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The relationship between gambling advertising and gambling attitudes, intentions and behaviours: a critical and meta-analytic review

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Gambling advertising has become ubiquitous in westernised countries in the last two decades, yet there is little understanding of the relationship between exposure to gambling advertising and gambling attitudes, intentions and behaviour. We conduct a critical and meta-analytic review of the past two decades of empirical research. The research suggests a positive association between exposure to gambling advertising and gambling-related attitudes, intentions and behaviour. The association is greatest for gambling behaviour. There is some evidence for a *dose-response* relationship. The quality and breadth of research on gambling advertising are weaker than those in comparable areas (e.g., alcohol, tobacco), with an absence of longitudinal and experimental studies. Gaps in, and methodological problems with, the field are discussed, and research directions recommended.

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Introduction

Gambling is one of the world's largest industries, generating over US$500 billion in revenue per year [1]. The gambling industry has grown substantially in the past two decades due in part to technological advances [2]. Because of its significant social, mental health and economic costs, gambling has become a serious public health issue, and of concern to peak bodies such as the World Health Organisation [3].

Along with availability and pricing, restrictions on advertising has been identified as one of the most cost-effective measures for reducing harms from products such as alcohol and tobacco [4], and might also be effective for gambling. Restrictions of alcohol and tobacco advertising have been introduced in many countries on the back of reviews of the evidence showing an association between exposure to alcohol and tobacco advertising and greater consumption [5–7]. However, effective regulations have yet to be developed for gambling advertising, and this appears in large part because of a lack of understanding of the relationship between gambling advertising and gambling-related attitudes, intentions, and behaviour [8,9]. Instead, gambling industry expenditure on advertising is increasing, and remains largely free from effective regulation [10]. The aim of this review is to examine the evidence on the relationship between gambling advertising and gambling-related attitudes, intentions, and behaviours.

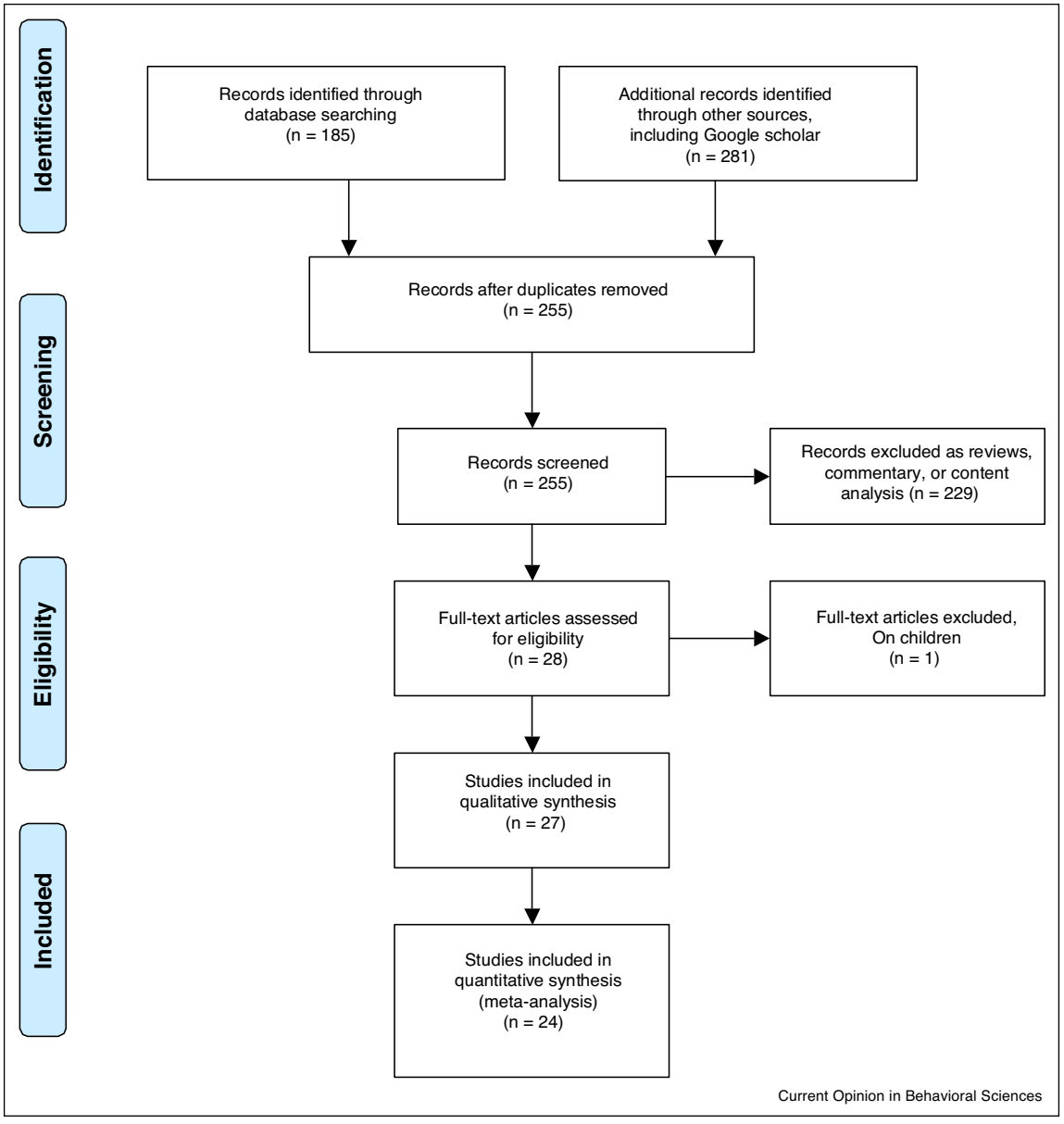
The effect of gambling advertising: an understudied field

That greater exposure to advertising of addictive products is associated with more positive attitudes, use initiation and more problematic use, is established [5,6,11,12]. For example, a systematic review of longitudinal research found that exposure to alcohol advertising was associated with greater drinking intentions, earlier initiation of drinking, and more problematic drinking [5]. Similar relationships have been observed for tobacco [7]. Despite comparable potential for harm, the effect of gambling advertising has historically been understudied compared to other areas of addiction, restricted by regulatory requirements [13], and potentially compromised by vested interests (e.g., industry funded studies; 14). The historical lack of research on gambling advertising means that policy makers, advocates, researchers and intervention designs are poorly informed [15]. This review seeks to address this gap by establishing the relationship between exposure to gambling advertising and gambling-related attitudes, intentions and behaviour.

Methodology

Following PRISMA guidelines (Figure 1), a literature search for studies published since 1999 (completed 20 July

Figure 1



PRISMA Flow Diagram [65].

2019) examining the effect of, or relationship between gambling advertising and attitudes, intentions and behaviour was conducted using research databases (i.e., ISI Web of Knowledge, PsychInfo, PubMed, Scopus) and Google Scholar. Searches used Boolean operators to identify all papers and used combinations of the terms gambl* bet* casino* lott* promot* advert* market* intent* expect* behave* activit* spons* attitude* belie*. The lack of empirical research necessitated an inclusive approach to the review. We included research that did not report a statistical relationship (i.e., qualitative research) between gambling advertising and gambling outcomes, but which provided insights for the field. We also did not use a strict definition for what constituted gambling attitudes, intentions, or expectancies, but instead included any papers that described their outcomes as such. Papers were deemed eligible for inclusion (and further screening) if they were in English, published after 1999, and fit a combination of advertising keywords and outcome keywords. Reference lists of gambling advertising publications were examined for additional research sources. Experts were also contacted to identify additional work. The search strategies yielded N = 255 results. Physical inspection of abstracts and results

Table 1

Summary of studies reviewed

Authors	N's	Setting	Population	Study Design	Independent variables (IVs)	Outcome variables[a] (DVs)	Relationship found	Recall of adverts	Self-report for outcome	Raw measures reported for effect size	Attitude link and average effect size	Intent link and average effect size	Behaviour link and average effect size
Browne *et al.* [40]	597	Australia	Regular gamblers (18+ years)	Cross-sectional (repeated measure/ ecological momentary assessments)	advertising observed (recall- but immediate through ecological assessment)	Intent AND Problem Gambling AND Gambling Behaviour (actual betting, amount spent- split on race versus sport bet)	Yes and no; exposure to advertising associated with higher betting and spend, but not with intentions (with some exceptions of direct advertising)	No	Yes	IV: gambling exposure DV for race betting, all odd ratios: intent:1.00 Behav (actual spend): 1.24 DV for race betting, all odds ratio: intent:1.03 Behav (actual spend): 1.13	N/A	Yes and No: Sports betting r = .01, Race betting r = .00	Yes; sports betting r = .06, race betting .03
Clemens *et al.* [43]	4617	Germany	Adolescents and young adults 13–25 years	Cross-sectional	Presented masked advertising	Gambling behaviour	Yes, top quartile of exposure had higher gambling rates than lowest	No, Recognition	Yes	IV: correct recall rate DVs and their Ds from ORs, comparing bottom quartile to top quartile of exposure to advertising: Lifetime prev of gambling (.468) 12-month prevalence (.473) Current gambling (called once a week): (.692) Probable pathological gambling (.646) scale used critiqued heavily	N/A	N/A	Yes: r = .28
Derevensky *et al.* [17]	1147	Canada	Adolescents and young adults 12–19 years	Cross-sectional	Advertising observed (recall)	Attitudes AND Gambling Behaviour AND Problem Gambling	Yes, gambling severity much higher amongst those who viewed ad, more positive attitudes	Yes	Yes	IV: exposure to adverts (continuous) DV (Correlations coefficients reported): with problem gambling severity TV: .166 Radio: .096 Billboard: .125 Newspaper: .160 Magazine: .212 Spam email:.144 Store ads:.145 Internet popups: .028 (not used for average effect calculation, as authors identified issues with IV).	Yes; indirect as self-report of link by gamblers	N/A	Yes; r = .15
Hanss *et al.* [47]	6034	Norway	Adults 18+ years	Cross-sectional	Advertising observed (recall)	Gambling Behaviour AND Problem Gambling	Yes, those who reported seeing gambling advertising more reported that advertising increased their involvement in gambling	Yes	Yes	IV: advertising exposure (all types) DV (as betas): Involvement in gambling (B = .13) Problem gambling 4 categories. Difference between categories in non-problem gambling Welch F test reported: (3214.16) = 36.91, proportion of variance explained or w squared .02. Non-problem M = 16.10, SD = 12.18. Problem M = 21.44, SD = 1.89.	N/A	N/A	Yes: r = .03
Hing *et al.* [20]	1000	Australia	Adults 18+ years	Cross-sectional	Self-report of watching show with embedded advertising	Attitude AND Intent AND Gambling Behaviour AND Problem Gambling	Yes, main finding that intent to bet is higher in those who saw ads. Problem gamblers (i.e., higher frequency gamblers) have positive attitudes towards gambling	No	Yes	IV: exposure to show with advertising DV: as Betas Gambling intention: B = .107	Yes: indirect. self-report of link by gamblers	Yes: r = .03	Yes: indirect. self-report of link by gamblers

Table 1 (*Continued*)

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Hing *et al.* [18]	212	Australia	Adults 18+ years	Cross-sectional	Advertising observed (recall, aided and unaided)	Attitude AND Intent AND Gambling Behaviour	Yes, main finding is those who gamble also have significantly higher exposure to advertising, and have better attitudes.	Yes	Yes	IV: Exposure to sponsorship marketing DV: Gambler (144) or not (68) Provided Ms and SDs on level of exposure to marketing. Gambler = 4.13 (2.02) Non-Gambler = 2.56 (1.84)- hence the beta	Yes: $r = .12$	Yes, indirect, as attitude (affected by watching match) links to intention. Beta provided: .44	Yes: $r = .38$
Hing *et al.* [19]	1714	Australia	Reanalysis of combined Adult and Adolescent studies/ samples	Cross-sectional and cross-sectional qualitative	Varied: some mock advertising, some advertising observed (recall)	Intent AND Gambling Behaviour	Somewhat: self-report suggests no effect of advertising in recall, but presenting mock ads increases intent. Self-report of ad exposure higher amongst problem gamblers	Yes, Recall and Recognition	Yes	N/A, as studies reported elsewhere. Qualitative focus groups primarily here.	N/A	Yes; qualitative	Yes; qualitative
Hing *et al.* [48]	544	Australia	Adults sports betters 18+ years	Cross-sectional	Self-report of watching show with embedded advertising	Gambling Behaviour AND Problem Gambling	Yes and no: respondents claimed no effect, but problem gamblers (as defined by frequency of gambling) self-reported impacted frequency and increased their problem	Yes and No	Yes	IV: Did exposure to ads increase the frequency of sports betting? Single question DV: means and SDs provided for different groups; compared 'problem gamblers' ($N = 120$, $M = 3.5$, SD = .09) to non-problem ($N = 273$, $M = 2.6$, SD = 1.1)	N/A	N/A	Yes: = .57
Hing *et al.* [39]	131	Australia	Adolescents 12–17 year	Cross-sectional	Self-report of watching show with embedded advertising	Attitude AND Intent	Yes and no, intent linked to advertising, but no link between attitudes (indirect). Multivariate relationship also insignificant for both attitude and intent as linked to advertising	No	Yes	IV: exposure to gambling promotions DV: Correlations reported. Intention to bet during sport $r = .20$, $N = 131$	No; indirect self-report survey suggesting largely no link	Yes: $r = .20$	N/A
Korn *et al.* [21]	1053	Canada	Adolescents 13–17 years	Cross-sectional and cross sectional qualitative	advertising observed (recall)	Attitude AND Problem Gambling	Yes, those who recalled ads more likely to have gambling problem, qualitative component on attitudes linked to advertising	Yes	Yes	IV: exposure to ambling promotion (various types) DV: category of gambler (non ($N = 174$), social (623), at risk(119), problem(61)). Chi square DF 3, overall $N = 977$ TV casinos lotteries, proline: $\chi 2 = 14.942$ Newspapers: $\chi 2 = 10.593$ Mags: $\chi 2 = 11.936$ Subway: $\chi 2 = 6.927$ TV for poker only: $\chi 2 = 31.31$	Yes; qualitative component suggests link	N/A	Yes; $r = .12$
Lee *et al.* [22]	229	USA	Mean age reported 20.5 years	Cross-sectional, multi-year	advertising observed (recall)	Attitude AND Intent	Yes, but advertising affects intent through attitude change toward ads.	Yes	Yes	$\gamma = .77$ between ad exposure and attitude, $B = .27$ between ad attitude and intent	Yes: $r = .62$	Yes	N/A

Table 1 (*Continued*)

Authors	N's	Setting	Population	Study Design	Independent variables (IVs)	Outcome variables[a] (DVs)	Relationship found	Recall of adverts	Self-report for outcome	Raw measures reported for effect size	Attitude link and average effect size	Intent link and average effect size	Behaviour link and average effect size
Munoz [49]	State	USA	Adults 18+ years	Cross-sectional, multi-year	Amount spent by state on advertising on scratch	Gambling Behaviour (sales of scratch tickets)	Yes, amount spent by state on advertising has direct return on investment	No	No	Provided correlation between scratch ad expenditure and scratch revenue: .38 Also provided correlation on lotto ad expend and sales: -.13, and Powerball advertising and Powerball sales: .28(ns) However, authors note that this is likely due to extreme state restrictions on lotto ads. In a regression model, (32 regressions, multiple states and times) power-ball was significant.	N/A	N/A	Yes; $r = .18$
Russell *et al.* [50•]	1813	Australia	Adults 18+ years	Cross-sectional	Self-report of watching show with embedded advertising, Availability of micro-betting	Gambling Behaviour AND Problem Gambling	Yes and no; exposure to sports positively correlates with micro-betting, but self-reported ad exposure *negatively* correlates with betting	Yes and No	Yes	IV: Frequency of exposure to gambling ads OR Watching sport DV: number of times micro betting Odds ratio (.742- Frequency of exposure to gambling ads AND Watching sport OR- 2.408	N/A	N/A	Yes for direct exposure to sport ($r = .48$) no for recalled advertising ($r = -.16$). Average is No; $r = -.08$
Stone [51]	State	USA	Adults 18+ years	Cross-sectional, multi-year	Amount spent by state on advertising	Gambling Behaviour (sales)	Yes, lottery advertising expenditure correlates strongly with revenue	No	No	IV: Ad expenditure DV: Correlation on lottery sales: .681 $N = 72$	N/A	N/A	Yes; $r = .68$
Yazdi and Katzian [52•]	3043	Austria	Adolescents and adults 16 + years	Cross-sectional	Indirect; online versus offline, where online has more advertising	Problem Gambling	Yes, online has more problem gambling. However, authors do not state directly that online = greater advertising	N/A	Yes	Lie and bet positive Offline gambling %, followed by o: 18.37% ($n = 1187$) Online gambling: 30.56% ($n = 72$)	N/A	N/A	Yes; $r = .14$
Gainsbury *et al.* [46]	964	Australia	Adults gamblers 18 + years	Cross-sectional	advertising observed (recall)	Problem Gambling	Yes, problem gamblers see more gambling advertising than non-problem gamblers on social media. Those at risk also more likely to report being influenced.	Yes	Yes	Moderate risk/problem gamblers more likely to report increase in gambling after seeing advertising: $\chi 2$ (1, $N = 964$) = 100.39, $p < .001$, $\phi = .32$	N/A	N/A	Yes: $r = .32$
Binde and Romild [44•]	2162	Sweden	Adults	Cross-sectional	Advertising observed (recall)	Gambling Behaviour AND Problem Gambling	Yes and no; self-report suggests that amongst those who say gambling advertising is influential, the more problem gambling they have. However, overall low self-reported impact	Yes	Yes	N/A	N/A	N/A	Yes; qualitative
Binde [36]	25	Sweden	Adults gamblers 18 + years with problems	Cross-sectional, qualitative	Presented actual ads	Gambling Behaviour	Yes, about 75% suggested some impact	No	Yes	N/A	N/A	N/A	Yes; qualitative
Hing *et al.* [54]	50	Australia	Adults 18+ years	Cross-sectional, qualitative	advertising observed (recall)	Problem Gambling	Yes, felt that exposure to advertising increased problem behaviour	Yes	Yes	N/A	N/A	N/A	Yes; qualitative
Lamont *et al.* [23]	39	Australia	18+ years Sport watchers	Cross-sectional, qualitative	Presented actual adverts	Attitude (feelings)	Yes, generally positive reactions such as joy and arousal	No	Yes	N/A	Yes; qualitative	N/A	N/A
Pitt *et al.* [24•]	48	Australia	Children 8–16 years	Cross-sectional, qualitative	advertising observed (recall)	Attitude	Yes, children learnt content, understood how to make a bet, and how exciting ad was	Yes	N/A	N/A	Yes; qualitative	N/A	N/A

Table 1 (*Continued*)

Authors	N's	Setting	Population	Study Design	Independent variables (IVs)	Outcome variables[a] (DVs)	Relationship found	Recall of adverts	Self-report for outcome	Raw measures reported for effect size	Attitude link and average effect size	Intent link and average effect size	Behaviour link and average effect size
Thomas *et al.* [25]	100	Australia	Adults 18+ years	Cross-sectional, qualitative	advertising observed (recall)	Attitude	Yes, generally positive (describing mutually beneficial, fitting masculinity), but some groups (especially older men) unhappy	Yes	N/A	NA	Yes; qualitative	N/A	N/A
Clarke *et al.* [26]	345	New Zealand	Adults 18+ years	Cross-sectional, qualitative	Advertising observed (recall)	Attitude AND Gambling Behaviour	Yes, over 75% of participants stated that advertising attracted them, and some participants suggested that it influenced their behaviour	Yes	Yes	N/A	Yes; qualitative	N/A	Yes; qualitative
Hing *et al.* [55]	611	Australia	Adult gamblers 18 + years	Experimental	Presented fake advertisements with different types to participants	Attitude AND Gambling Behaviour (likelihood of placing a bet on the video presented)	Yes, presenting 'typical' advertisement increased behaviour more than 'neutral' in most gamblers.	No	Somewhat; asked 'would you bet right now'	Provided 'importance' of appeals compared to gambling type. Not possible to compare directly, and therefore no effect size.	Yes	N/A	Yes; not possible to convert to R
Ho *et al.* [38]	4208	Hong Kong	Adolescent/ adults 16+ years	Quasi-experimental	Increase in gambling advertising between 2008 and 2010	Intent AND Gambling Behaviour (expenditure and past gambling)	Yes and no, expenditure tripled, while increase of 10.8–13.2% of gambling in past year. Intent did not increase.	No	Yes	2.4% increase in gambling after two years	N/A	No	Yes; not possible to convert to R
Lund [12]	1293	Norway	Adults 18+ years	Quasi-experimental	Ban on EGMs	Gambling Behaviour AND Problem Gambling	Yes, drop in problem behaviour, and 'chasing' gambling behaviour	No	Yes	Problem behaviour drop from 1.2% to .3% after ban; chasing dropped from 3.5% to 1.9%	N/A	N/A	Yes; r = .47
Zhang [51]	Three states	USA	Adults 18+ years	Quasi-experimental	Comparison of states advertising through the years and return on advertising through revenue	Gambling Behaviour (revenue)	Yes, direct link between advertising and gambling revenue	No	No	1% increase in advertising spending would increase sales by .1% to .24%.	N/A	N/A	Yes; not possible to convert to R
Russell *et al.* [41]	202	Australia	Regular gambling adults (98 sport, 104 race)	Longitudinal (repeated measure/ ecological momentary assessments across one week)	Advertising observed (recall- but immediate through ecological assessment)	Intent AND Gambling Behaviour (actual betting, amount spent)	Yes and no; emails increase intent, but not actual behaviour, while text associated with higher intent and betting	No	Yes	IV: gambling exposure- email or text. Note different N's for type of bet, and ORs given here for log transformed DV. DV for sports bet: Intent, email: OR = 1,62 Intent: text: OR = 1.18 Behav, email: OR = 1.53 Behav, text: OR = 2.58 DV for race bet: Intent, email: OR = 1.25 Intent: text: OR = 1.15	N/A	Yes; sports bettors: r = .08, race bettors, r = .05 average between sports and race bettors: r = .07	Yes, for sports bettors (race bettors data unavailable): r = .19

[a] Unless otherwise indicated, behaviour refers to frequency of past gambling behaviour.

to ensure the studies were empirical in nature, not review articles, established associations between gambling advertising/marketing and attitudes, intentions and behaviour, resulted in the exclusion of $N = 229$ papers. A total of 28 studies were identified and reviewed (Table 1). After examining the full text, we excluded one qualitative study conducted in young children (6-year olds) because of queries regarding cognitive capacity to recall gambling advertising [16]. We describe the reported statistical and non-statistical relationships (qualitative) in text. Raw effect sizes for each study are reported in Table 1. Meta-analyses were conducted for studies where sufficient statistical information was provided, and effect sizes and confidence intervals calculated for attitudes, intentions, and behaviour (see Figures 2–4, respectively). In each case, we converted available effect sizes to *r*'s and submitted these values to a random-effects analysis using MAVIS (an *R* statistical tool). A sufficient number of studies were identified to allow for tests of publication bias for gambling behaviour research. There was no statistical indication of publication bias in research on gambling intentions and advertising studies (funnel plot asymmetry, $t(5) = 1.46$, $p = .20$), although the publication bias estimate should be treated with caution due to the smaller number of studies. There was no statistical indication of publication bias in gambling advertising and behaviour studies (funnel plot asymmetry, $t(13) = 1.11$, $p = .29$).

Gambling advertising and gambling attitudes

Eleven studies have examined the link between gambling advertising and gambling-related attitudes (see Table 1; 17–23,24•,25,26,27•). Attitude assessment included measures of affect, favourability and interest. Five studies adopted quantitative methods, four reported significant associations between exposure to gambling advertising and more positive gambling-related attitudes. Only two studies correctly reported statistics to allow estimates of overall effect size. Effect sizes ranged from $r = .12$ to $r = .62$; Mean $r = .40$). Five qualitative studies reported a link between gambling advertising and gambling-related attitudes. For example, in qualitative work Thomas and colleagues [25] found that participants perceived gambling advertising to be saturating, normalised gambling, and that advertising seeking to incentivise gambling (betting promotions) was effective in influencing gambling-related attitudes.

There was some evidence for a dose-response relationship between gambling advertising and attitudes similar to that observed for alcohol marketing [5,28,29], although this is primarily based on retrospective self-report. Cross-sectional work in the United States (US; $N = 229$) found that greater self-reported exposure to gambling advertisements was related to more positive gambling attitudes [22]. Cross-sectional research from Australia found that exposure to gambling sponsorship of sporting events was related to favourable attitudes towards gambling [18]. Research with adolescents $N = 1195$ also suggests that exposure to lottery advertisements increases adolescents' perceptions of success and likelihood of large cash prizes [30]. A large Canadian survey of adolescents $N = 1147$ found that gambling-related advertising is more likely to influence established gamblers and problem gamblers' attitudes by prompting gambling. Counter-intuitively, participants did not believe that advertising would create new gamblers [17].

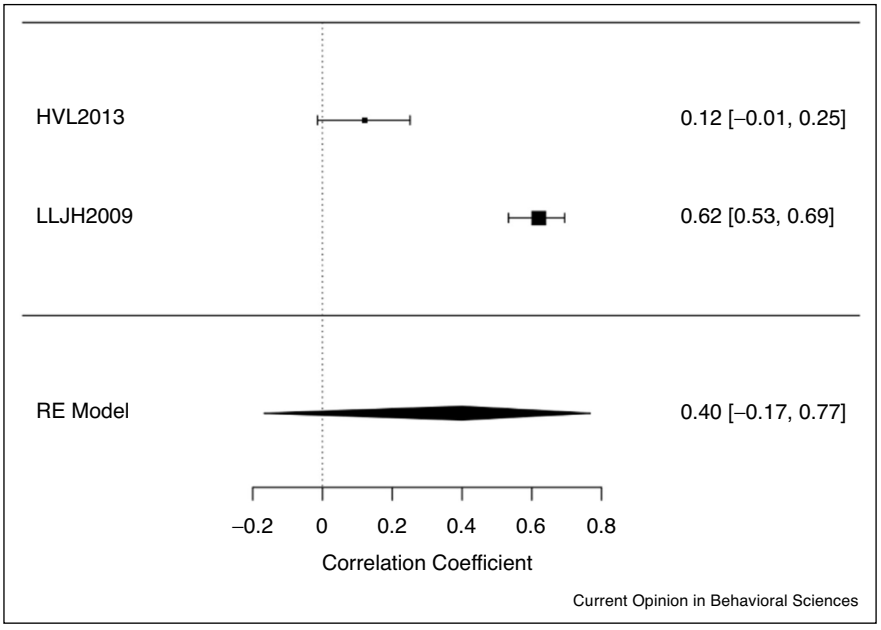
Gambling advertising appears to influence gambling attitudes by normalising and/or glamorising gambling [31]. For example, research from Europe and Australia suggests that valued forms of entertainment, especially sport, are used to normalise betting and create positive attitudes toward gambling by seeing gambling as an interactive part of sport participation/viewing [25,32–34]. In other countries (e.g., Canada) advertisements function to normalise and romanticise lottery ticket purchases [34]. However, whether lottery advertisements are successful in changing attitudes remains unclear [35–37].

Gambling advertising and gambling intentions

Only eight studies have examined the link between exposure to gambling advertising and gambling-related intentions or expectancies (see Table 1; [18–20,22,38–41]). Most studies assessed intentions in a rudimentary manner by asking participants if they were going to engage in gambling behaviour, and/or within a set time period. All except three studies were cross-sectional (quantitative), and all studies except two [38,40] reported an overall positive association between exposure to gambling advertising and gambling intentions. Only five reported sufficient statistics details to allow effect size calculations (effects sizes ranged from $r = .00$ to $r = .20$, Mean $r = .05$). This small (but significant) effect size suggests there is link, although caution is warranted here as there are very few studies included in this calculation. Consistent with the findings on gambling attitudes, three studies found that participants who reported watching sports programs containing large amounts of gambling advertisements expressed greater intentions to gamble [18,20]. Notably, this work also suggests a *dose-response relationship* whereby higher self-reported exposure was related to greater intentions to gamble, particularly in riskier gamblers. Gambling intentions were also associated with gambling attitudes [18,20].

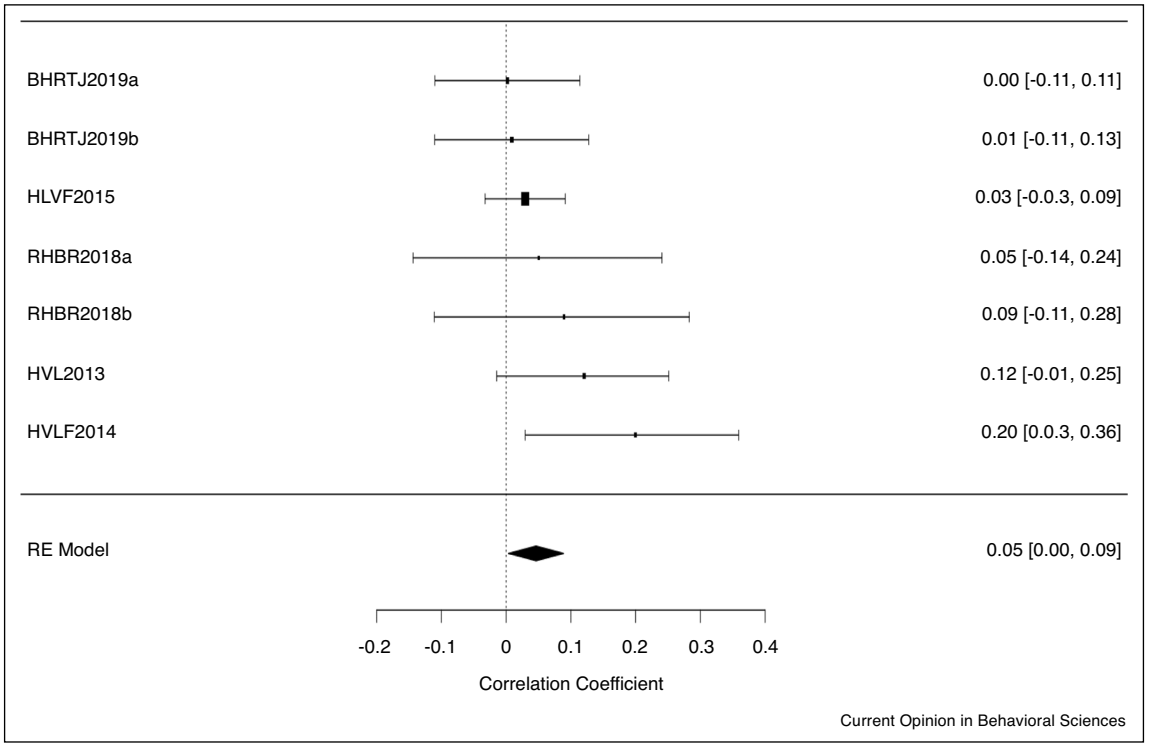
Two studies used ecological momentary assessment techniques to reduce problems with recall [40,41], and both found that receipt of direct messaging for example, email and text prompts and promotions was associated with greater gambling intent. And although there were no experimental studies on gambling advertising, one large population study in Hong Kong $N = 4208$ found that gambling intentions were not changed but gambling

Figure 2



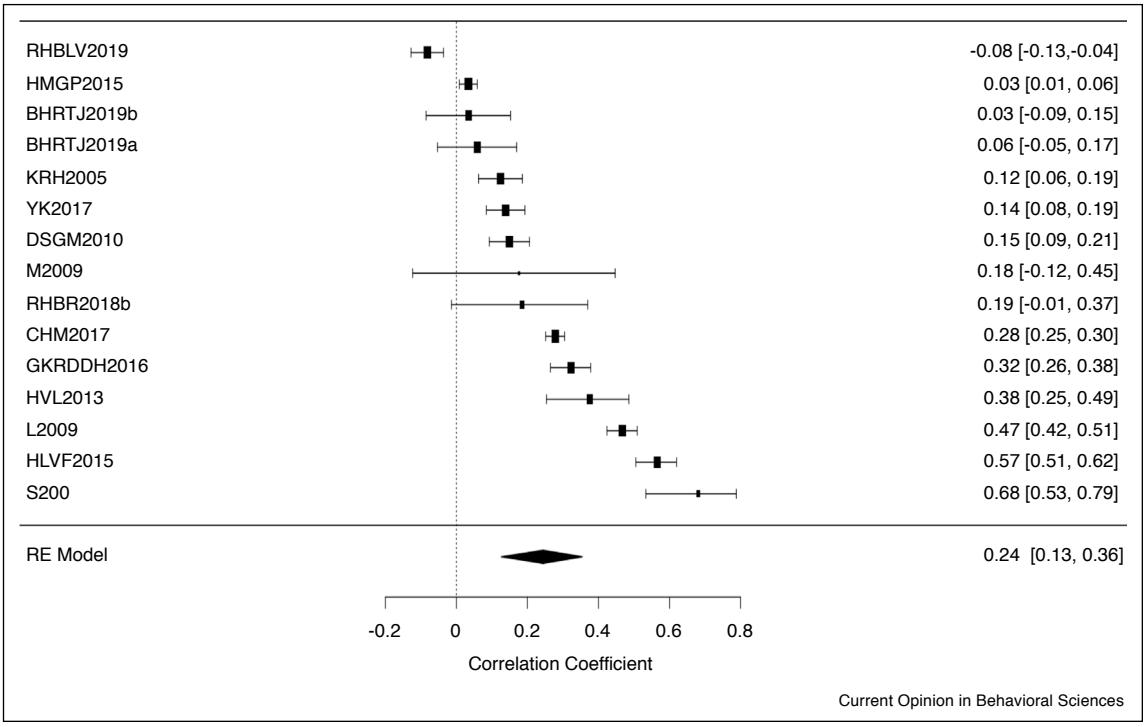
Coefficients and confidence intervals for relations between gambling advertising and gambling attitudes. Author initials and year of publication for studies are provided alongside coefficients. Figures created using MAVIS [64].

Figure 3



Coefficients and confidence intervals for relations between gambling advertising and gambling intentions. Author initials and year of publication for studies are provided alongside coefficients. Figures created using MAVIS [64].

Figure 4



Coefficients and confidence intervals for relations between gambling advertising and gambling behaviours. Author initials and year of publication for studies are provided alongside coefficients. Figures created using MAVIS [64].

behaviour increased following a large increase in gambling advertising due to the removal of gambling marketing restrictions in neighbouring Macau [38]. Similarly experiments with alcohol advertising suggest that young people's exposure increases intentions to buy and consume alcohol [42,43]. It is reasonable to expect that gambling advertisements would increase gambling intentions in a similar fashion.

Gambling advertising and gambling behaviour

Our review found 23 studies examining relationships between gambling advertising and gambling behaviour [12,17–21,26,36,38,40,41,44•,45•,46–49,50•,51,52•,53–55], with 14 studies using cross-sectional methods to assess the relationship. One study sought to conduct a longitudinal analysis of EMA data collected across one week in regular gamblers [41], with one experimental study and three quasi-experimental studies (i.e., naturalistic studies). Overall, 16 studies assessed the relationship between gambling advertising and gambling behaviours generally, and five studies examined the relationship with problem gambling exclusively. Because problem gambling measures also included measures of gambling frequency (a potential confound), and the overall number of studies is small, we simply treated these studies as having evidence for a gambling behaviour. All but one study suggested a statistically significant link between advertising and gambling behaviours (effects sizes ranged from $r = -.08$ to $r = .68$, Mean $r = .24$). Five studies used qualitative methods to assess gambling advertising impact on behaviour. For example, a Norwegian study ($N = 25$) presented gambling advertising to gamblers and asked whether they felt the advert would affect their gambling [36]. Approximately half of these gamblers indicated that the advertising would increase their gambling behaviour.

Quantitative cross-sectional research in Norwegian $N = 6034$; 47), Australian ($N = 544$; 48, and US samples $N = 1813$; 50•) show that greater exposure to gambling advertising (both self-report and proxy measures) is associated with gambling or problem gambling behaviour. US research analysing the link between gambling advertising expenditure and lottery scratch card revenue (sales) shows a dose-response relationship between the two whereby greater advertising expenditure is associated with greater purchasing of scratch cards [49,51]. Notably, a study involving three US states found that for each 1% increase in advertising expenditure there was a .1–.24% increase in revenue due to increased gambling [53]. Novel work from Norway $N = 1293$ examining the effect of a ban of electronic gambling machines EMG's, which because of their attractive built-in lighting and sound functions as advertising, found a drop-off in all gambling

behaviour following the government ban on EMG's [12]. While it is possible that this reduction in gambling behaviour was due to a loss of accessibility to a familiar gambling method, the ban did not cover other forms of gambling which were normally located in the same place (i.e., supermarkets), which likely means the loss of EGMs lighting and built in advertising acted as a loss in advertising, rather than just a loss of access. Furthermore, both studies using ecological momentary assessment (one using a longitudinal analysis, [41]) found an association between advertising exposure, gambling frequency, and gambling expenditure [40,41].

Ultimately, the goal of gambling advertisements is to increase gambling behaviour frequency and/or expenditure amongst established gamblers, and develop new gamblers [32,33,56]. Overall, the research suggests a significant positive relationship between exposure to gambling advertising and gambling-related behaviour. Effects vary, but suggest greater exposure equals more gambling.

Conclusions

Despite decades of research detailing the increasing harm caused by gambling [3] and the rapid increase in gambling advertising [8,9], there has been a paucity of quality research, particularly longitudinal and experimental research, examining the relationship between gambling advertising and gambling-related attitudes, intentions and behaviour. Almost half the studies were qualitative, making it harder to apply the results to the research question. Quantitative studies on attitudes and intentions were rare, and even when they were available, many studies did not explain their measurement methods in enough detail nor provide enough statistics for measures of effect size. The research was also diverse, as some chose purely to focus on problem gamblers, or certain types of gambling, or on a particular form of gambling advertising in certain areas. This lack of high-quality research has hampered previous reviews and policy makers. Even with these limitations, this research review of the past two decades, using available evidence shows that exposure to gambling-related advertising is likely associated with more positive gambling related-attitudes, greater gambling intentions, and increases in gambling and problem gambling behaviour.

The pattern of results is consistent with those found in the fields of alcohol and tobacco [5–7]; however, the research on gambling advertising is considerably less developed than for alcohol and tobacco. In particular, there is an absence of longitudinal and experimental studies. The most convincing research on the association between advertising and attitudes, intentions and behaviour, comes from the large naturalistic quasi-experimental studies where due to government interventions gambling advertising is either banned, permitted, or increased [12,38,53]. This work shows a *dose-response* relationship between advertising and behaviour, suggesting increases in advertising leads to increases in behaviours. As with research in alcohol and tobacco advertising, cross-sectional studies show that people reporting more exposure to gambling advertising were more likely to report positive gambling attitudes, intentions and being gamblers. Although there are challenges in conducting large-scale longitudinal studies in representative population samples, the absence of such research is hampering policy makers and advocates from developing effective policies and regulations regarding gambling advertising.

Gambling advertising research needs to address a number of significant design and measurement issues. Notably, poor methodological and statistical reporting is common. There is little justification and psychometric support for the choice of measures of exposure, attitudes, intentions and indeed gambling behaviour. For example, one study [39] used different Likert scales to assess attitudes to promotion of gambling during televised sport, but also used a scale developed in marketing to measure attitude to gambling sponsors of televised sport. Furthermore, links between measures of intention and behaviour have already been questioned in psychological research [57,58], suggesting validity issues for measuring intent as a predictor of gambling behaviour. Accordingly, there is little consistency in measurement across studies, potentially compromising the integrity of the meta-analytic component of this study as it is unknown how much these measurement methods show convergent validity.

Lack of comprehensive analytical and statistical information and reporting makes assessment of the quality of evidence difficult, and undermines the credibility of the field. Sample selection and study designs utilised in the field (largely cross-sectional), mean that reverse causation cannot be ruled out. Sample selection needs to be better to avoid bias as it is known that the gambling industry advertises in areas, and to populations, where gambling is already common and problematic (e.g., young men, those with poor impulse control, low socioeconomic status areas; [59]). Although experimental designs are impractical because of the ubiquitous nature of gambling advertising, longitudinal studies in young populations who may be less exposed can overcome inherent problems with establishing causal inferences [5]. Direct measurements of gambling activity after observing gambling advertisements are more likely to be a valid measure of their impact. For example, a study could track gambling advertising in mobile phones compared to the installing and use of gambling applications, which appear to be a significant form of gambling [60].

Use of standardised definitions and measurement of advertising exposure and gambling behaviours would lead to better understanding of the causal mechanisms

involved. For example, most studies developed their own definitions and measures to assess the impact of diverse forms of advertising against varying definitions of gambling attitudes, intentions and behaviour. Notably, the studies on behaviour often use scales on *problem gambling* to assess gambling, masking potential associations between gambling advertising and a broader range of gambling behaviours.

Overall, the breadth and quality of research in this area need to be improved. Governments and non-gambling funded bodies need to invest in quality research on the effect of gambling advertising. In the absence of government funding for research in this area, it is possible that the gambling industry funded research, as found with the tobacco and alcohol industry, could result in a biased and/or unreliable evidence base [61–63]. Although our research did not find evidence of publication bias in behaviour links to gambling advertising, it is worth remembering that much of the research examined in this review used problem gamblers as the sample of interest, which in turn, pathologises the issue rather than discuss social harm. Therefore, industry funded studies may have an actual incentive to report a relationship in these studies, while divesting or downplaying any studies that use the general population. This may mask findings which are unfavourable to the gambling industry, while also showing no publication bias. To conduct these studies, public funding is required. Governments at state and/or federal/national levels gather considerable revenue from gambling, and disproportionately from those most at risk of being problem gamblers. Accordingly, it is their responsibility that they need to ensure that the societal harms associated with gambling are minimised by supporting research that can inform best practice for reducing gambling harms.

Gambling is a growing problem for most western societies [8], and the gambling industry's profit motive means that they now spend record amounts on gambling advertising [10]. The past two decades of research suggests that the gambling industries investment in advertising is effective. The more people are exposed to gambling advertising, the more likely they are to become gamblers and problem gamblers. In the absence of effective government regulation, gambling advertising is likely to increase and be more influential, and lead to greater societal harm. Within this climate it is important that more and higher quality research on this issue is conducted in order to inform regulations and interventions that can reduce gambling harms.

Conflict of interest statement

None of the authors of the paper have received funding from the gambling industry, or have shares of financial interests in gambling related industries. Nor do the authors have any other related conflicts of interest to declare.

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