nearly all used a dual-frame methodology, in which land-line as well as mobile phone numbers were utilised in obtaining the sample. As Table 1 indicates, the sample sizes were very large in many of the recent surveys so that the conclusions drawn in this paper are based on a total combined sample of over 100,000 people.

Each study incorporated very similar measures, including questions that asked about the frequency of gambling on different activities as well as the Problem Gambling

Table 1 Summary of major Australian prevalence surveys: 2011–2020: sample details and participation rates

State	Year	N	% EGM	% Racing	% Casino games	% Problem gamblers
ACT	2014	7068	19.9	17.6	5.8	0.5
NSW	2012	10,000	27.0	24.0	7.0	0.6
NSW	2019	10,012	16.0	12.0	5.0	1.0
QLD	2012	15,000	30.0	19.0	6.0	0.5
QLD	2017	15,000	24.7	18.0	5.6	0.5
SA	2012	9508	26.5	20.5	6.1	0.6
SA	2018	20,017	19.0	12.0	5.0	0.7
TAS	2011	4303	20.7	14.5	5.8	0.7
TAS	2014	5000	18.6	10.5	6.3	0.5
TAS	2017	5000	18.6	9.9	5.1	0.6
VIC	2014	13, 554	15.2	20.1	5.1	0.8
VIC	2019	10, 930	14.1	19.8	9.0	0.7
M_w			21.2	17.0	5.9	0.65

Sources: ACT (Davidson et al. 2015), NSW (2012), Sproston et al. (2012), NSW (2019), Browne et al. (2019), SA (2012), Department of Communities and Social Inclusion; SA (2018), Woods et al. (2018), TAS (2011–2017), ACIL Allen Consulting et al. (2011, 2014, 2017), VIC (2014), Schottler Consulting (2015), VIC (2019), Rockloff et al. (2019)

Explanatory note: M_w = Weighted mean across all surveys

Severity Index (PGSI) (Ferris and Wynne 2001) as the screening tool to identify the prevalence of problem gambling. Although there are some subtle differences in the scoring method for the PGSI (original method or the inclusion of an additional and scored 'rarely' response category) (Jackson et al. 2010), this is unlikely to have much bearing on the results of this paper, where the focus was on comparisons conducted within the studies, rather than across them.

Analytical approach

This paper presents a summary of the individual studies. We then examine the association between problem gambling and the three different forms of gambling (EGMs, bets on races, casino table games) using three different methodologies. First, we compare the participation rates for the forms of gambling among problem gamblers to the corresponding participation rates for the whole samples. Second, we examine the percentages of participants in each form of gambling who are classified as problem gamblers. Third, we calculate the percentages of participants in each form of gambling that choose to gamble on a regular basis (i.e., approximately weekly or more often), and then calculate similar percentages based on the problem gamblers within the groups of participants corresponding to the three forms of gambling. Finally, we provide a summary of attempts made to conduct multivariate analyses to predict the extent to which each of the activities predicted problem gambling after controlling for participation in other activities.

Table 2 % Participation rate for problem gamblers

State	Year	EGMs		Racing		CTGs	
		% PG gambling	RATIO PG/total sample	% PG gambling	RATIO PG/total sample	% PG gambling	RATIO PG/total sample
ACT	2014	76.0	3.82	44.7	2.54	34.6	5.97
NSW	2012	77.2	2.86	61.0	2.54	19.3	2.76
NSW	2019	72.0	4.50	na	na	23.0	4.60
QLD	2012	89.0	2.97	58.7	3.09	32.7	5.45
QLD	2017	91.0	3.68	48.0	2.67	27.9	4.98
SA	2012	94.9	3.58	65.7	3.20	29.2	4.79
SA	2018	87.0	4.58	40.8	3.40	20.8	4.16
TAS	2011	84.1	4.06	na	–	na	–
TAS	2014	85.7	4.61	64.0	6.10	51.0	8.09
TAS	2017	85.1	4.57	na	–	na	–
VIC	2014	66.6	4.38	52.5	2.61	22.3	4.41
VIC	2019	69.3	4.91	52.4	2.64	21.7	2.41
M_w		81.7	3.85	52.5	3.08	26.4	4.48

Explanatory notes: Mw = the weighted average values based on the sample sizes for the surveys. CTGs = Casino table games. The ratios indicate the degree to which the problem gambler participation rate is greater than the overall base-rate for the sample, i.e., PG % participation rate for EGMs/ Sample % participation rate for sample as a whole. For example, 3.82 for EGMs in ACT = 76/19.9 from Table 1 = 3.82

Results

Overall Participation And Prevalence Rates

Table 1 summarises the year, sample size, participation rates and problem gambling prevalence rates for the major types of continuous gambling in Australia in the 2011–2020 decade. Participation rates for EGM gambling are the highest (around 1 in 5 adults), but this is only slightly higher than for racing, which is now more popular than EGMs in some Australian states or territories.[1] Comparisons of surveys conducted across time in the same jurisdictions suggest that rates of EGM gambling and casino table games remain relatively stable, whereas the prevalence of EGM gambling has declined. Problem gambling rates are very consistent and converge around a figure of 0.6–0.7%.

Problem Gambler Participation Rates In Each Activity

Table 2 indicates what percentage of problem gamblers reported participating in each activity. This table yields several important insights. The first is that problem gamblers are much more likely to gamble on all the activities than other gamblers. This is indicated by

[1] Participation rates for EGM gambling were over 30% in the 1990s (Productivity Commission 1999) and racing was consistently around 20%.

Table 3 % PGs detected in each activity group

State	Year	EGMs % PG gamblers	Racing % PG gamblers	CTGs % PG gamblers
ACT	2014	1.8	1.3	2.9
NSW	2012	1.8	1.7	3.1
NSW	2019	5.0	4.0	7.0
QLD	2012	1.4	1.5	2.6
QLD	2017	1.8	1.3	2.5
SA	2012	2.2	2.0	3.0
SA	2018	3.2	2.4	3.3
TAS	2011	2.8	na	na
TAS	2014	2.3	3.0	4.0
TAS	2017	2.8	na	na
VIC	2014	3.5	2.1	3.3
VIC	2019	3.6	1.9	2.6
M_w		2.7	2.1	3.2

Explanatory notes: Mw = the weighted average values based on the sample sizes for the surveys. CTGs = Casino table games; This table indicates what % of participants in each activity were problem gamblers, e.g., 5.0% of people who reported EGM gambling in NSW were problem gamblers

the ratio figures which are consistently above 1.0. Problem gamblers are 3.69 times more likely to gamble on EGMs, 3.04 times more likely to gamble on racing and 4.55 times more likely to gamble on casino table gambles as compared with other people in the surveys (total sample). A second important point is that the ratio is highest for casino table games (CTGs). The third important observation is that problem gamblers appear to have very high participation rates in EGM gambling (82%) as compared with racing (53%) and casino table games (26%). The ratio of problem gambler participation in EGMs to racing is 82/53 = 1.55 as compared to EGMs/Racing 21.2/17 = 1.25 for the overall sample (Table 1). In other words, the EGM participation rate for problem gamblers is disproportionately higher than expected based on the overall percentages for EGMs and racing in Table 1.

Problem Gambling Prevalence by Activity

Table 3 indicates the percentage of people participating in each activity identified as problem gamblers. Problem gamblers are significantly over-represented in all of these activities. For example, a figure of 2.7% for EGMs is around 4 times the mean prevalence rate for problem gambling. The results show that the over-representation of problem gamblers is greatest in casino table games and lower for racing.

Regular Gambling By Activity

These figures provide insights into what extent overall participation converts into regular gambling for each activity. Table 4 indicates the percentage of participants in each activity who gambled regularly (around 50 times per year or more often). The absolute figures have

Table 4 % of participants in each activity who gambled regularly

State	Year	EGMs	Racing	CTGs	Definition of regular
ACT	2014	10.5	na	na	48+ times per year
NSW	2012	14.0	12.0	4.0	Weekly+
NSW	2019	4.0	6.0	1.0	More than weekly
QLD	2012	3.7	3.6	0.8	More than weekly
QLD	2017	2.7	3.6	1.0	More than weekly
SA	2012	8.4	10.9	0.8	Weekly+
SA	2018	4.0	6.0	1.0	More than weekly
TAS	2011	5.9	20.5	na	Weekly+
TAS	2014	6.0	16.6	2.8	Weekly+
TAS	2017	6.6	20.3	na	Weekly+
VIC	2014	na	na	na	Weekly+
VIC	2019	2.9	0.5	0.5	More than weekly
M_w		5.6	7.5	1.2	

Explanatory note: The figures in each column are based on participants in each activity. For example, 5.5 for EGMs means that 5.5% of people who played EGMs gamble around 50 or more times per year (or more often)

to be treated with some caution because of some variations in the frequency categories used in surveys (some did not have a weekly category), but comparisons across activity would appear to be valid. The results show that EGMs and racing appear more likely than those who play casino table games to play regularly. In other words, casino table games (as activities based only at larger destination casinos) appear to be a more occasional activity.

It was also possible to determine the estimated percentage of problem gamblers who participated regularly on each activity, although this information was not available in most of the surveys. The percentage of problem gamblers reporting weekly gambling was consistently high: 50% in NSW (2012); 25.5% in QLD (2012); 26% in QLD (2017); 33.1% in SA (2012) and 40% in SA (2019). The weighted mean for EGMs was 34.3%. By contrast, the figures for racing were much lower: 28% in NSW (2012); 9.9% in QLD (2012); 13.2% in QLD (2017); 27.6% in SA (2012) and 14% in SA (2019). The weighted mean for racing was 16.8. Figures for casino table gamblers in the surveys were usually less than 1% and were too small to be reported.

Multivariate Predictors of Problem Gambling

A number of the surveys examine what activities were the best predictors of moderate-risk/problem gambling or problem gambling, in a multivariate framework controlling for other forms of gambling. Although gamblers often participate in multiple gambling activities, the covariation between activities is generally low enough such that collinearity is not a concern. Given that gambling problems must logically arise from participation in one or more gambling activities; in principle, multivariate regression allows for attribution of unique causal effects among activities. A summary of the findings is presented in Table 5. Engagement with each of activities were usually positively associated with problem gambling. However, all six of these studies consistently showed that the association between

Table 5 Multivariate results from prevalence studies: how participation predicts higher risk gambling

	EGMs	Racing	CTGs	Statistic
NSW (2012)[a]	10.7	2.8	n.a	Odds-ratio
NSW (2019)	3.58	1.44	1.56	Odds ratio
SA (2018)	4.27	1.83	1.14	Odds ratio
TAS (2011)	.355	.184	n.a	Regression coefficient
TAS (2014)	5.36	2.17	1.31^	Odds ratio
TAS (2017)	1.58	.48	.81	Regression coefficient

[a]Examined regular gambling; all statistically significant except for ^; A positive odds-ratio indicates a stronger association between participation in that activity and problem gambling. For example, 4.27 for EGMs in SA means that participation in EGMs increases the odds of being a problem gambler 4.27 times

EGM participation and problem gambling was much stronger than for the other two activities, often double the effect size or greater.

Discussion

The major prevalence studies conducted in Australia over a decade reveal a number of insights into how EGM gambling participation rates compare with other activities often associated with problem gambling. The first insight is that the prevalence of problem gambling in a specific class of activity does not necessarily indicate how strong a role this activity plays in overall problem gambling rates or its relative riskiness. For example, as many studies have shown (e.g., ACIL Allen Consulting 2011, 2013, 2017), problem gamblers tend to gamble on a wider range of activities than other gamblers and this was confirmed in many of the prevalence studies examined in this manuscript. Problem gamblers tend to participate in the popular activities (lotteries, EGMs) as with other gamblers. However, what what sets them apart is their greater involvement in rarer activities such as those involving skill or knowledge: racing, sports, or casino games, and this includes in online contexts (Gainsbury 2012). As with land-based casino table games, this effect appears due to the fact that: (a) problem gamblers are more likely to choose to gamble on these "lower prevalence" activities; and (b) these activities attract demographic groups (e.g., young males) who usually have a higher risk of being problem gamblers (Gainsbury 2012). Thus, detecting higher rates of problem gambling for these activities is unlikely to be due to the activities themselves, but to the characteristics of those who choose them (a 'selection' effect).

The second insight emerging from this study is that EGMs are more strongly associated with problem gambling than racing and casino table games. Several explanations can be advanced to account for this association. First, due to the structural characteristics outlined in the introduction to this manuscript, EGMs tend to encourage elevated levels of regular play (around 5 times higher than casino table games). Although problem gamblers report higher participation rates in all activities, their participation in EGMs is disproportionately higher than for other gamblers. A higher proportion of problem gamblers (over 80%) gamble on EGMs; and EGMs, as a type of gambling, attract a higher rate of regular (weekly +) gambling. Racing similarly attracts a relatively higher proportion of regular gambling as compared with

casino table games, but problem gamblers are much less likely to report gambling on racing events (the rate is 40% lower than for EGMs). Our estimates based on the data available from five surveys showed that around 34% of problem gamblers play EGMs at least weekly or more often and this is double the rate observed for racing (34% vs. 16.8%). In other words, EGMs are a class of activity associated with the highest overall participation rate and also a higher rate of regular gambling amongst problem gamblers.

These observations relate to a topic that is often discussed in regulatory contexts, for example, in countries such as New Zealand, where gambling legislation has led to analysis of the distinction that needs to be drawn between people's opportunities to gamble, product utilisation, and the harm associated with the activity (conditional on utilisation). In theory, it is possible that EGMs, racing and casino table games could be equally harmful if supplied in equal quantities and there were equal number of gamblers motivated to play them. Such a situation could, for example, arise in a busy casino where there were 1000 EGMs, 1000 spots at gaming tables, and many places to place bets on races. However, in reality, people do not utilise the activities to the same extent. People tend to prefer to gamble on EGMs and to do so more regularly, even when they are located inside casinos (Abbott et al. 2013). Thus, aside from the question of the degree to which EGMs facilitate the development of problems among users, EGMs are also relatively more effective at *attracting* users. An analysis of the structural characteristics of activities can only provide part of the assessment of how harmful a given form of gambling is likely to be. While certain structural features clearly make some activities more likely to cause harm than others (Parke et al. 2016), one does not know how a product will be utilised until it is in the market. Any real-world impact of structural features ought to be reflected in the experience of problems reported by consumers. Thus, assessments of the relative harmfulness of products should place strong weight on empirical evidence (such as obtained in prevalence studies) to indicate the realised impacts; who uses the product; how often; with what intensity; and to what degree it is uniquely associated with problems.

The environmental and game-design explanations for the relatively high levels of utilisation of EGMs have been extensively studied in the literature. EGM venues are highly accessible in Australia (Doran and Young 2010) and this encourages habitual, impulsive and convenience gambling. People can travel short distances from their home to gamble, often for extended periods, and this becomes part of their daily lives and routines. EGMs also tend to attract people who need to escape from complex problems in life and regulate their emotions, including psychological distress, trauma, family and work difficulties, and may be one of the few leisure activities available for people in less well-resourced or isolated communities (Gannon et al. 2020; McCormick et al. 2012). Another important feature of EGMs is their broader accessibility and cost. People can play low denomination machines with a lower entry cost than for casino table games; the machines are designed and tailored to be attractive to a range of different people; they are easy to play; and they are located in generic gaming environments that are culturally neutral, not overtly masculine, or focused on a particular age group (Livingstone et al. 2008; Parke et al. 2016; Rockloff et al. 2015). EGM gambling also does not require players to learn various rules of play, the slang and terminology associated with racing and card games, or interact with other people who might be more experienced gamblers (e.g., on a table).

Limitations

It is important to acknowledge a number of limitations associated with the data compiled in this paper. The first is that it is based on self-report, so it may be that people's actual frequencies of participation of different activities is higher than they report. Second, the studies have some variations in methodology (although not major ones) and were conducted at different points in time. A third issue is that data concerning some key statistics was not consistently available across all the surveys. For example, not all studies reported the frequency of participation for casino table games. A fourth issue was that much of the data were descriptive and barely a handful reported the results of multivariate models that provided for mutual control of other forms of gambling participation. Finally, it should be acknowledged that the study was specifically designed to enhance the internal validity of findings by focusing just on Australia where the type of machines could be held constant. Other studies would need to be conducted in other countries to examine whether the findings can be generated. Despite these limitations, we believe that the volume of data, probability based nature of the sampling and similar methodologies provide a strong evidence on which to draw some indicative conclusions about the association between the different activities and problem gambling.

Conclusions

Taken together, the results from a decade of Australian prevalence studies build upon the limited evidence available to Dowling et al. (2005) and the Productivity Commission (1999), both of which attempted to assess the relative riskiness of EGMs as compared with other activities. In the Dowling et al. (2005) paper, it was concluded that it was difficult to establish definitively that EGMs were a riskier form of gambling. However, we believe that evidence in now in favour of EGMs being a markedly riskier activity is gradually mounting. As with Dowling et al., we support the view that some lines of evidence (e.g., help-seeking statistics) can provide only qualified insights into the harmfulness of different products because of selection biases inherent in treatment-seeking samples. Instead, we propose that greater insights into the relative impact of EGMs is provided by examining the frequency and intensity of this activity (i.e., how it is utilised) in higher risk gamblers. From a methodological perspective, such insights are best informed by prevalence survey designs that recruit population-representative samples and present overall and frequency-based participation rates by activity which are broken down by categories of gambling risk (e.g., by PGSI category). We further believe that the most valid approach for comparing forms is via multivariate analyses, which provides for mutual control of forms, providing a strong case for attribution in the case of players who engage in multiple forms. Tellingly, the multivariate analyses summarised here provided the clearest indication of higher per-person risk for gambling problems among EGM gamblers. When combined with the fact that EGM participation is generally higher than CTGs or racing, it is likely this relative impact is magnified at the population level. Given that financial losses are the primary driver of harm, this accords with industry financial data that shows that EGMs account for almost 3 times more revenue in Australia than racing or CTGs combined (Queensland Treasury 2019).

Future studies should extend these analyses to other jurisdictions that have their own specific type and distribution of machines. Such work should also make greater use of multivariate analyses that attempt to examine how individual activities present greater risk at the individual level, and complement this with an assessment of harm at the population level. Another important line of research would be to examine why EGMs attract greater expenditure and appear to be most implicated in problem gambling. Although major reviews of this topic (Parke et al. 2016) indicate that structural characteristics are very important (e.g., the high intensity nature of EGMs in Australia), Australia also has a regulatory system that increases the accessibility of EGMs. Understanding the relative importance of accessibility as opposed to structural characteristics in the etiology of problem gambling would be an important avenue for future research.

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