



## All in: a scoping review of the association between gambling and athletic participation

Sarah E. Nelson, John M. Slabczynski, Taylor G. Lee & Debi A. LaPlante

To cite this article: Sarah E. Nelson, John M. Slabczynski, Taylor G. Lee & Debi A. LaPlante (2024) All in: a scoping review of the association between gambling and athletic participation, International Gambling Studies, 24:2, 185-209, DOI: [10.1080/14459795.2023.2229417](https://doi.org/10.1080/14459795.2023.2229417)

To link to this article: <https://doi.org/10.1080/14459795.2023.2229417>



© 2023 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.



Published online: 30 Jul 2023.



Submit your article to this journal [↗](#)



Article views: 1939



View related articles [↗](#)



View Crossmark data [↗](#)



Citing articles: 2 View citing articles [↗](#)



# All in: a scoping review of the association between gambling and athletic participation

Sarah E. Nelson<sup>a,b</sup>, John M. Slabczynski<sup>a</sup>, Taylor G. Lee<sup>a</sup> and Debi A. LaPlante<sup>a,b</sup>

<sup>a</sup>Division on Addiction, Cambridge Health Alliance, Boston, MA, USA; <sup>b</sup>Department of Psychiatry, Harvard Medical School, Boston, MA, USA

## ABSTRACT

The barriers between sport and gambling recently have eroded in the US. While this presents economic opportunities, it may also increase the risk of gambling problems among athletes, particularly if athletes are already more susceptible to gambling problems than others. We conducted a scoping review of the literature that sought to characterize what is known about the relationship between participation in athletics and gambling. We identified 45 studies that met our inclusion criteria. The majority (56%) sampled athletes at the collegiate level. More than half of the studies did not include a non-athlete control group. Among the studies that did compare athletes to non-athletes, findings were mixed. Half of the studies that examined gambling involvement found that athletes had higher involvement than non-athletes, while half found no relationship. About 23% of studies that examined gambling problems found a positive relationship between being an athlete and experiencing gambling problems; 69% found no relationship, and 8% found a negative relationship. In some cases, gender appeared to moderate these relationships; in others, there was no interaction with gender. Future research should include rigorous studies that examine these relationships at diverse levels of play, include non-athlete controls, and test what mechanisms explain these relationships.

## ARTICLE HISTORY

Received 14 February 2023

Accepted 20 June 2023

## KEYWORDS

Gambling; problem gambling; sports; athletes; sports gambling

Since the Professional and Amateur Sports Protection Act of 1992 (PASPA) was overturned in 2018, sports gambling in the U.S. has grown significantly, with bettors wagering \$7 billion in October 2021 alone, up from \$310 million in June 2018 (O'Brien & He, 2021). While some athletes are benefitting from lucrative endorsement deals, others have faced serious repercussions because of gambling. For example, in March, 2022, the National Football League (NFL) suspended budding superstar wide receiver Calvin Ridley indefinitely for betting on NFL games. Ridley became the second NFL player suspended in the past 3 years due to gambling (McCann & Jackson, 2022). As the U.S. sporting world becomes more and more saturated with gambling, whether athletes themselves are at risk of developing gambling problems remains an important question.

**CONTACT** Sarah E. Nelson  [snelson@hms.harvard.edu](mailto:snelson@hms.harvard.edu)  Division on Addiction, Cambridge Health Alliance; Department of Psychiatry, Harvard Medical School, 350 Main Street, Malden, MA 02148

© 2023 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

The current research addresses this concern and investigates the state of the current literature by completing a scoping review of the literature related to athletes and gambling.

Though gambling and sport have been intertwined at least since the days of the Roman Empire (Farris, 2012), the U.S. has only recently liberalized the industry. Yet, since the repeal of PASPA, the U.S. has developed into one of the fastest-growing sports gambling markets in the world. However, the relationship between sports and gambling is not unique to the U.S. For example, ITV, a British broadcaster, aired nearly 90 minutes of gambling advertisements during its coverage of the 2018 World Cup (Newall et al., 2019). Lindsay et al. (2013) found similarly high rates of gambling advertisements during Australian rugby games. The U.S.'s shift in policy and rapidly developing sport gambling industry suggests that it is primed to surpass these markets, though new technologies support continued growth even in mature sports gambling markets. In particular, the proliferation of online gambling apps has allowed for increased access in terms of where, when, and how one can bet. In a qualitative study on UK sports gamblers (McGee, 2020), participants claimed that the anonymity in online gambling apps makes gambling a more comfortable experience, free from social shame. Rather than travel to a bookie to place one or two moderate bets, individuals suggest that they can spend whatever they like on whatever bets they are interested in from the comfort of their own homes (McGee, 2020). As a whole, all of these factors contribute to the normalization and continued growth of the relationship between sports and gambling.

Many of the criticisms of the integration of gambling and sports center on sport integrity as the ultimate risk. This can be seen through comments from key figures in major league sports such as Bob Selig, former commissioner of the MLB, who described gambling as 'evil, [and that it] creates doubt and destroys your sport' (Wertheim, 2021). However, commentators should devote more attention to the risk this relationship poses to athletes. Although there are rules in place in many leagues that forbid athletes from gambling on their sport or gambling at all, it seems plausible that the incorporation of gambling as an integral part of sporting culture elevates the risk of gambling and gambling problems among athletes.

### ***Athletes as a special population***

Since gambling disorder was officially recognized in DSM-III in 1980, researchers have identified a number of risk factors, as well as special populations at increased risk of developing gambling problems. Notably, athletes are more likely than non-athletes to engage in risky behaviors, like high-risk drinking (Martens et al., 2006), and to exhibit characteristics such as sensation-seeking and competitiveness, that have been linked to at-risk gambling (Fong, 2005; Goma-I-Freixanet et al., 2012; N. Harris et al., 2015; Mastroleo et al., 2013; Mowen et al., 2009; Parke et al., 2004). Additionally, social experiences, such as exposure to gambling, have been cited as a factor that potentially normalizes betting and increases the risk for gambling problems (Parrado-Gonzalez & Leon-Jariego, 2020; Philander, 2019). As mentioned earlier, the sporting world has welcomed gambling as an important part of spectatorship. As gambling becomes a more important aspect of athletes' workplace, the behavior is normalized and thus may increase the risk for problems. Finally, some have suggested that gambling, along

with numerous other harmful actions, might be a problematic response to injury among athletes, with gambling being used to modulate the negative emotional responses to injury (e.g. Putakian, 2016). There might even be a more direct link between injury and gambling among athletes: specific injuries such as traumatic brain injuries, a common concern in sports (Sahler & Greenwald, 2012), appear to have unique mechanisms related to gambling disorder (Turner et al., 2020). These characteristics and risk factors suggest that athletes might be particularly at risk of experiencing gambling problems.

Participation in athletics is also linked to mental health in a number of ways. For example, the relationship between participation in athletics and eating disorders is clear and well established (Joy et al., 2016). However, sports may also provide some protective effects against depression and anxiety among youth (Tahtinen, 2021), though other research suggests that this relationship is multifaceted, involving other factors such as sex, age, and specific sport (Yang et al., 2007). Reviews regarding the mental health of athletes note a paucity of research investigating other common psychiatric disorders such as PTSD or ADHD, though these reviews provide a number of theories on why these disorders may be more prevalent among athletes (Esfandiari et al., 2011; Reardon, 2017). Additionally, as stated, athletes engage in high-risk drinking at an elevated rate, though this is not the only substance use of concern among this population. Other substance use behavior such as the use of performance-enhancing drugs, marijuana, and tobacco also have complex relationships with sports, often drawing on decades of cultural reinforcement (Brisola et al., 2016; Eaves, 2011; T. S. Harris, 2021).

Determining whether athletes are an at-risk population for experiencing gambling problems is important for prevention and intervention efforts. Understanding who is at-risk for gambling-related harms allows us to better target individuals who may be in need of intervention, and treat gambling problems earlier. Early intervention can include comprehensive screening and recommendations for treatment for those who screen positive, or improved outreach efforts, for example, by educating the target population on the odds of winning games or the risks associated with gambling (Skarupova et al., 2020).

### **Current study**

Previous reviews (Derevensky et al., 2019; Nowak, 2018; Winters & Derevensky, 2019) suggest that participation in athletics is a risk factor for gambling problems. Derevensky et al. (2019) determined that 2.9% to 15% of collegiate athletes screened positive for gambling disorder, significantly elevated compared to the global estimates for the general population of 0.12% to 5.8% (see Calado & Griffiths, 2016). Nowak (2018) further clarified this relationship. This review expanded on the finding that collegiate athletes appear to have elevated rates of gambling disorder, and found that this applies to former athletes as well. Nowak (2018) also noted that gambling disorder among collegiate athletes appears to be related to several other high-risk behaviors such as heavy-episodic drinking, cigarette usage, and unprotected sex, indicating that gambling is an important intervention target. Finally, in their review of sports betting practices, Winters and Derevensky (2019) reported that approximately a quarter of male National Collegiate Athletic Association (NCAA) student-athletes bet on sports despite NCAA regulations

prohibiting such. They also supported the previous findings that current and former athletes appear to have elevated rates of gambling disorder relative to the general public.

These reviews provide an important foundation for this issue, and also indicate important areas for additional investigation. For instance, it is unclear whether athletes' increased risk for gambling problems extends to all performance levels (i.e. from informal intramural to elite) as the previous reviews examined the collegiate level and above. Furthermore, these foundational reviews do not weigh in on different factors that might change the nature of the relationship, such as type of sport, nature of sport (e.g. individual versus team), and gender, or describe possible mediational pathways of the relationship between gambling and athletics. These examples suggest that there is a need to systematically identify open questions of interest that might impact our understanding of gambling and athletics. Therefore, the goal of this scoping review is to provide a high level review of the current research to map the existing literature in this area, identify any potential gaps in our knowledge, and determine whether a formal meta-analysis on the topic is possible. We elected to conduct a scoping review, as opposed to a systematic review because we were most interested in understanding the state of the literature and areas that need additional work (Munn et al., 2018). To accomplish this, we defined athlete and gambling broadly. Our definition of athlete included all levels of competitive play, youth through elite. Our definition of gambling included both gambling participation and problems. Our primary focus is on identifying the trends and gaps in the literature. We performed this review with four research questions in mind:

- (1) What is known from the literature about the associations between gambling and participating in athletics?
- (2) What is known about the associations between athletic participation and gambling-related problems?
- (3) What is known about the potential moderators and mediators of the associations between gambling and participating in athletics?
- (4) What is known about the relationship between different types of athletic participation (e.g. recreational, pre-collegiate, collegiate, professional) and gambling?

## Methods

We conducted this review using the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) extension for Scoping Reviews. Prior to our search, we registered our research plan on the Open Science Framework ([https://osf.io/gpcmb/?view\\_only=f115480cead6494ca572e38d3db9fc54](https://osf.io/gpcmb/?view_only=f115480cead6494ca572e38d3db9fc54)). To be included in our scoping review, studies must have measured or focused on the potential association between gambling and participation in athletics, though we defined both of these terms broadly. The term 'gambling' encompasses the full range of gambling behavior, from gambling without experiencing gambling-related problems, to gambling with some problems, to gambling disorder. Athlete encompasses anyone who participates in any competitive athletic activity, ranging from recreational sports to full-time professional athletes. We purposefully excluded esports from our scoping review because although there is a case for them

to be considered as athletes, the intersection of gambling and gaming in this instance deserves attention as a separate topic.

### ***Study inclusion criteria & search strategy***

We included studies in our review if they (1) were peer-reviewed (excluding conference proceedings), (2) were published at any point prior to our search, (3) were written in English, (4) involved human participants, and (5) described measures of gambling in a sample that included athletes. We specified the first four inclusion criteria in the database query search where possible. We assessed all five criteria during both our title/abstract screening as well as our full text review.

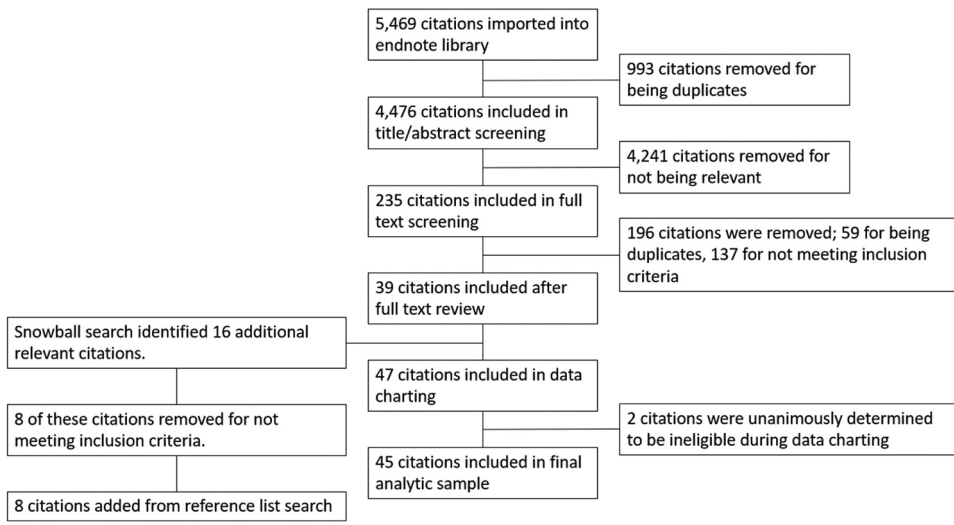
We searched for studies within two online databases – PubMed and PsycINFO – and supplemented this search with searches within four targeted journals: the Journal of Sport & Social Issues, British Journal of Sports Medicine, Journal of Gambling Studies, and International Gambling Studies. We chose these four journals because they represent the top journals in the fields of gambling studies and sports science, and in the case of Journal of Sport & Social Issues, a journal that focuses specifically on the interface of sports and other issues.

Our search terms for gambling included *gambl\**, *betting*, *'gaming'*, *wagering*, and *ludomania*. Our search terms for athletics included *athlet\**, *sport*, and *player*. Studies had to include at least one of the gambling terms and one of the athletic terms to be selected.<sup>1</sup> We exported the results from all six searches (i.e. two database searches and four journal searches) to Endnote and removed all duplicates, resulting in a starting study set of 4,476.

### ***Title/abstract & full-text screening***

Two of the study authors conducted title and abstract screening for all of the articles in our initial study set. We retained articles in which the title and abstract made it clear that the study included a measure of gambling within a sample that included athletes, or for which the title and abstract did not contain enough information to make this determination. Articles whose title and abstract made it clear that the study did not include both a measure of gambling and athletes within its sample were discarded. We used an iterative process to determine the reliability of our title and abstract screening. The two screeners independently screened an initial 10% of all retrieved studies, and continued screening subsequent sets of 10% until they reached an acceptable inter-screener reliability of  $\kappa = .70$ . After each 10%, they and a third author discussed and resolved discrepancies. The two screeners reached acceptable reliability after two rounds of screening (round one  $\kappa = .57$ ; round two  $\kappa = .94$ ) and were able to then divide the remaining 3,584 articles randomly between them to complete screening. After title and abstract screening, 235 articles remained.

Next, we completed the same process using the full text of the remaining 235 articles, assessing whether all inclusion criteria were met. The two screeners achieved a  $\kappa$  of 1.00 on their first round of screening 10% of the studies, so they randomly divided the remaining 90% of articles to complete full-text screening. In addition, the senior author reviewed all of the full-text articles marked for exclusion and identified four additional studies for rescue (i.e. to be included as eligible). This resulted in an interim sample of 39



**Figure 1.** Study selection process: PRISMA diagram.

eligible articles. Finally, the two screeners reviewed the reference list of all eligible articles. They identified 16 more articles in this way for full-text screening, and, upon screening, found 8 of those to be eligible, resulting in a sample of 47 eligible articles. During data charting, this sample was reduced to a final sample of 45 eligible articles when two of the articles were unanimously determined to be ineligible. [Figure 1](#) displays the study selection process in a PRISMA diagram.

### **Data charting process**

We charted data from eligible studies using Qualtrics, an online survey platform. We created a custom Qualtrics survey to record information for this study. The survey included questions for each of the data items listed in [Table 1](#). These data items assessed information about the study authors and funders, sample, measures, design, and analysis. Data items had three possible forms – dichotomous (e.g. whether the study measured gambling problems), ordinal (e.g. what level of athletic participation characterized the sample), and narrative (e.g. major study findings).

For items with three or fewer response options (e.g. yes/no; observational/experimental/other), or where the relevant information could be condensed to three or fewer response options (e.g. whether the study listed a funder or not), we assessed reliability using  $\kappa$ . For items with open response or more than three response options, we assessed reliability using percent agreement. There were a few narrative response items for which we did not assess reliability (e.g. major findings). For these, we arrived at final narrative item responses through discussion between coders.

All four authors independently coded an initial two studies, discussed our discrepancies and how best to interpret the data items, and then repeated this process, coding another two studies independently and discussing and resolving



**Table 1.** Data items, response format, response options, and reliability.

Data item	Response format	Response options, if applicable	Kappa* or % Agreement
Country of origin	Select one	e.g., United States	97.0%
Funder(s)	Open		.82/.86/.87
Year of study publication	Open		92.6%
Years of data collection (inclusive)	Open	e.g., 2005–2008	83.0%
Sample size of the final analytic sample	Open		85.2%
Specific population	Open	e.g., 'professional athletes recruited from 2 MLS teams'	N/A (narrative)
Specific sport	Open	e.g., 'American football'	88.1%
Study design: major category	Select one	Experimental vs. Observational vs. Other	N/A (all coded observational)
Study design: minor category	Select one	If EXPERIMENTAL: Randomized Controlled Trial (RCT), Non-Randomized Trial, Other: _____	N/A (no experimental)
Study design: minor category	Select one	If OBSERVATIONAL: Cross-sectional study, Cohort Study, Case-Control study, Case series/case study, Other: _____	-.03/.66/-.02 (all but 2–3 cross-sectional)
Gambling concept(s) measured	Select all that apply	(1) Gambling participation/involvement, (2) Presence/severity of gambling problem, (3) Other: _____	(1) .85/.83/.83 (2) .86/.92/.85 (3) .42/.75/.33
Source of gambling concept(s) measured	Select all that apply	(1) Self-report, (2) Proxy report, (3) Financial records, (4) Other: _____	(1) N/A (all y) (2) -.00/.00 (all but 0–1 n) (3) N/A (all y) (4) .00/1.00/.00 (all but 0–1 n)
Athletic participation concept(s) measured	Select all that apply	(1) High school athletics, (2) Private youth competitive (e.g. club, Olympic development), (3) Collegiate athletics (varsity), (4) Collegiate athletics (intramural/club), (5) Adult recreational competitive, (6) Elite, (7) Other: _____	(1) .73/.90/.73 (2) .56/.64/.56 (3) .95/.95/1.00 (4) .76/.80/.80 (5) 1.00/.88/.88 (6) 1.00/.94/.94 (7) .53/.38/.29
Duration of follow-up phase, if applicable	Open	e.g., 3 months	97.8%
Did the authors statically test the association between gambling and athletic participation?	Select one	Yes, No	.46/.68/.59
→ If YES: Which aspect(s) of gambling were included in this analysis?	Select all that apply	Responses carried over from 'Gambling concept(s) measured'	(1) -.00/- (all but 0–1 y) (2) 1.00/1.00/1.00 (3) -.00/.00 (only 1–2 cases)
→ If YES: Which aspect(s) of athletic participation were included in this analysis?	Select all that apply	Responses carried over from 'Athletic participation concept(s) measured'	(1) -.00/.00 (all but 0–1 y) (2) -.00/.00 (all but 0–1 y) (3) 1.00/.00/.00 (all but 1–2 y) (4) 1.00/-/- (all but 0–1 y) (5) N/A (all y) (6) 1.00/1.00/.5 (only 3–4 cases) (7) N/A (all y)

*(Continued)*



**Table 1.** (Continued).

Data item	Response format	Response options, if applicable	Kappa* or % Agreement
→ If YES: When statistically testing the association between gambling and athletic participation, did the authors conduct only bivariate tests or did they conduct any multivariable tests?	Select one	Bivariate only, Multivariable	.87/.71/.80
Did the authors include potential confounders/moderators in their analysis?	Select one	Yes, no	.57/.42/.05
→ If YES: What confounders/moderators?	Open	e.g., presence of psychiatric condition(s), Age, SES, Gender, Race/ethnicity	N/A (narrative)
Did the authors include potential mediators in their analysis?	Select one	Yes, no	.64/1.00/.64
→ If YES: What mediators?	Open	e.g., competitiveness, impulsivity	N/A (narrative)
Major finding(s)	Open		N/A (narrative)

Note: \*Reported kappa included kappa for Coders 1 & 2/kappa for Coders 1 &3/kappa for Coders 2&3.

discrepancies.<sup>2</sup> Because of the manageable number of eligible studies, we assigned three authors to independently code random subsets of 10% of eligible articles to assess reliability. Coders met after each coding round to review any discrepancies in coding and resolved differences through discussion. We initially planned to use this iterative process until coders achieved  $\kappa$ s of .70 and percent agreement of 80% across all data items. Because this benchmark was not reached, all three coders coded all 45 studies. Table 1 includes  $\kappa$ s and percent agreements for all data items for which they were assessed.

We achieved acceptable reliability for 24 of the 37 items (65%). Many of the items for which we did not achieve acceptable reliability (e.g. observational study design) had unbalanced cells such that all but one or two studies were coded by all coders as falling in the same category (e.g. cross-sectional) and the resulting discrepancy on the categorization of the remaining studies reduced  $\kappa$ . One systematic coding discrepancy was whether to include an ‘other’ category for gambling concept or athletic concept measured. Often, coders would agree on the primary gambling or athletic categories, but one or two coders would also add an ‘other’ gambling or athletic concept such as gambling motivations or type of sport.

Data associated with this paper are available at [https://osf.io/nmfxt/?view\\_only=c1a98c5e54ef4601bbac3253cf4d73f3](https://osf.io/nmfxt/?view_only=c1a98c5e54ef4601bbac3253cf4d73f3).

### **Analytic strategy**

We created a Characteristics of Included Studies (COIS) table to map study-level information on all of our data items (available at [https://osf.io/nmfxt/?view\\_only=c1a98c5e54ef4601bbac3253cf4d73f3](https://osf.io/nmfxt/?view_only=c1a98c5e54ef4601bbac3253cf4d73f3)). We provide frequency counts and crosstabs of measurement of gambling and athletic participation concepts, as well as year of publication, elements of research design, and statistical tests. We chart the findings for studies that employed statistical tests examining the relationship between gambling and athletics.

We also synthesize the outcomes narratively to provide an overall description of the body of relevant research evidence available.

## Results

### *Characteristics of included studies*

Detailed information about data items for each of the included studies is available in the COIS table. (Table 2) includes a list of included studies with their study ID number used in the COIS table.

#### *Study characteristics*

Among the 45 articles included in this review, 19 (42%) were published by first authors affiliated with United States organizations, nine (20%) were published by first authors affiliated with Canadian organizations, and the remaining 17 (38%) had authors representing 12 other countries. Fifteen of the 45 studies (33%) did not report or did not have a funding source, seven (16%) received funding from the NCAA, and 14 (31%) received funding from a government agency, university, nonprofit, or other private organization. Publication year ranged from 1990 to 2021 with 93% of studies having been published since 2000, and 49% published in the past 10 years.

#### *Samples*

Sample sizes varied widely, from 11 to 93,875 ( $M = 11,757.1$ ,  $SD = 22,529.8$ ; Median = 954). Twenty-five studies (56%) focused on college populations, 14 (31%) focused on adults, and six (13%) sampled high school students. Twenty-five of the 45 studies (56%) included only athletes, and eight (18%) included only males. Eleven studies (24%) used data from the NCAA surveys of college athletes. Seventeen studies (38%) used random national or state-level samples, including the 11 NCAA survey studies.

#### *Study design*

None of the studies were experimental. One study (Caldeira et al., 2017) used an observational longitudinal prospective study, one (Moriconi & de Cima, 2020) used a multi-stage qualitative design, and the remaining 43 (96%) employed observational cross-sectional designs using surveys or interviews to collect data. Six of these (Bhullar et al., 2012; DiCicco-Bloom & Romero, 2012; Marchica & Derevensky, 2016; Richard, Paskus, et al., 2019; Sansanwal et al., 2018; Shead et al., 2014) employed multi-wave cross-sectional designs, four of which (Marchica & Derevensky, 2016; Richard, Paskus, et al., 2019; Sansanwal et al., 2018; Shead et al., 2014) used NCAA survey data.

#### *Gambling and athletic concepts measured*

Table 3 displays the gambling and athletic concepts measured by each study. We coded whether studies measured gambling participation, gambling problems, or other gambling concepts. All studies measured either participation or problems. Thirty-eight studies (84%) measured gambling participation, and 38 (84%) measured gambling problems. Additionally, 15 studies (33%) measured other gambling concepts. The most common of these other concepts were motivations to gamble, attitudes

**Table 2.** Studies included in scoping review.

Study ID	Study
1	Ariyabuddhipongs & Sakolnakorn (2014). Peer pressure and Thai amateur golfers' gambling on their games: The mediating effect of golf self-efficacy. <i>Journal of Gambling Studies</i> , 30(3), 685–696.
2	Bacon, V. L., & Russell, P. J. (2004). Addiction and the college athlete: The multiple addictive behaviors (MABQ) questionnaire with college athletes. <i>The Sport Journal</i> , 7(2), 1–7.
3	Bhullar et al. (2012). The significance of gender and ethnicity in collegiate gambling and drinking. <i>Addictive Disorders &amp; Their Treatment</i> , 11(3), 154–164.
4	Butts, F. (2006). A study of gambling activity in a NCAA Division II Institution. <i>The Sport Journal</i> , 9(4).
5	Caldeira et al. (2017). Risk factors for gambling and substance use among recent college students. <i>Drug and Alcohol Dependence</i> , 179, 280–290.
6	Cross et al. (1998). Student-athletes and gambling: An analysis of attitudes toward risk-taking. <i>Journal of Gambling Studies</i> , 14(4), 431–439.
7	Curry, T. J., & Jiobu, R. M. (1995). Do motives matter? Modeling gambling on sports among athletes. <i>Sociology of Sport Journal</i> , 12, 21–35.
8	DiCicco-Bloom and Romero (2012). Poker, sports betting, and less popular alternatives: Status, friendship networks, and male adolescent gambling. <i>Youth &amp; Society</i> , 44(1), 141–170.
9	Ellenbogen et al. (2008). Gambling behavior among college student-athletes. <i>Journal of Applied Sport Psychology</i> , 20(3), 349–362.
10	Engwall et al. (2004). Gambling and other risk behaviors on university campuses. <i>Journal of American College Health</i> , 52(6), 245–255.
11	Escario and Wilkinson (2020). Exploring predictors of online gambling in a nationally representative sample of Spanish adolescents. <i>Computers in Human Behavior</i> , 102, 287–292.
12	Gavriel-Fried et al. (2015). The link between competitive sports and gambling behaviors among youths. <i>The American Journal on Addictions</i> , 24(3), 200–202.
13	Geisner et al. (2012). Differences between athletes and non-athletes in risk and health behaviors in graduating high school seniors. <i>Journal of Child &amp; Adolescent Substance Abuse</i> , 21(2), 156–166.
14	Grall-Bronnec, M., Caillon, J., Humeau, E., Perrot, B., Remaud, M., Guilleux, A., . . . Bouju, G. (2016). Gambling among European professional athletes Prevalence and associated factors. <i>Journal of Addictive Diseases</i> , 35(4), 278–290.
15	Håkansson et al. (2020). Psychological distress and problem gambling in elite athletes during COVID-19 restrictions – A web survey in top leagues of three sports during the pandemic. <i>Int J Environ Res Public Health</i> , 17(18).
16	Håkansson et al. (2018). Problem gambling and gaming in elite athletes. <i>Addictive Behaviors Reports</i> , 8, 79–84.
17	Hraba et al. (1990). Lottery play and problem gambling. <i>Journal of Gambling Studies</i> , 6(4), 355–377.
18	Huang et al. (2010). Sexual risk-taking behaviors, gambling, and heavy drinking among US college athletes. <i>Archives of Sexual Behavior</i> , 39(3), 706–713.
19	Huang et al. (2011). DSM-based problem gambling: Increasing the odds of heavy drinking in a national sample of US college athletes? <i>Journal of Psychiatric Research</i> , 45(3), 302–308.
20	Huang et al. (2007a). Gambling and health risk behaviors among US college student-athletes: Findings from a national study. <i>Journal of Adolescent Health</i> , 40(5), 390–397.
21	Huang et al. (2007b). A national study on gambling among US college student-athletes. <i>Journal of American College Health</i> , 56(2), 93–99.
22	Jensen, S. N., Ivarsson, A., Fallby, J., & Elbe, A.-M. (2019). Gambling behaviors among Danish and Swedish elite football players. <i>Journal of Clinical Sport Psychology</i> , 13(1), 95–102.
23	Jones, C. M., & Noël, B. (2021). Skin in the game – Erroneous beliefs and emotional involvement as correlates of athletes' sports betting behavior and problems. <i>Journal of Behavioral Addictions</i> , 10(3), 412–421.
24	Kerber, C. S. (2005). Problem and pathological gambling among college athletes. <i>Annals of Clinical Psychiatry</i> , 17(4), 243–247.
25	Lim, M. S. M., Bowden-Jones, H., Salinas, M., Price, J., Goodwin, G. M., Geddes, J., & Rogers, R. D. (2017). The experience of gambling problems in British professional footballers: A preliminary qualitative study. <i>Addiction Research &amp; Theory</i> , 25(2), 129–138.
26	Marchica and Derevensky (2016). Fantasy sports: A growing concern among college student-athletes. <i>International Journal of Mental Health and Addiction</i> , 14(5), 635–645.
27	Martin, R. J., Nelson, S. E., & Gallucci, A. R. (2016). Game on: Past year gambling, gambling-related problems, and fantasy sports gambling among college athletes and non-athletes. <i>Journal of Gambling Studies</i> , 32(2), 567–579.
28	Molinaro et al. (2018). Prevalence of youth gambling and potential influence of substance use and other risk factors throughout 33 European countries: First results from the 2015 ESPAD study. <i>Addiction</i> , 113(10), 1862–1873.

*(Continued)*

**Table 2.** (Continued).

Study ID	Study
29	Moore and Ohtsuka (2000). The structure of young people's leisure and their gambling behavior. <i>Behaviour Change</i> , 17(3), 167–177.
30	Moriconi and de Cima (2020). Betting practices among players in Portuguese championships: From cultural to illegal behaviors. <i>Journal of Gambling Studies</i> , 36(1), 161–181.
31	Nelson et al. (2007). Sports betting and other gambling in athletes, fans, and other college students. <i>Res Q Exerc Sport</i> , 78(4), 271–283.
32	Purcell et al. (2020). Rates and correlates of mental health symptoms in currently competing elite athletes from the Australian National High-Performance Sports System. <i>Sports Med</i> , 50(9), 1683–1694.
33	Richard, Martin-Storey, et al. (2019). Variations in gambling disorder symptomatology across sexual identity among college student-athletes. <i>Journal of Gambling Studies</i> , 35(4), 1303–1316.
34	Richard, Paskus, et al. (2019). Trends in gambling behavior among college student-athletes: A comparison of 2004, 2008, 2012 and 2016 NCAA survey data. <i>Journal of Gambling Issues</i> , 41, 73–100.
35	Rockey et al. (2002). Gambling by college athletes: An association between problem gambling and athletes. <i>Journal of Gambling Issues</i> , 7(7).
36	Sansanwal et al. (2018). Trends in gambling behavior among NCAA college student-athletes: A comparison of 2004, 2008 and 2012 NCAA survey data. <i>International Journal of Sports and Exercise Medicine</i> , 4(3).
37	Shead et al. (2014). Trends in gambling behavior among college student-athletes: A comparison of 2004 and 2008 NCAA survey data. <i>Journal of Gambling Issues</i> , 29, 1–21.
38	St-Pierre et al. (2014). Predicting gambling problems from gambling outcome expectancies in college student-athletes. <i>Journal of Gambling Studies</i> , 30(1), 47–60.
39	Stuhldreher et al. (2007). Gambling as an emerging health problem on campus. <i>Journal of American College Health</i> , 56(1), 75–83.
40	Vinberg et al. (2020). Gambling and gambling problem among elite athletes and their professional coaches: findings from a Swedish total population survey of participants in four sports. <i>International Gambling Studies</i> , 20(2), 262–281.
41	Vinberg, M., Wetterborg, D., & Enebrink, P. (2021). Gambling at Work: A Qualitative Study of Swedish Elite Athletes, Coaches, and Managers. <i>Journal of Gambling Studies</i> .
42	Weinstock et al. (2007). Gambling behavior of student-athletes and a student cohort: What are the odds? <i>Journal of Gambling Studies</i> , 23(1), 13–24.
43	Weiss (2010). Cross-addiction on campus: More problems for student-athletes. <i>Substance Use &amp; Misuse</i> , 45(10), 1525–1541.
44	Weiss and Loubier (2010). Gambling habits of athletes and nonathletes classified as disordered gamblers. <i>The Journal of Psychology: Interdisciplinary and Applied</i> , 144(6), 507–521.
45	Weiss and Loubier (2008). Gambling behaviors of former athletes: The delayed competitive effect. <i>UNLV Gaming Research &amp; Review Journal</i> , 12(1–2), 53–60.

toward gambling, knowledge of NCAA rules about gambling, and betting on one's own sport. All gambling concepts were measured using self-report surveys and/or interviews.

We coded athletic concepts for each study in terms of the athletic populations they sampled, as well as any athletic concepts they measured. Twenty-seven studies (60%) sampled college varsity athletes (with 11 of those using NCAA survey data), 11 (24%) sampled elite athletes, nine (20%) sampled college club/intramural athletes, six (13%) sampled high school athletes, five (11%) sampled competitive youth athletes, and three (7%) sampled adult recreational athletes. Additionally, 16 studies measured other athletic concepts. The most common of these were sport type and sport level/division (e.g. Division I vs. Division III college athletics).

### **Analytic approach**

Twenty-six studies (58%) included at least one statistical test that assessed differences in gambling by athletic concept. Nineteen of these compared gambling among athletes to non-athletes while seven only tested the relationship between sport type or other athletic concepts and gambling. Twenty-two of the studies that included

**Table 3.** Evidence Map Using COIS Study IDs.

Athletic Concept	Gambling Concept Measured		
	Gambling Participation (e.g. frequency, money spent, type of gambling activity, age of onset gambling) regardless of problem gambling	Presence/severity of problem gambling (includes gambling-related consequences, age of onset of problem gambling)	Other (Specify) Gambling Concept: (e.g. gambling exposure, Daily Fantasy Sports participation, knowledge of gambling rules)
High School Athletics	<b>8, 12, 13, 28, 29, 43</b>	<b>8, 12, 29, 43</b>	8
Private youth competitive (e.g. club, olympic development)	<b>8, 12, 28, 29</b>	<b>8, 12, 22, 29</b>	8
Collegiate Athletics (varsity)	<b>3, 4, 5, 6, 7, 9, 10, 20, 21, 24, 26, 27, 31, 33, 34, 35, 36, 37, 38, 39, 42, 43, 45</b>	<b>2, 3, 4, 9, 10, 18, 19, 20, 21, 24, 26, 27, 31, 33, 34, 35, 36, 37, 38, 39, 42, 43, 44, 45</b>	4, 6, 9, 20, 24, <b>34, 36, 38</b>
Collegiate Athletics (Club/Intramural)	<b>3, 5, 7, 10, 24, 27, 31, 39</b>	<b>3, 10, 24, 27, 31, 39, 44</b>	24
Adult Recreational Athletics (i.e. competitive activities where the primary purpose of the activity is participation, with the related goals of improved physical fitness, fun, and social involvement often prominent)	<b>1, 43, 45</b>	<b>43, 45</b>	
Elite Athletics	<b>14, 16, 25, 30, 40, 41, 43, 45</b>	<b>14, 15, 16, 22, 25, 30, 32, 40, 41, 43, 45</b>	14, 25, 30, 40, 41
Other Athletic Concept: (e.g. type of sport, sports motives)	<b>6, 7, 9, 11, 14, 16, 17, 20, 23, 34, 36, 37, 40, 43</b>	<b>9, 14, 15, 16, 17, 20, 23, 32, 34, 36, 37, 40, 43</b>	6, 9, 14, 20, 23, <b>34, 36, 40</b>

Note: Each study was assigned a number and numbers are repeated because many studies measured multiple concepts. Study numbers in bold indicate the authors conducted a statistical test of significance between the gambling and athletic participation concept.

a statistical test tested for differences in gambling participation, 19 tested for differences in gambling problems, and one tested for differences in gambling knowledge and attitudes. Table 3 displays the distribution of statistical tests across athletic and gambling concepts; studies that included statistical tests are bolded in the table. Among the 26 studies that tested the relationship between athletics and gambling, 11 conducted only bivariate tests and 15 conducted multivariable tests, most commonly multiple regression.

Twenty-two of these 26 studies included either moderators of the association between athletics and gambling or control variables in their models. The most common of these was gender, which was included both as a variable in multivariable models in 14 studies (with the interaction between gender and athlete status tested in 9 of these studies), and to divide the sample in seven studies that included only bivariate analyses (e.g. by running Chi-Square analyses separately for female and male participants). Other moderator and control variables included age, education, country of residence, ethnicity, race, socioeconomic status/income, other personality traits, exposure to gambling, religion, marital status, alcohol use, other leisure activities, GPA, family gambling history, peer behavior, cyberbullying, mental health, Greek involvement, truancy, and family status. Only one study included mediators. That study examined whether substance use served

as a mediator between risk factors (including athletic involvement) and gambling frequency (Caldeira et al., 2017).

### **Temporal trends**

Publications about athletes and gambling have increased over time, with that increase initially driven by papers about college athlete populations. Papers about other athlete populations began to increase about five years after college athlete papers, and, despite being less frequent overall, represent 64% of the papers published in the past eight years. Papers that included non-athlete comparison samples increased at approximately the same rate as those that did not include comparison samples across time until eight years ago. However, in the past eight years, the number of papers without comparison samples has outnumbered the number of papers with comparison samples almost three to one.

### **Study findings**

In the sections that follow, we describe the study findings in relation to the types of tests conducted – no tests, bivariate tests, and multivariable tests – and whether the study tested the interaction between gender and athletic status on gambling. Table 4 includes a summary of those findings.

*No tests.* Nineteen studies (42%) included no statistical tests of the association between athletic status and gambling. Most of these investigated the prevalence of both gambling involvement and gambling problems within samples of athletes. As noted in the table, just under half of these examined differences in gambling and gambling problems among male and female athletes. Rates were largely higher among men than women in various studies (e.g. 3.1% of male athletes experienced gambling problems compared to 0.3% of female athletes: Huang et al., 2007b).

*Bivariate tests.* Eleven studies (25%) included a bivariate analysis of the association between athletic status and gambling. Of these eleven studies, six (Bhullar et al., 2012; Engwall et al., 2004; Gavriel-Fried et al., 2015; Purcell et al., 2020; Rockey et al., 2002; Stuhldreher et al., 2007) compared gambling involvement (4 of the 6 studies) and/or gambling problems (5 of the 6 studies) between athletes and non-athletes while five (Ellenbogen et al., 2008; Hakansson et al., 2020; Håkansson et al., 2018; Richard, Paskus, et al., 2019; Vinberg et al., 2020) examined gambling involvement and/or gambling problems based on a different definition of athletic status (e.g. type of sport, NCAA Division level). Among the four studies comparing gambling involvement between athletes and non-athletes, two studies (Gavriel-Fried et al., 2015; Stuhldreher et al., 2007) found that athletes had greater gambling involvement than others, while two studies (Bhullar et al., 2012; Rockey et al., 2002) found no relationship between being an athlete and gambling involvement. Findings were similar for the five studies that compared gambling problems between athletes and non-athletes: two studies (Engwall et al., 2004; Stuhldreher et al., 2007) found a positive relationship between being an athlete and experiencing gambling problems, two studies (Bhullar et al., 2012; Rockey et al., 2002) found no relationship, and one study (Purcell et al., 2020) found a negative relationship.



**Table 4.** Categories and Subcategories of Charted Studies.

Findings	# of Studies	%	% w/in Category
<b>No statistical test of the association between gambling and athletic status</b>	<b>19</b>	<b>42.2</b>	
Prevalence of gambling among athletes	15	33.3	78.9
Prevalence of gambling problems among athletes	17	37.8	89.5
Compared gender differences in gambling among athletes	9	20	47.4
Compared gender differences in gambling problems among athletes	11	24.4	57.9
<b>Bivariate test of the association between gambling and athletic status</b>	<b>11</b>	<b>24.4</b>	
Positive relationship between being an athlete and gambling	2	4.4	18.2
Positive relationship between being an athlete and gambling problems	2	4.4	18.2
No relationship between being an athlete and gambling	2	4.4	18.2
No relationship between being an athlete and gambling problems	2	4.4	18.2
Negative relationship between being an athlete and gambling problems	1	2.2	9.1
Only tested relationship between sport type or level and gambling or gambling problems	5	11.1	45.5
<b>Bivariate test of the association between gambling and athletic status, run separately by gender</b>	<b>7</b>	<b>15.6</b>	
Positive association between being an athlete and gambling, but only for males	0	0	0
No gender by athlete status interaction on association between being an athlete and gambling	2	4.4	28.6
Positive association between being an athlete and gambling problems, but only for males	2	4.4	28.6
Positive association between being an athlete and gambling problems, but only for females	1	2.2	14.3
No gender by athlete status interaction on association between being an athlete and gambling problems	1	2.2	14.3
Only tested gender interaction with sport type or level on gambling or gambling problems	3	6.7	42.9
<b>Multivariable test of association between gambling and athletic status</b>	<b>15</b>	<b>33.3</b>	
Positive relationship between being an athlete and gambling, when controlling for other factors	5	11.1	33.3
No relationship between being an athlete and gambling, when controlling for other factors	5	11.1	33.3
Positive relationship between being an athlete and gambling problems, when controlling for other factors	1	2.2	6.7
No association between being an athlete and gambling problems, when controlling for other factors	7	15.6	46.7
Only tested relationship between sport type or level and gambling or gambling problems	2	4.4	13.3
<b>Multivariable test of the interaction between gender and athletic status in relation to gambling</b>	<b>9</b>	<b>20</b>	
Gender by athlete status interaction – association between being an athlete and gambling, but only for males	3	6.7	33.3
No gender by athlete status interaction on association between being an athlete and gambling	3	6.7	33.3
Gender by athlete status interaction – association between being an athlete and gambling problems, but only for males	1	2.2	11.1
No gender by athlete status interaction on association between being an athlete and gambling problems	4	8.9	44.4



Seven (64%) of the eleven studies ran analyses separately by gender, and four of those examined whether differences between athletes and non-athletes in gambling involvement (2 of the 4 studies) and/or problems (4 of the 4 studies) were affected by gender. The two studies (Gavriel-Fried et al., 2015; Stuhldreher et al., 2007) that examined this relationship for gambling involvement found that there was no gender by athlete status interaction when looking at the association between being an athlete and gambling involvement. Among the four studies that examined the gender by athlete interaction on gambling problems, two studies (Engwall et al., 2004; Stuhldreher et al., 2007) found no interaction, one study (Gavriel-Fried et al., 2015) found that the relationship between being an athlete and experiencing gambling problems only occurred for males, and one study (Rockey et al., 2002) found that the relationship between being an athlete and experiencing gambling problems only occurred for females.

*Multivariable tests.* Fifteen studies (33%) included a multivariable analysis of the association between athletic status and gambling. Of these fifteen studies, thirteen compared gambling involvement (10 of the 13 studies) and/or problems (8 of the 13 studies) between athletes and non-athletes while four studies examined gambling involvement and/or problems using other athletic status concepts (i.e. sport type, sport motives, passive participation, former athlete status). Among the ten studies comparing gambling involvement between athletes and non-athletes while controlling for other factors, five studies (Caldeira et al., 2017; DiCicco-Bloom & Romero, 2012; Escario & Wilkinson, 2020; Molinaro et al., 2018; Weinstock et al., 2007) found that athletes had greater gambling involvement than others, while five studies (Geisner et al., 2012; Hraba et al., 1990; Martin et al., 2015; Moore & Ohtsuka, 2000; Nelson et al., 2007) found no relationship between being an athlete and gambling involvement. Among the eight studies that examined gambling problems among athletes and non-athletes while controlling for other factors, only one (Weiss, 2010) found a relationship between being an athlete and experiencing gambling problems; the other seven (Hraba et al., 1990; Martin et al., 2015; Moore & Ohtsuka, 2000; Nelson et al., 2007; Weinstock et al., 2007; Weiss & Loubier, 2008, 2010) found no relationship.

Nine of the fifteen multivariable studies examined the interaction between gender and athletic status (athlete vs. non-athlete) on gambling involvement (6 of the 9 studies) and/or gambling problems (5 of the 9 studies). Among the six multivariable studies that examined the gender by athlete interaction on gambling involvement, three studies (Escario & Wilkinson, 2020; Geisner et al., 2012; Weinstock et al., 2007) found no interaction, and three studies (Martin et al., 2015; Moore & Ohtsuka, 2000; Nelson et al., 2007) found that the relationship between being an athlete and gambling involvement only occurred for males. Among the five multivariable studies that examined the gender by athlete interaction on gambling problems, four studies (Martin et al., 2015; Moore & Ohtsuka, 2000; Weiss & Loubier, 2008, 2010) found no interaction and one study (Weiss, 2010) found that the relationship between being an athlete and experiencing gambling problems only occurred for males.

### **Findings from NCAA reports**

As discussed, 11 (24%) of the included studies relied on data from the NCAA-sponsored national surveys on collegiate gambling and associated health risks (Ellenbogen et al., 2008;

Huang et al., 2007a, 2007b, 2010, 2011; Marchica & Derevensky, 2016; Richard, Martin-Storey, et al., 2019; Richard, Paskus, et al., 2019; Sansanwal et al., 2018; Shead et al., 2014; St-Pierre et al., 2014). These data are collected every four years and represent a nationally representative sample of NCAA student-athletes, inclusive of all sports and divisions. Overall, these studies indicated that student-athlete gambling practices vary based on a number of factors. Similar to the general population, gambling involvement and gambling problems were more prevalent among male student-athletes than female student-athletes. The specific sport also appears to moderate the relationship with athletes in baseball, ice hockey, lacrosse, and particularly golf, showing higher rates of gambling participation and problems compared to other athletes. Several of these studies found connections between problem gambling severity and other risky behaviors like unprotected sex, and high-risk drinking. Four studies (Marchica & Derevensky, 2016; Richard, Paskus, et al., 2019; Sansanwal et al., 2018; Shead et al., 2014) compared results from multiple surveys among NCAA athletes from 2004 until 2016. These studies found a decrease in gambling behavior among student-athletes over time. They also showed an increase in knowledge of NCAA gambling restrictions and increasingly negative attitudes toward gambling among student-athletes across time, which might have been a contributing factor in the observed decrease in gambling behavior in this population. Unfortunately, despite the strengths of the large randomized sample design of these surveys, none of these studies included a comparative sample of non-athletes, precluding any potential claims that NCAA student-athletes are at increased risk for gambling problems compared to their non-athlete peers.

## Discussion

This review concerned four main questions; (1) what is known from the literature about the associations between gambling and participating in athletics; (2) what is known about the associations between athletic participation and gambling-related problems; (3) what is known about the potential moderators and mediators of the associations between gambling and participating in athletics; and (4) what is known about the relationship between different types of athletic participation (e.g. recreational, pre-collegiate, collegiate, professional) and gambling. We also sought to identify whether a formal meta-analysis was feasible based on the current field of literature. The discussion below addresses each of these and provides general recommendations and suggestions. These recommendations are meant to guide both the teams doing research in this area to advance the methodological rigor of this work and population sampled, as well as those crafting policy in the area to better understand what we do and do not know about the risks gambling and its expansion pose to athletes.

### *Relationship between participation in athletics and gambling*

To answer the first of these questions, several studies identified gambling as a relatively common pastime among athletes, even within leagues that prohibit athletes from gambling. This is particularly alarming considering the potential consequences for this group related to infractions of league policies, such as in the case of Calvin Ridley. Similarly, multiple studies identified betting on one's own games as a rare but present practice (e.g. ~3% of athletes admit to gambling on their own games: Cross et al., 1998). Athletes also

showed a propensity for certain types of gambling, particularly card and other skill-based games. Based on the findings of the NCAA-sponsored surveys, reducing gambling at the collegiate level may include increased education efforts regarding the risks of gambling for athletes and NCAA restrictions on gambling. Division I players reported less gambling than Division II and III players while also reporting a higher awareness of the NCAA gambling restrictions and regulations, suggesting that this awareness may serve as an important intervention target.

Studies that examined the relationship between athletic status and gambling involvement using non-athlete control groups found mixed results. Across bivariate and multi-variable studies, half found no relationship, and half found a positive relationship. It is important to note that no studies found a negative relationship. This suggests that there might be a relationship between being an athlete and being involved with gambling, but that the relationship either is not as strong as previously thought, or is dependent on other variables and moderators that have not been clearly identified.

### ***Relationship between participation in athletics and gambling problems***

Previous literature reviews concluded that athletes experience gambling problems at an elevated rate; however, our study indicates that the field's findings are more equivocal. Several of the studies that lacked comparison samples identified a high prevalence of both gambling participation and problems among athletes, suggesting that athletes are an at-risk group. However, similar to the abovementioned findings about athletes' gambling involvement, some studies found a positive relationship between being an athlete and experiencing gambling problems, but the majority of studies found no relationship. Only one study found a negative relationship. It is possible that a positive relationship between being an athlete and being at-risk for gambling problems only manifests at certain levels of play or when other variables are present. Because experiencing gambling problems is a relatively rare phenomenon in the general population, it is possible that these studies were under-powered to detect such a relationship.

### ***Moderators and mediators of the athlete/gambling relationship***

Very few studies in our analysis directly investigated any moderators of the relationship between athlete status and gambling, other than gender. Many studies included control variables when investigating this relationship, but few proposed any specific theories or hypotheses related to moderators, and other than gender, interactions were rarely tested. Analyses investigating mediators were even more rare. Only one study in our analysis included a mediational pathway between athlete status and gambling, examining whether substance-using behaviors mediated that relationship (Caldeira et al., 2017). In that study, self-reported athletic involvement among college students directly predicted both gambling involvement and alcohol use, with no indirect relationships between the two (i.e. alcohol use mediating the relationship between athletic involvement and gambling or vice versa). A few other substance use variables partially mediated the relationship between athletic involvement and gambling, but these indirect pathways were not strong.

Among those studies that did investigate gender as a moderator, findings were again mixed. Just over half of those studies found no evidence of an interaction for gambling involvement, and more than 60% found no interaction for gambling problems. For those studies that did find a significant interaction, all but one study found that the relationship between being an athlete and gambling involvement or gambling problems was accounted for by male athletes. These findings suggest that more work is needed to understand the causes of this interaction where it exists. Some of the studies in this review found unique risk factors for male and female athletes. Whereas male athletes showed more substance use behavior, female athletes were more likely to experience disorders related to eating and exercise. Furthermore, one study found that gambling problems were positively correlated with risky sexual practices among female athletes but negatively correlated among male athletes. It is possible that gender differences in the relationship between participation in athletics and gambling participation and problems mirror other gender differences related to gambling. For example, while males are more likely to gamble and experience problems, females who do encounter gambling problems often have more severe psychiatric distress and different risk factors, exhibiting a unique risk profile (Diez et al., 2014; Hakansson & Widinghoff, 2020; Moon et al., 2016). It is also possible that the culture surrounding different sports and different sports teams varies considerably between male and female sports teams, affecting the context that might encourage or discourage unhealthy gambling.

### ***Gambling at different levels of sport***

Overall, there was not enough evidence provided in the reviewed studies to draw any clear conclusions about differences between sports and sports levels on gambling involvement and problems. Although several studies found that the relationship between gambling and participation in athletics varied between sports, these differences were not explored in detail. Several studies identified golfers as particularly involved in gambling. Other sports that were especially involved were hockey, lacrosse, and basketball. It is unclear whether certain aspects of these sports such as physicality or competitiveness are the primary mechanism for this increased involvement or a culture within the sport that has developed over time (e.g. betting on practice rounds in golf), or, as another research group noted, whether it is simply being in a high-profile sport. Future studies must make efforts to confirm these trends and identify mediational pathways that better explain these relationships.

More research is needed to understand the relationship between athletics and gambling at different levels of play. Although the NCAA studies had rigorous designs and represent some of the most robust data available, collegiate athletes were overrepresented in the studies in our review. In fact, higher levels of play were overrepresented as a whole. The two most studied levels of play were varsity college and elite athletes, the two highest levels we considered for our study. However, the majority of these studies did not compare athletes at these higher levels to non-athlete controls. Intramural college athletes were the third most studied level, likely due to the convenience of sampling college students. Fewer studies focused on youth despite the majority of athletes playing at this level. Only three studies examined adult recreational leagues, which is surprising considering a quarter of adults claim to continue to play sports (Harvard T.H. Chan School of Public Health, Robert Wood Johnson Foundation, & National Public Radio, 2015). Research at this level might also be important because there is also some evidence of

a delayed competitive effect. More specifically, one study identified former athletes as more involved in gambling and more likely to experience problems compared to both current and non-athletes. It is possible that many adult recreation athletes fit this profile, having played more competitively at younger ages.

Because the vast majority of the studies in this review were cross-sectional and did not assess gambling or gambling problems at multiple time points, it is unclear how this relationship changes as individuals progress through different levels of play. It is possible that lower levels of sport (i.e. youth/high school) expose individuals to gambling and then higher levels (i.e. college/elite) reinforce gambling behaviors, though this cannot be determined through the current literature.

### **Future directions**

At this point, due to the lack of comparison samples in our review and the heterogeneity of studies, we do not believe a meta-analysis is merited. Valentine et al. (2010) argue that when the field is small with disparate methodology, such as in our case, meta-analytic approaches are ‘untenable’. If more of our included studies contained comparison samples, perhaps a meta-analysis would be more appropriate. However, with the current state of the literature, it is instead more pertinent to explore the gaps in the literature. For example, the quadrennial NCAA report would greatly benefit from incorporating non-athlete comparison samples. This addition would allow for rigorous analysis of the gambling behavior and risks of athletes compared to their non-athlete collegiate peers. Additionally, the field needs more studies that apply rigorous sampling designs (similar to that used by the NCAA surveys) coupled with non-athlete control groups to the study of other athlete groups such as professional, Olympic, and youth levels of sport. Future research should also incorporate more longitudinal analyses to understand how gambling involvement and problems develop among athletes and, for high-level athletes, after retirement. These same designs could examine potential moderators and mediators of that relationship in more detail.

### **Limitations**

One concern for this research is that a large group of included studies (24%) analyzed data from the same series of NCAA reports. Although these are well-designed and wide-reaching surveys, they focus on a specific group of athletes, and some of the reviewed studies had overlapping samples. Also, we used an agreed-upon charting process to code studies that may have differed from how other research groups would have coded studies. There might have been other important variables that were not captured by our coding scheme. Other limitations that commonly apply to scoping reviews are present in our study as well. Specifically, we limited our review to peer-reviewed studies, which might have introduced bias (Rosenthal, 1979), and our key words used for identification might not have been exhaustive, potentially limiting the number of studies we were able to identify.

### **Conclusion**

Overall, this scoping review identified several notable trends in the literature on gambling among athletes. The field has grown considerably over the past decade,

and many studies include multivariable analyses. However, these advances are largely offset by the limited number of studies that employ non-athlete comparison samples. This lack of comparison samples makes definitive statements regarding the gambling behaviors of athletes dubious at best. Despite this, the evidence that does exist suggests that gambling is related to other risky behaviors among athletes, and that athletes gamble – in spite of considerable potential sanctions for many of them. The mixed findings identified throughout this review suggest that the relationship between gambling and athletic participation continues to be an important topic to investigate and that better designs are needed to understand the extent of these relationships, their mechanisms, and the settings within which they occur.

## Notes

1. We were not able to include ‘gaming’ as a search term for the British Journal of Sports Medicine because that journal’s search function only allowed ‘gaming’ to be searched as an isolated term, instead searching for every derivative, including ‘game’. This resulted in too many results because of the overlap of game and sport.
2. We made two transparent changes to our pre-registration ([https://osf.io/nmfx/?view\\_only=c1a98c5e54ef4601bbac3253cf4d73f3](https://osf.io/nmfx/?view_only=c1a98c5e54ef4601bbac3253cf4d73f3)) that included adding these training rounds and changing the wording of some data items based on these training rounds.

## Disclosure statement

The Division on Addiction currently receives funding from DraftKings, Inc., a sports betting and gaming company; Entain PLC, a sports betting and gambling company; EPIC Risk Management; Foundation for Advancing Alcohol Responsibility, a not-for-profit organization founded and funded by a group of distillers; International Center for Responsible Gambling (ICRG); Massachusetts Department of Public Health, Office of Problem Gambling Services via Health Resources in Action; National Academy of Medicine; National Institutes of Health (NIH) via The Healing Lodge of the Seven Nations. During the past five years, Sarah E. Nelson has received honoraria from ICRG, GambleAware, NIH, and the Responsible Gaming Association of New Mexico, as well as royalty fees from the American Psychological Association (APA), and the Harvard Medical School Department of Continuing Education (HMS-DCE). During the past five years, Debi A. LaPlante has received honoraria from ICRG and the National Collegiate Athletic Association, as well as royalty fees from APA and HMS-DCE. Dr. LaPlante is a non-paid member of the New Hampshire Council for Responsible Gambling and the Conscious Gaming advisory board. John M. Slabczynski and Taylor G. Lee have no additional funding to declare.

## Funding

This manuscript was supported by a research contract between the Division on Addiction and EPIC Risk Management. EPIC is an organization based in the United Kingdom that provides gambling harm prevention and education services to sports organizations and other groups across the world. EPIC had no involvement with the design of this review, the data collection/analysis, or development of this manuscript.



## Notes on contributors

**Sarah E. Nelson** is the Director for Research at the Division on Addiction, Cambridge Health Alliance, a Harvard Medical School teaching hospital, as well as an Assistant Professor at Harvard Medical School. Her research includes studies of internet gambling, sports gambling, and daily fantasy sports, as well as examination of early online play patterns to detect gamblers at risk for gambling problems.

**John M. Slabczynski** is a Research Coordinator at the Division on Addiction, Cambridge Health Alliance, a Harvard Medical School teaching hospital. He graduated with a Bachelor of Arts Dual-Degree in Psychology and Sociology from the University of Massachusetts Lowell.

**Taylor G. Lee** is a Research Coordinator at the Division on Addiction, Cambridge Health Alliance, a Harvard Medical School teaching hospital. She graduated with a Bachelor of Arts in Psychology from Boston University.

**Debi A. LaPlante** is the Director of the Division on Addiction, Cambridge Health Alliance, a Harvard Medical School teaching hospital, as well as an Associate Professor at Harvard Medical School. Dr. LaPlante is interested in the epidemiology of gambling and gambling-related problems, and addiction studies.

## References

- Ariyabuddhiphongs, & Sakolnakorn. (2014). Peer pressure and Thai amateur golfers' gambling on their games: The mediating effect of golf self-efficacy. *Journal of Gambling Studies*, 30(3), 685–696.
- Bacon, V. L., & Russell, P. J. (2004). Addiction and the college athlete: The multiple addictive behaviors (MABQ) questionnaire with college athletes. *The Sport Journal*, 7(2), 1–7.
- Bhullar, N., Simons, L., & Joshi, K. (2012). The significance of gender and ethnicity in collegiate gambling and drinking. *Addictive Disorders & Their Treatment*, 11(3), 154–164. <https://doi.org/10.1097/ADT.0b013e31822f9ca9>
- Brisola, S. M. B., de Mello, E., Gallinaro, J. G., Gil, F., Sampaio, J. B., Marin, M. C. D., de Andrade, A. G. Castaldelli, M. J. M. (2016). Prevalence and correlates of cannabis use among athletes—A systematic review. *The American Journal on Addictions*, 25(7), 518–528. <https://doi.org/10.1111/ajad.12425>
- Butts, F. (2006). A study of gambling activity in a NCAA Division II Institution. *The Sport Journal*, 9(4).
- Calado, F., & Griffiths, M. D. (2016). Problem gambling worldwide: An update and systematic review of empirical research (2000–2015). *Journal of Behavioral Addictions*, 5(4), 592–613. <https://doi.org/10.1556/2006.5.2016.073>
- Caldeira, K. M., Arria, A. M., O'Grady, K. E., Vincent, K. B., Robertson, C., & Welsh, C. J. (2017). Risk factors for gambling and substance use among recent college students. *Drug and Alcohol Dependence*, 179, 280–290. <https://doi.org/10.1016/j.drugalcdep.2017.06.024>
- Cross, M. E., Basten, J., Hendrick, E. M., Kristofic, B., & Schaffer, E. J. (1998). Student-athletes and gambling: An analysis of attitudes towards risk-taking. *Journal of Gambling Studies*, 14(4), 431–439. <https://doi.org/10.1023/A:1023081228054>
- Curry, T. J., & Jiobu, R. M. (1995). Do motives matter? Modeling gambling on sports among athletes. *Sociology of Sport Journal*, 12, 21–35.
- Derevensky, J. L., McDuff, D., Reardon, C. L., Hainline, B., Hitchcock, M. E., & Richard, J. (2019). Problem gambling and associated mental health concerns in elite athletes: A narrative review. *British Journal of Sports Medicine*, 53(12), 761–766. <https://doi.org/10.1136/bjsports-2019-100668>
- DiCicco-Bloom, B., & Romero, D. (2012). Poker, sports betting, and less popular alternatives: Status, friendship networks, and male adolescent gambling. *Youth & Society*, 44(1), 141–170. <https://doi.org/10.1177/0044118X10396641>



- Diez, D., Aragay, N., Soms, M., Prat, G., & Casas, M. (2014). Male and female pathological gamblers: Bet in a different way and show different mental disorders. *The Spanish Journal of Psychology*, 17, E101. <https://doi.org/10.1017/sjp.2014.88>
- Eaves, T. (2011). The relationship between spit tobacco and baseball. *Journal of Sport & Social Issues*, 35(4), 437–442. <https://doi.org/10.1177/0193723511429826>
- Ellenbogen, S., Jacobs, D. F., Derevensky, J. L., Gupta, R., & Paskus, T. S. (2008). Gambling behavior among college student-athletes. *Journal of Applied Sport Psychology*, 20(3), 349–362. <https://doi.org/10.1080/10413200802056685>
- Engwall, D., Hunter, R., & Steinberg, M. (2004). Gambling and other risk behaviors on university campuses. *Journal of American College Health*, 52(6), 245–255. <https://doi.org/10.3200/JACH.52.6.245-256>
- Escario, J., & Wilkinson, A. V. (2020). Exploring predictors of online gambling in a nationally representative sample of Spanish adolescents. *Computers in Human Behavior*, 102, 287–292. <https://doi.org/10.1016/j.chb.2019.09.002>
- Esfandiari, A., Broshek, D. K., & Freeman, J. R. (2011). Psychiatric and neuropsychological issues in sports medicine. *Clinics in Sports Medicine*, 30(3), 611–627. <https://doi.org/10.1016/j.csm.2011.03.002>
- Farris, S. B. (2012). Changing public policy and the evolution of Roman civil and criminal law on gambling. *UNLV Gaming Law Journal*, 3(2), 199–219.
- Fong, T. W. (2005). The vulnerable faces of pathological gambling. *Psychiatry (Edgmont)*, 2(4), 34–42.
- Gavriel-Fried, B., Bronstein, I., & Sherspsky, I. (2015). The link between competitive sports and gambling behaviors among youths. *American Journal of Addiction*, 24(3), 200–202. <https://doi.org/10.1111/ajad.12189>
- Geisner, I. M., Grossbard, J., Tollison, S., & Larimer, M. E. (2012). Differences between athletes and non-athletes in risk and health behaviors in graduating high school seniors. *Journal of Child & Adolescent Substance Abuse*, 21(2), 156–166. <https://doi.org/10.1080/1067828X.2012.662433>
- Goma-I-Freixanet, M., Martha, C., & Muro, A. (2012). Does the sensation-seeking trait differ among participants engaged in sports with different levels of physical risk? *Anales de Psicología*, 28(1), 223–232.
- Grall-Bronnec, M., Caillon, J., Humeau, E., Perrot, B., Remaud, M., Guilleux, A., & Bouju, G. (2016). Gambling among European professional athletes Prevalence and associated factors. *Journal of Addictive Diseases*, 35(4), 278–290.
- Hakansson, A., Jonsson, C., & Kentta, G. (2020). Psychological distress and problem gambling in elite athletes during COVID-19 restrictions—a web survey in top leagues of three sports during the pandemic. *International Journal of Environmental Research and Public Health*, 17(18), 6693. <https://doi.org/10.3390/ijerph17186693>
- Håkansson, A., Kenttä, G., & Åkesdotter, C. (2018). Problem gambling and gaming in elite athletes. *Addictive Behaviors Reports*, 8, 79–84. <https://doi.org/10.1016/j.abrep.2018.08.003>
- Hakansson, A., & Widinghoff, C. (2020). Gender differences in problem gamblers in an online gambling setting. *Psychology Research and Behavior Management*, 13, 681–691. <https://doi.org/10.2147/PRBM.S248540>
- Harris, T. S. (2021). The social environment of sport and athletes' doping-related cognitions. *Dissertation Abstracts International: Section B: The Sciences & Engineering*, 82 6-B.
- Harris, N., Newby, J., & Klein, R. G. (2015). Competitiveness facets and sensation seeking as predictors of problem gambling among a sample of university student gamblers. *Journal of Gambling Studies*, 31(2), 385–396. <https://doi.org/10.1007/s10899-013-9431-4>
- Harvard T.H. Chan School of Public Health, Robert Wood Johnson Foundation, & National Public Radio. (2015). *Sports and Health in America*. Retrieved from <https://media.npr.org/documents/2015/june/sportsandhealthpoll.pdf>
- Hraba, J., Mok, W., & Huff, D. (1990). Lottery play and problem gambling. *Journal of Gambling Studies*, 6(4), 355–377. <https://doi.org/10.1007/BF01014590>

- Huang, J.-H., Jacobs, D. F., & Derevensky, J. L. (2010). Sexual risk-taking behaviors, gambling, and heavy drinking among US college athletes. *Archives of Sexual Behavior, 39*(3), 706–713. <https://doi.org/10.1007/s10508-009-9521-7>
- Huang, J.-H., Jacobs, D. F., & Derevensky, J. L. (2011). DSM-based problem gambling: Increasing the odds of heavy drinking in a national sample of US college athletes? *Journal of Psychiatric Research, 45*(3), 302–308. <https://doi.org/10.1016/j.jpsychires.2010.07.001>
- Huang, J.-H., Jacobs, D. F., Derevensky, J. L., Gupta, R., & Paskus, T. S. (2007a). Gambling and health risk behaviors among U.S. college student-athletes: Findings from a national study. *Journal of Adolescent Health, 40*(5), 390–397. <https://doi.org/10.1016/j.jadohealth.2006.11.146>
- Huang, J.-H., Jacobs, D. F., Derevensky, J. L., Gupta, R., & Paskus, T. S. (2007b). A national study on gambling among US college student-athletes. *Journal of American College Health, 56*(2), 93–99. <https://doi.org/10.3200/JACH.56.2.93-100>
- Jensen, S. N., Ivarsson, A., Fallby, J., & Elbe, A.-M. (2019). Gambling behaviors among Danish and Swedish elite football players. *Journal of Clinical Sport Psychology, 13*(1), 95–102.
- Jones, C. M., & Noël, B. (2021). Skin in the game – Erroneous beliefs and emotional involvement as correlates of athletes’ sports betting behavior and problems. *Journal of Behavioral Addictions, 10*(3), 412–421.
- Joy, E., Kussman, A., & Nattiv, A. (2016). 2016 update on eating disorders in athletes: A comprehensive narrative review with a focus on clinical assessment and management. *British Journal of Sports Medicine, 50*(3), 154–162. <https://doi.org/10.1136/bjsports-2015-095735>
- Kerber, C. S. (2005). Problem and pathological gambling among college athletes. *Annals of Clinical Psychiatry, 17*(4), 243–247.
- Lim, M. S. M., Bowden Jones, H., Salinas, M., Price, J., Goodwin, G. M., Geddes, J., & Rogers, R. D. (2017). The experience of gambling problems in British professional footballers: A preliminary qualitative study. *Addiction Research & Theory, 25*(2), 129–138.
- Lindsay, S., Thomas, S., Lewis, S., Westberg, K., Moodie, R., & Jones, S. (2013). Eat, drink and gamble: Marketing messages about ‘risky’ products in an Australian major sporting series. *BMC Public Health, 13*(1), 719. <https://doi.org/10.1186/1471-2458-13-719>
- Marchica, L., & Derevensky, J. (2016). Fantasy sports: A growing concern among college student-athletes. *International Journal of Mental Health and Addiction, 14*(5), 635–645. <https://doi.org/10.1007/s11469-015-9610-x>
- Martens, M. P., Dams O’Connor, K., & Beck, N. C. (2006). A systematic review of college student-athlete drinking: Prevalence rates, sport-related factors, and interventions. *Journal of Substance Abuse Treatment, 31*(3), 305–316. <https://doi.org/10.1016/j.jsat.2006.05.004>
- Martin, R. J., Nelson, S. E., & Gallucci, A. R. (2015). Game on: Past year gambling, gambling-related problems, and fantasy sports gambling among college athletes and non-athletes. *Journal of Gambling Studies, 32*(2), 567–579. <https://doi.org/10.1007/s10899-015-9561-y>
- Mastroleone, N. R., Scaglione, N., Mallet, K. A., & Turrise, R. (2013). Can personality account for differences in drinking between college athletes and non-athletes? *Journal of Drug Education, 43*(1), 81–95. <https://doi.org/10.2190/DE.43.1.f>
- McCann, M., & Jackson, E. (2022, March 7). Ridley betting suspension tests NFL standards as sportsbooks expand. *Sportico*.
- McGee, D. (2020). On the normalisation of online sports gambling among young adult men in the UK: A public health perspective. *Public Health, 184*, 89–94. <https://doi.org/10.1016/j.puhe.2020.04.018>
- Molinaro, S., Benedetti, E., Scalse, M., Bastiani, L., Fortunato, L., Cerrai, S., Urdih Lazar, T. (2018). Prevalence of youth gambling and potential influence of substance use and other risk factors throughout 33 European countries: First results from the 2015 ESPAD study. *Addiction, 113*(10), 1862–1873. <https://doi.org/10.1111/add.14275>
- Moon, M., Lister, J. J., Milosevic, A., & Ledgerwood, D. M. (2016). Subtyping non-treatment-seeking problem gamblers using the pathway model. *Journal of Gambling Studies, 33*(3), 841–853. <https://doi.org/10.1007/s10899-016-9658-y>

- Moore, S., & Ohtsuka, K. (2000). The structure of young people's leisure and their gambling behaviour. *Behaviour Change*, 17(3), 167–177. <https://doi.org/10.1375/bech.17.3.167>
- Moriconi, M., & de Cima, C. (2020). Betting practices among players in Portuguese championships: From cultural to illegal behaviours. *Journal of Gambling Studies*, 36(1), 161–181. <https://doi.org/10.1007/s10899-019-09880-x>
- Mowen, J. C., Fang, X., & Scott, K. (2009). A hierarchical model approach for identifying the trait antecedents of general gambling propensity and of four gambling-related genres. *Journal of Business Research*, 62(12), 1262–1268. <https://doi.org/10.1016/j.jbusres.2008.11.007>
- Munn, Z., Peters, M. D. J., Stern, C., Tufanaru, C., McArthur, A., & Aromataris, E. (2018). Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Medical Research Methodology*, 18(1), 143. <https://doi.org/10.1186/s12874-018-0611-x>
- Nelson, T. F., LaBrie, R. A., LaPlante, D. A., Stanton, M., Shaffer, H. J., & Wechsler, H. (2007). Sports betting and other gambling in athletes, fans, and other college students. *Research Quarterly for Exercise and Sport*, 78(4), 271–283. <https://doi.org/10.1080/02701367.2007.10599425>
- Newall, P. W. S., Moodie, C., Reith, G., Stead, M., Critchlow, N., Morgan, A., & Dobbie, F. (2019). Gambling marketing from 2014 to 2018: A literature review. *Current Addiction Reports*, 6(2), 49–56. <https://doi.org/10.1007/s40429-019-00239-1>
- Nowak, D. E., Jr. (2018). Gambling disorder in the college student-athlete population: An overview. *Journal of Gambling Issues*, 39(39), 222–234. <https://doi.org/10.4309/jgi.2018.39.8>
- O'Brien, T. L., & He, E. (2021, December 16). The sports gambling gold rush is absolutely off the charts. *Bloomberg*. Retrieved from <https://www.bloomberg.com/graphics/2021-opinion-online-sports-betting-future-of-american-gambling/>
- Parke, A., Griffiths, M. D., & Irwing, P. (2004). Personality traits in pathological gambling: Sensation seeking, deferment of gratification and competitiveness as risk factors. *Addiction Research and Theory*, 12(3), 201–212. <https://doi.org/10.1080/1606635310001634500>
- Parrado-Gonzalez, A., & Leon-Jariego, J. C. (2020). Exposure to gambling advertising and adolescent gambling behavior: Moderating effects of perceived family support. *International Gambling Studies*, 20(2), 214–230. <https://doi.org/10.1080/14459795.2020.1712737>
- Philander, K. S. (2019). Regional impacts of casino availability on gambling problems: Evidence from the Canadian Community Health Survey. *Tourism Management*, 71, 173–178. <https://doi.org/10.1016/j.tourman.2018.10.017>
- Purcell, R., Rice, S., Butterworth, M., & Clements, M. (2020). Rates and correlates of mental health symptoms in currently competing elite athletes from the Australian National High-Performance Sports System. *Sports Medicine (Auckland)*, 50(9), 1683–1694. <https://doi.org/10.1007/s40279-020-01266-z>
- Putakian, M. (2016). The psychological response to injury in student athletes: A narrative review with a focus on mental health. *British Journal of Sports Medicine*, 50(3), 145–148. <https://doi.org/10.1136/bjsports-2015-095586>
- Reardon, C. L. (2017). Psychiatric comorbidities in sports. *Neurologic Clinics*, 35(3), 537–546. <https://doi.org/10.1016/j.ncl.2017.03.007>
- Richard, J., Martin-Storey, A., Wilkie, E., Derevensky, J. L., Paskus, T., & Temcheff, C. E. (2019). Variations in gambling disorder symptomatology across sexual identity among college student-athletes. *Journal of Gambling Studies*, 35(4), 1303–1316. <https://doi.org/10.1007/s10899-019-09838-z>
- Richard, J., Paskus, T. S., & Derevensky, J. L. (2019). Trends in gambling behavior among college student-athletes: A comparison of 2004, 2008, 2012 and 2016 NCAA survey data. *Journal of Gambling Issues*, 41(41), 73–100. <https://doi.org/10.4309/jgi.2019.41.5>
- Rockey, D. L., Beason, K. R., & Gilbert, J. D. (2002). Gambling by college athletes: An association between problem gambling and athletes. *Journal of Gambling Issues*, 7(7). <https://doi.org/10.4309/jgi.2002.7.11>
- Rosenthal, R. J. (1979). The file drawer problem and tolerance for null results. *Psychological Bulletin*, 86(3), 638–641. <https://doi.org/10.1037/0033-2909.86.3.638>

- Sahler, C. S., & Greenwald, B. D. (2012). Traumatic brain injury in sports: A review. *Rehabilitation in Research and Practice*, 2012, 659652. <https://doi.org/10.1155/2012/659652>
- Sansanwal, R. M., Derevensky, J. L., & Paskus, T. S. (2018). Trends in gambling behaviour among NCAA college student-athletes: A comparison of 2004, 2008 and 2012 NCAA survey data. *International Journal of Sports and Exercise Medicine*, 4(3). <https://doi.org/10.23937/2469-5718/1510096>
- Shead, N. W., Derevensky, J. L., & Paskus, T. S. (2014). Trends in gambling behavior among college student-athletes: A comparison of 2004 and 2008 NCAA survey data. *Journal of Gambling Issues*, 29(29), 1–21. <https://doi.org/10.4309/jgi.2014.29.18>
- Skarupova, K., Vlach, T., & Mravcik, V. (2020). Early intervention and identification of gambling disorder: A systematic literature review of strategies implemented by gambling operators. *Central European Journal of Public Health*, 28(1), 18–23. <https://doi.org/10.21101/cejph.a5849>
- St-Pierre, R. A., Temcheff, C. E., Gupta, R., Derevensky, J., & Paskus, T. S. (2014). Predicting gambling problems from gambling outcome expectancies in college student-athletes. *Journal of Gambling Studies*, 30(1), 47–60. <https://doi.org/10.1007/s10899-012-9355-4>
- Stuhldreher, W. L., Stuhldreher, T. J., & Forrest, K. Y. (2007). Gambling as an emerging health problem on campus. *Journal of American College Health*, 56(1), 75–83. <https://doi.org/10.3200/JACH.56.1.75-88>
- Tahtinen, R. E. (2021). The killing of a sacred veneer: Depressive symptoms in athletes. *Dissertation Abstracts International: Section B: The Sciences & Engineering*, 82 9-B.
- Turner, N. E., Cook, S., Shi, J., Elton-Marshall, T., Hamilton, H., Ilie, G., Mann, R. E. (2020). Traumatic brain injuries and problem gambling in youth: Evidence from a population-based study of secondary students in Ontario, Canada. *PLoS ONE*, 15(10), e0239661. <https://doi.org/10.1371/journal.pone.0239661>
- Valentine, J. C., Pigott, T. D., & Rothstein, H. R. (2010). How many studies do you need? A primer on statistical power for meta-analysis. *Journal of Educational and Behavioral Statistics*, 35(2), 215–247. <https://doi.org/10.3102/1076998609346961>
- Vinberg, M., Durbeej, N., & Rosendahl, I. (2020). Gambling and gambling problem among elite athletes and their professional coaches: Findings from a Swedish total population survey of participants in four sports. *International Gambling Studies*, 20(2), 262–281. <https://doi.org/10.1080/14459795.2020.1726990>
- Vinberg, M., Wetterborg, D., & Enebrink, P. (2021). Gambling at Work: A Qualitative Study of Swedish Elite Athletes, Coaches, and Managers. *Journal of Gambling Studies*.
- Weinstock, J., Whelan, J., Meyers, A., & Watson, J. (2007). Gambling behavior of student athletes and a student cohort: What are the odds? *Journal of Gambling Studies*, 23(1), 13–24. <https://doi.org/10.1007/s10899-006-9043-3>
- Weiss, S. M. (2010). Cross-addiction on campus: More problems for student-athletes. *Substance Use & Misuse*, 45(10), 1525–1541. <https://doi.org/10.3109/10826081003682297>
- Weiss, S. M., & Loubier, S. L. (2008). Gambling behaviors of former athletes: The delayed competitive effect. *UNLV Gaming Research & Review Journal*, 12(1–2), 53–60.
- Weiss, S. M., & Loubier, S. L. (2010). Gambling habits of athletes and nonathletes classified as disordered gamblers. *The Journal of Psychology*, 144(6), 507–521. <https://doi.org/10.1080/00223980.2010.503248>
- Wertheim, J. (2021, August 9). The big picture. *Sports Illustrated*. Retrieved from <https://www.si.com/betting/2021/08/09/gambling-issue-daily-cover>
- Winters, K. C., & Derevensky, J. L. (2019). A review of sports wagering: Prevalence, characteristics of sports bettors, and association with problem gambling. *Journal of Gambling Issues*, 43, 102–127. <https://doi.org/10.4309/jgi.2019.43.7>
- Yang, J., Peek-Asa, C., Corlette, J. D., Cheng, G., Foster, D. T., & Albright, J. (2007). Prevalence of and risk factors associated with symptoms of depression in competitive collegiate student athletes. *Clinical Journal of Sports Medicine*, 17(6), 481–487. <https://doi.org/10.1097/JSM.0b013e31815aed6b>