

review

A Review of Sports Wagering: Prevalence, Characteristics of Sports Bettors, and Association with Problem Gambling

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Abstract

Given significant technological advances, the U.S. Supreme Court ruling in 2018 permitting U.S. states to offer and regulate sports wagering, and multiple international governments already regulating and licensing sports wagering operators, sports wagering will likely continue to grow exponentially. This expanding landscape of sports wagering may pose public health problems. This literature review provides a description of our current knowledge of sports gambling behaviour among adults, adolescents, and athletes, including prevalence rates and factors associated with problem gambling sports bettors. We highlight new issues that are surfacing, particularly the interaction between online betting, sports viewing, live betting, mobile technology, and sports fantasy gambling. We also address future research directions, including the need for longitudinal studies to clarify factors that contribute to the onset and maintenance of sports-related problem gambling, to examine the impact of major league sports leagues and professional teams that partner with gambling operators and casinos on gambling behaviour, and the need to assess public policy and treatment approaches.

Keywords: sports betting, gambling behaviour, problem gambling

Résumé

Compte tenu des progrès technologiques importants, de la décision rendue par la Cour suprême des États-Unis en 2018 autorisant les États américains à proposer et à réglementer les paris sportifs et des multiples réglementations gouvernementales internationales les autorisant, les paris sportifs continueront probablement de croître de manière exponentielle. Or, ce domaine de paris sportifs en pleine expansion peut poser des problèmes de santé publique. Cet examen de la littérature contient une description de nos connaissances actuelles sur le comportement au jeu sportif chez les adultes, les adolescents et les athlètes, notamment les taux de prévalence et les facteurs associés aux parieurs sportifs du jeu problématique. Nous mettons en

lumière des problèmes émergents, notamment l'interaction entre les paris en ligne, l'écoute de joutes sportives, les paris en direct, la technologie mobile et les jeux de hasard fantastiques. Y sont également abordés l'orientation des recherches futures, notamment la nécessité d'études longitudinales visant à clarifier les facteurs qui contribuent aux débuts et à la poursuite du jeu compulsif lié au sport, un examen de l'impact sur le comportement de jeu des collaborations entre des ligues sportives majeures et des équipes professionnelles et des opérateurs de jeux et des casinos, ainsi que les secteurs d'intérêt concernant les politiques publiques et le traitement.

Introduction

Whether someone is gambling among their peers or through a sportsbook, local bookmaker, or online site, there is ample evidence that sports wagering has grown in popularity. Individuals are engaging in sports wagering more often, and the total amount of money wagered is increasing (Statista, 2018). A 2017 U.S. consumer survey indicated that 45% of respondents had placed a bet on a sporting event at least once in their lives, although currently only 4% report doing so regularly (Statista, 2018). The growth of online sports betting—a major mode of sports betting—has increased in many different countries and jurisdictions over the past few years (Estevez et al., 2017). The market share contributed by sports wagering to online gambling worldwide in 2015 was estimated to be 45%, by far the highest among online gambling options (second place was casino online gambling at 24%; Statista, 2018).

The acceleration of sports wagering requires researchers and public health officials to rethink the relationship between gamblers, gambling, and the nature and extent of gambling-related harm (e.g., Gainsbury, Russell, Blaszczynski, & Hing, 2015; Gainsbury, Russell, Hing, et al. 2015; Gray, LaPlante, & Shaffer 2012; McCormack, Shorter, & Griffiths 2013; Nordmyr, Forsman, Wahlbeck, Björkqvist, & Österman, 2014). Sports wagering is speculated to be an alluring path for some individuals to develop a gambling problem (e.g., Hing, Russell, Vitartas, & Lamont, 2016). This concern was raised several decades ago in a report from the U.S.-based National Research Council (1999), which found that problem and pathological gamblers were disproportionately involved in sports betting (among other games) compared with non-problem social and recreational gamblers (p. 78).

This review provides a description of sports gambling behaviour among several groups (adults, youth, and athletes), as well as factors associated with problem gambling among sports bettors. We highlight new issues that are surfacing, particularly concerning the potentially detrimental effects of the interaction between online betting, sports viewing, live betting, mobile technology, and fantasy sports gambling. Finally, we address future research directions, including clinical issues.

Review Parameters

The identification and retrieval of the relevant published and unpublished studies and reports were based on the following procedures:

1. Terms and themes relevant to sports betting were entered into the major search engines and search systems through 2018 (PsycINFO, PubMed, GoPubMed, PubPsych, Google Scholar, and Web of Science).
2. A search of several sources was conducted to locate grey literature (e.g., Campbell Collaboration Library, Cochrane Collaboration CENTRAL, CDC Gaming Reports, Gambling and the Law, American Gaming Association, sportshandle.com, SustainableGAMING Digest).
3. The bibliographies of all screened and eligible studies were also checked and hand searches conducted of recent issues of relevant gambling and addiction journals (e.g., *Journal of Gambling Studies*; *Journal of Gambling Issues*; *International Gambling Studies*).

Inclusive publications and reports were required to be published in English or French between January 1980 (i.e., the year that pathological gambling was officially recognized in the third edition of the *Diagnostic and Statistical Manual of Mental Disorders [DSM]*, American Psychiatric Association, 1980) and December 2018. Given the limited legal status of sports betting in the United States until recently, the predominance of data was from Europe and Australia. (Of note is the recent literature review of sports bettors by Mercier and colleagues, 2018, which was limited to addressing the role of skill and chance in sports betting.)

General Sports Bettors

A long-standing conclusion from decades of surveys of gambling behaviour is that sports betting is a relatively common form of gambling. A representative national survey of 2,630 U.S. adults found that 20% of them reported sports betting in the prior 12 months (Welte, Barnes, Wiczorek, Tidwell, & Parker, 2002). Among youth and young adults, sports gambling is usually cited in survey results as one of the more prevalent gambling activities (e.g., Huang & Boyer 2007; Winters, Bengston, Dorr, & Stinchfield, 1998). Nonetheless, more recent surveys conducted in the Internet era suggest a different picture. A nationally representative telephone survey of Australian adults ($N = 15,006$) found that sports betting was reported by 13.3% of the sample; yet, among bettors who used the Internet to place bets, 59% engaged in sports wagering via this mode (Gainsbury, Russell, Hing, et al., 2015b). In general, the prevalence literature is sparse when it comes to characteristics that differentiate involvement in sports gambling from other types of gambling, with the exception that females consistently report lower levels of sports betting than males do (Holdsworth, Hing, & Breen 2012; Wood & Williams, 2011). This trend may be caused by several factors, including less interest in sports by females and lack of

female peer networks that are heavily influenced by an interest and involvement in sports. An examination of the promotional and advertising campaigns in Australia, which exploit demographic characteristics of sports bettors on the basis of market research, suggest that the target group is young, single, upwardly mobile, professional, and tech-savvy young men (Hing, Lamont, Vitartas, & Fink, 2015; Milner, Hing, Vitartas, & Lamont, 2013). Notably, Australian online sports wagering opportunities have been available for several decades.

Problem Gambling Sports Bettors (PGSBs)

Prevalence

A striking finding from recent prevalence studies that have measured or screened for problem gambling among contemporary sports bettors with the option of online-based wagering is that the prevalence rates of reported problem gambling are remarkably higher than in population-wide estimates. International data show that approximately 1% of individuals who gamble report experiencing a serious gambling problem at some time in their lives (e.g., gambling disorder), with an additional 2%–3% having experienced somewhat less severe gambling problems (Winters & Smith, in press). These figures are in stark contrast to estimates of current PGSBs in countries with electronic wagering options. (An issue beyond the scope of this review is the relative accuracy of measuring problem gambling as a function of gambling involvement rather than of any specific type of gambling; see LaPlante, Nelson, LaBrie, & Shaffer, 2009). Five survey reports were located that address this issue:

1. The 2010 British Gambling Survey ($N = 7,756$) asked respondents to report on gambling involvement across 15 types of games while assessing problem gambling symptoms. Among those who reported sports betting in the prior 12 months, 4.4% met the criteria of either the fourth edition of the *DSM* (American Psychiatric Association, 2000) or the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001) for problem gambling. This figure was roughly the median number; the highest problem gambling rates were among those who reported poker playing (12.8%), online slots (9.1%), or fixed-odds betting terminals (8.8%; Wardle, Moody, Griffiths, Orford, & Volberg, 2011).
2. From data collected in 2005–2007 from bwin, a major European internet sports gambling service provider (primarily used by Germans and Austrians), among the 679 bettors who self-reported the reason for closing their account during the study period, 32% indicated it was due to gambling-related problems (LaBrie & Shaffer, 2011; LaPlante, Schumann, LaBrie, & Shaffer, 2008). In a subsequent study that was based on customers who used this gambling service, the Brief Biosocial Gambling Screen (Gebauer, LaBrie, & Shaffer, 2010) was administered to 1,422 gamblers who volunteered to take the questionnaire. Approximately one quarter of the gamblers (27%) were identified as having gambling-related problems (LaPlante, Nelson, & Gray, 2014).

3. In 2015, the National Opinion Research Center (NORC) DSM Screen for Gambling Problems (NODS; National Opinion Research Center, 1999) was administered as an online survey to 500 individuals in Spain who had gambled online during the past 12 months. Among those who indicated that they had participated in online sports betting, 16.2% were identified as pathological gamblers, with an additional 13.2% being problem gamblers (Dirección General de Ordenación del Juego, 2016). These figures were surpassed only by those who participated in online poker and other online card games.
4. A survey of 659 Spanish sports bettors (online and land-based, including sports fantasy gambling) identified the following PGSI-defined groups: non-problem gamblers (39%), low-risk gamblers (27%), moderate-risk gamblers (16%), and problem gamblers (19%; Lopez-Gonzalez, Estévez, & Griffiths, 2018b).
5. A national online gambling survey conducted in the United States in late 2018 ($N = 3,000$) included additional questions for those who reported sports betting in the prior year ($n = 720$). Sports bettors endorsed the “many times” response option for each of the four problem gambling items (Lie/Bet Questionnaire and two criteria for gambling disorder from the fifth edition of the *DSM* [*DSM-5*], American Psychiatric Association, 2013) at approximately twice the rate of non-sports bettors (endorsement rate for sports bettors: 5%–7%; endorsement rate for non-sports bettors: 2%–3%; National Council on Problem Gambling, 2019).

Characteristics Associated With PGSBs

Identifying characteristics of PGSBs is an important endeavour for prevention, early intervention, and treatment initiatives (Hing, Cherney, et al., 2015). An emerging set of studies has begun to identify the profile of a typical, contemporary “indulgent sports bettor.” Common features of individuals who engage in sport betting frequently and who are classified as meeting the definition of problem gambling (typically based on the PGSI score) include the following: male, young (young adults to approximately age 35), not married, full-time employed or studying, high level of education, engage in poly-gambling, have significant others and peers who also favour sports betting, frequent user of multiple online accounts with different operators, frequent use of multiple types of promotions, and show more impulsive responses to betting opportunities (e.g., spontaneous betting in the absence of reflection by the bettor; e.g., Delfabbro & King, 2012; Hing et al., 2016; Russell, Hing, Li, & Vitartas, 2018; Wood & Williams, 2011).

Given that sports bettors often gamble via the Internet in jurisdictions where this is possible, this profile aligns with common characteristics of those who use the Internet to gamble in non-sports games (i.e., more likely to be male, better educated, studying or working full-time in managerial or professional occupations, and earning above-average salaries; Gainsbury, Russell, & Hing, 2014; Gainsbury, Wood, Russell, Hing, & Blaszczynski, 2012). On the other hand, the profile of a typical PGSB appears to be distinct from common features observed in older studies of individuals

who were receiving treatment for a gambling problem (casino game typically preferred, middle age, variability in terms of education, more likely married, and a narrower male-female gap; e.g., Stinchfield & Winters, 2001).

Being male and young. Being a young adult male has consistently been identified as a risk factor for problem gambling in general (Hing et al., 2016; Johansson, Grant, Kim, Odlaug, & Götestam, 2009; Williams, West, & Simpson, 2012). It is also a robust risk factor with respect to sports betting (e.g., among online PGSBs, 98% were males with an average age about 10 years younger than non-PGSBs; Hing, Russell, & Browne, 2017) and suggests that this group of sports bettors face heightened risks of related gambling problems (Lamont, Hing, & Gainsbury 2011; Milner et al., 2013; Russell et al., 2018). It should come as no surprise that where sport wagering is legal (in particular, parts of Europe and Australia), this activity is heavily marketed to young males (Hing, Vitartas, & Lamont, 2013). Notably, the American Gaming Association (AGA) recently released its Responsible Marketing Code for Sports Wagering (AGA, 2019). Whereas much of the focus has been on male PGSBs, an important observation is that a significant proportion of females are classified as PGSBs. For example, in Lopez-Gonzalez's (2018b) study in Spain, almost a third (32%) of those classified as PGSBs were women.

Marital status. Several lifestyle features of being single have been linked to PGSBs. They have fewer financial and family responsibilities that might help restrain gambling; PGSBs are more likely to watch and bet on sports with friends who also favour sports wagering; and they have a higher likelihood of frequenting social settings, such as bars, where sports betting among male peers is common (Gordon, Gurrieri, & Chapman, 2015).

The influence of peers and significant others. Among sports bettors, the most common "sports betting opportunity" was to have placed a bet with a friend on a sporting event (47%; Statista, 2018). With respect to PGSBs, frequenting social environments with peers and significant others may lead to exposure to settings in which sports betting is normative and where social pressures to wager on sports exist. Moreover, this risk factor may be linked to the tendency to gravitate toward friendship groups that are supportive of this form of gambling (Gordon et al., 2015; Thomas, Lewis, McLeod, & Haycock, 2012). Peer influence on sports gambling may have parallels with peer influences on other risky behaviours, such as alcohol drinking games that are typically associated with both a competitive context and excessive behaviour (Grossbard, Geisner, Neighbors, Kilmer, & Larimer, 2007).

Perceptions of knowledge and skill. Online sports bettors and sports fantasy gamblers in particular, and, to a lesser degree, offline-based sports bettors, perceive their gambling as more determined by their own skills, knowledge, and analysis and less by chance or luck (Auer & Griffiths, 2017; Gordon et al., 2015; Mercier et al., 2018). This pattern aligns with the common profile that sports gamblers are likely to be highly educated and tech-savvy (e.g., Hing, Cherney, et al., 2014) and to believe that accumulating data on past statistics or bets will confer advantages when seeking

profitable bets (Mercier et al., 2018). These results are consistent with the notion that gamblers who engage in games of skill overestimate their personal ability to win (e.g., Toneatto, Blitz-Miller, Calderwood, Dragonetti, & Tsanos, 1997; Walker, 1992). Such “delusions of expertise” (Browne, Rockloff, Blaszczyński, Allcock, & Windross, 2015), which may be mediated by cognitive distortions similar to those observed in other problem gamblers (Ladouceur et al., 2001), could be an enabling force that maintains or accelerates involvement in sports betting to the point of developing a gambling problem (Hing et al., 2016).

Substance use. Hing and colleagues (2017) observed that, among PGSBs, there was an elevated likelihood of alcohol or illicit drug use while gambling compared with that for non-PGSBs. This finding dovetails with the general problem gambling literature (Castrén et al., 2013; Dannon et al., 2006; Petry, 2007; Welte, Barnes, Wieczorek, Tidwell, & Parker, 2004). A recent concern from a public health standpoint is that online sports betting and substance use are a particularly bad mix, with sports wagering in private increasing the ease of substance use while gambling, which may negatively impact on decision making.

Mode and Related Features of Sports Betting

The mode of accessing a sporting event has received research attention, given its potential to significantly affect “harm potential” (Griffiths & Auer, 2011). There are public health concerns that availability and accessibility to new delivery characteristics of gambling opportunities are contributing to increased levels of gambling problems (Gainsbury, Liu, Russell, & Teichert, 2016; Reith, 2012). Technological advances and innovation led by the gambling industry have translated into new gambling products being available continuously via online, mobile, and other computer-related devices. These advances have enabled several gambling options to evolve, including live in-play betting. In the next section, we discuss the two most prevalent new modes of sports betting: Internet/online gambling and mobile phone wagering.

Internet/Online Gambling

The greater availability of Internet gambling and other reinforcing properties associated with it, including sports betting via the Internet, has raised serious concerns about gambling-related harms. Whereas it is premature to claim that gambling via the Internet creates an inherent propensity to engage in excessive gambling (e.g., population-level statistics of the European bwin subscribers indicated that gambling activity levels were, for the most part, moderate; LaBrie & Shaffer, 2011), the unsettling health risk of Internet sports betting appears to be justified. Internet-based gambling is increasingly being viewed as a conduit for problem gambling (Gainsbury et al., 2014; Griffiths, Wardle, Orfor, Sproston, & Erens, 2009; Kairouz, Paradis, & Nadeau, 2012; Philander & MacKay, 2014; Wood & Williams, 2011; Wu, Lai, & Tong, 2015), and core risk factors for problem gamblers who engage in Internet-based gambling are beginning to be identified (e.g., Hing et al., 2016; McBride & Derevensky, 2009; Potenza et al., 2011; Wood & Williams, 2009).

Notably, in Australia, young men in particular are increasingly seeking treatment for difficulties in controlling their online sports betting (Blaszczynski & Hunt, 2011). If online betting occurs sporadically or in a social context (e.g., watching a sporting event with peers), online play may represent minimal extra risk when compared with venue-based play. On the other hand, if online sports betting facilitates different patterns of use (e.g., solitary betting in extended sessions late at night), then this provides further evidence that the online product presents a greater risk.

Hing and colleagues (2017) reported the first peer-reviewed publication of a study that examined risk factors specific to problematic gambling as a function of different forms of online gambling. This Australian study considered only online problematic gamblers ($N = 4,594$; PGSI score in either the moderate-risk or problem gambling range) who specifically attributed their gambling problem to online electronic gaming machines, race betting, or sports betting. The background characteristics for problematic online sports betting were similar to those for problematic online race betting, with both groups being significantly younger, more educated, and engaged in significantly fewer forms of gambling than were online electronic gaming machine players. All problematic groups, compared with their respective non-problematic group, reported significantly greater psychological distress—a finding consistent with the larger literature that frequent gamblers report higher rates of psychological distress and mental health issues compared with non-frequent gamblers—that may suggest that gambling is a way to cope with negative mood states (Blaszczynski & Nower, 2002; Thomas, Lewis, Westberg, & Derevensky, 2013). Individuals motivated to alleviate psychological distress may find online gambling to be particularly convenient, provide more privacy and be less socially demanding than attending a physical venue, allow greater ease of substance use while gambling, and allow solitary betting in extended sessions late at night (Corney & Davis, 2010; Griffiths, 2003; Griffiths & Parke, 2002; Monaghan, 2009).

Mobile Phone Wagering

Although not a vast literature, some published studies have examined whether the prevalence of gambling problems among mobile-based bettors differs from those who prefer land-based sports betting. Gainsbury and colleagues (2016) examined the association of PGSI scores as a function of different preferred ways to access Internet-based gambling (offline, PC, mobile device). Mobile device bettors were found to have had a higher proportion of problem gambling (22%) than were individuals who used other modes of betting (18% offline, 16% PC). As noted earlier, Lopez-Gonzalez and colleagues (2018b) compared three modes of sports wagering (mobile, Internet, and land-based) in a convenience sample ($N = 659$). Bettors who preferred mobile gambling did so more frequently and scored significantly higher on the PGSI compared with sports bettors who preferred to wager at a land-based venue. Of the bettors who preferred mobile gambling, 25% were in the problem gambler group, compared with much lower rates among laptop (18%) and land-based bettors (11%).

Mobile betting, with its one-touch, easily accessible wagering options, allows for accelerated speed of play and more instantaneous and immediate gambling, all features

that may be particularly attractive to those who are prone to impulsive responses to betting opportunities (Deans, Thomas, Daube, & Derevensky, 2016; Griffiths & Auer, 2013; Lopez-Gonzalez, Estévez, & Griffiths, 20018a). Correspondingly, it has been observed that bookmakers promote mobile betting over other modes of gambling in their promotions and advertisements by emphasizing its ease of access, providing messages that emphasize the skills involved and that diminish the role of luck (Lopez-Gonzalez, Estévez, & Griffiths, 2017).

Live In-Play Betting

Enabled by online and mobile-based betting, live-action betting on brief bet cycles during play has been identified as an important risk factor for problem gambling (Braverman, LaPlante, Nelson, & Shaffer, 2013; Gray et al., 2012; LaPlante et al., 2008, 2014; Nelson et al., 2008). Concerns have been raised that the live in-play method greatly reduces the delay between wager and reward found in traditional sports betting (Griffiths & Auer, 2013). Convergent evidence suggests that impulsive-like betting (e.g., no prior planning; betting more than one has intended), as well as the provision of betting options that enable it, poses substantial risks for some gamblers (Hing, Li, Vitartas, & Russell, 2018). Live in-play betting was a recurrent characteristic of problem gamblers studied in the bwin sample (1,440 subscribers), in which 11 of 16 online games had a significant univariate association with a positive screen for gambling disorder (LaPlante et al., 2014). However, after controlling for breadth of gambling involvement (the number of games an individual plays), only live-action (in-play) sports betting retained a significant relationship with potential gambling-related problems (defined by a web-based version of the Brief Biosocial Gambling Screen). Risk of problem gambling was also found to increase with greater in-play live-action betting. In an online survey of Australian sports bettors by Hing and colleague (2016), higher PGSI scores were significantly associated with a higher rate of engaging in live-action betting ($r = .36$ for percentage of bets placed during the match; $r = .37$ for the percentage of bets placed on impulse during the match; $r = .47$ for the percentage of bets placed on micro events within the match). Lopez-Gonzalez and colleagues (2018b) used the PGSI to classify problem gambling groups from an online survey of sports bettors. They found that 39% were non-problem gamblers, 27% were low-risk gamblers, 16% were moderate-risk gamblers, and 19% were problem gamblers. The rate of endorsing frequent in-game betting (more frequently betting during the game than before the game) was significantly ($p < .0001$) associated with a PGSI score in the expected direction (i.e., PGSI mean scores were significantly higher as a function of gambling group).

Micro-betting, in which players are able to bet on an almost immediate outcome during a live sports event, was found to be similarly problematic. From an Australian study of PGSI-defined groups, among those who bet on micro events, 78% were considered problem gamblers and only 5% as non-problem gamblers (Russell, Hing, Browne, Li, & Vitartas, 2019). Among non-micro-bettors, the problem gambling rate was 29%. Micro-bettors were found to be younger, well educated, and single and to participate in multiple types of gambling.

It is likely that bettors who experience more problems with in-sports betting are attracted to the immediacy (e.g., rewards offered in a short amount of time) that this type of betting offers (Casino City Press, 2019; Griffiths & Auer, 2013; Lamont, Hing, & Vitartas, 2016). In addition, this form of wagering facilitates chasing behaviours, common among problem and disordered gamblers. Moreover, live wagering features may expose a person's cognitive biases (e.g., elevated self-view of skill; Lopez-Gonzalez et al., 2017; Lopez-Gonzalez & Griffiths, 2016). In a study of 161 sports bettors from France, participants with time constraints in placing their bets resorted more frequently to heuristic processing that featured less cognitive activity instead of the more intensive analytical processing, leading to theoretically less reasonable bets (d'Astous & Di Gaspero, 2015).

Fantasy Sports Gambling

Recent reports from the Fantasy Sports Trade Association (2018) estimate that 57.4 million people participated in fantasy sports betting in the United States and Canada (compared with 13.5 million in 2004). A fantasy sport is a type of game that is often played by using the Internet or within a social group, in which participants assemble imaginary or virtual teams of real players of a professional sport. Participants act as team owner or general manager by drafting, trading, and cutting players, analogous to real sports. Widespread participation in daily fantasy sports (DFS) may have been exacerbated by the near \$206 million dollars spent on advertising by the two largest DFS operators in 2015 alone (Derevensky & Marchica, 2018; Kludt, 2015). Although debate is ongoing concerning whether fantasy sports wagering can be legally considered "gambling" in certain jurisdictions (Rose, 2015), there are indications that fantasy sports players share similarities with sports gamblers. Drayer, Shapiro, Dwyer, Morse, and White (2010) found that participation in fantasy sports was associated with frequent watching of live sports, sports wagering on real games, in-play betting, and identification with a team. Also similar to sport bettors, the majority of daily fantasy players believe that their participation in the game is more about skill than chance (Dwyer & Weiner, 2018).

It has been argued that "sports fandom" features (e.g., identification with a team; wagering on real games) increase the vulnerability of participants to the promotions and marketing strategies of fantasy gambling products that are addressed to them (Deans et al., 2016; Lopez-Gonzalez et al., 2017). Those who engage in frequent fantasy sports are characterized by high-end problem severity and comorbid problems, including suicidal ideation (Nower, Caler, Pickering, & Blaszczynski, 2018). In the multi-mode study in Spain, fantasy sports involvement was significantly higher in the moderate-risk gambling group (62%) and the problem gambling group (94%) compared to the low-risk gamblers and the non-problem gamblers (Lopez-Gonzalez et al., 2018b). In addition, continuous scores on the degree of fantasy game participation were significantly associated with severity scores on the PGSI. Nower,

Volberg, and Caler (2017) reported that among a sample of 1,500 adults in New Jersey, 22.4% engaged in DFS, the majority being between the ages of 25 and 34 (61%), married or living with a partner (62.7%), and having a college or postgraduate degree (46%). Although most DFS players also engage in other forms of gambling activities, 95% of them were high-frequency gamblers and were identified as high-risk problem gamblers. In a study of college student athletes, Marchica and Derevensky (2016) reported a steady increase across the survey data points (2004, 2008, and 2012) of fantasy sports playing among National Collegiate Athletic Association (NCAA) student athletes. Moreover, among those who were fee-based fantasy sport players, 48% of males and 25% of females were identified as at-risk or pathological gamblers on the basis of a *DSM* gambling screen score of 3 or more (range 0–10; Stinchfield, Govini, & Frisch, 2005). A similar finding was reported in a survey of general college students at three universities (Martin, Nelson, Gallucci, & Lee, 2018). Fantasy sports gamblers wagered significantly more frequently and endorsed more gambling disorder criteria from the *DSM-5* than did those who did not play fantasy sports (Martin et al., 2018). A survey of over 7,000 high school students from Ohio found that 7.3% of youth reported wagering money on fantasy sports and 5.1% on DFS at least once in their lifetimes (Marchica, Zhao, Derevensky, & Ivoska, 2017). Among individuals who participated in DFS more than once per month, 36% of males and 59% of females were considered at risk for a gambling problem (one or more endorsements on the three-item NODS-CLiP; Toce-Gerstein, Gerstein, & Volberg, 2009); betting more than once a month on DFS, after gender and age were controlled for, doubled the likelihood of meeting criteria for at-risk gambling (Marchica et al. 2017).

Sports Betting Among Youth

Converging evidence indicates that sports gambling begins early (Derevensky, 2012; Productivity Commission, 2020; Volberg, Gupta, Griffiths, Olason, & Delfabbro, 2010) and, as previously noted, young adults are at high risk for sports gambling-related problems (Calado, Alexandre, & Griffiths, 2017; Welte, Barnes, Tidwell, Hoffman, & Wieczorek, 2015). Qualitative studies of Australians' sports betting behaviour suggest an overlap of sports participation and sports betting (Deans et al., 2016), especially for younger bettors and children who identify betting as a safe way of winning money (Pitt, Thomas, Bestman, Daube, & Derevensky, 2017).

Sports wagering remains a popular form of gambling by adolescents. Several older surveys have found that sports betting was in the group of the most popular prior-year gambling activities: 30% in a Montreal sample (Gupta & Derevensky, 1998) and 37% in a Minnesota sample (Winters, Stinchfield, & Fulkerson, 1993). The earlier cited Ohio school survey found that the rate of prior-year sports betting was 13.5% (compared with 7.3% wagered money on fantasy sports and 5.1% wagered on DFS; Marchica et al., 2017). All forms of sports gambling activities were significantly associated with problem gambling status (odds ratio range: 2.0–2.5).

Sports Betting Among College Students

A number of large-scale epidemiological prevalence studies suggest that 75%–80% of college students report having gambled in general within the past year (Barnes, Welte, Hoffman, & Tidwell, 2010; Blinn-Pike, Worthy, & Jonkman, 2007; Lostutter, Lewis, Cronce, Neighbors, & Larimer, 2014). As is the case with adolescents, older surveys of college students indicate that sports betting is a popular form of gambling (e.g., 23%, Barnes et al., 2010; 37%, Winters et al., 1998). Fantasy sports participation was the focus of a survey by Martin and Nelson (2014). Among 1,556 college students in the United States, 13% of males and <1% of females had participated in wagering on fantasy leagues in the prior year. Logistic regression analyses indicated that for the full sample, sports fantasy participants (regardless of whether they played for money) were over 5 times more likely to endorse at least one *DSM-5* criteria for a gambling disorder (American Psychiatric Association, 2013) compared with those with no fantasy sports participation. Interestingly, male sports fantasy participants who did not play for money did not have an elevated likelihood of endorsing any of the *DSM* gambling disorder criteria.

Student Athletes and Sports Wagering

Student athletes represent a significant subpopulation of college students in North America. In the United States alone, there are over 485,000 college students participating in NCAA-sanctioned athletics yearly (NCAA, 2016). NCAA guidelines are clear about gambling: No direct or indirect involvement in betting of any kind is permitted by a collegiate athlete (NCAA, 2016). These zero-tolerance guidelines include prohibitions on soliciting or accepting a bet, on providing information concerning intercollegiate athletics about a person or group who may use it for gambling purposes, and on involvement in betting pools and fantasy sports. Despite these restrictions, several studies consistently show that rates of problem or disordered gambling among college student athletes are higher than those of the general population (2.9%–15%; Bourn, 1998; Ellenbogen, Jacobs, Derevensky, Gupta, & Paskus, 2008; Engwall, Hunter, & Steinberg, 2004; Huang, Jacobs, Derevensky, Gupta, & Paskus, 2007; Kerber, 2005; Nowak & Aloe, 2014). There are indications, however, that the rate may be decreasing. From four repeated NCAA cross-sectional surveys spanning 2004 to 2016, both gambling participation rates and the proportion of student athletes classified as either at-risk or pathological gamblers were generally found to have decreased (Richard, Paskus, & Derevensky, 2019).

Survey results from the NCAA report provide detailed information on sports wagering by college athletes (Richard et al., 2019). Nearly a quarter of NCAA male student athletes reported wagering on sports in each of the surveys from 2004 to 2016 (against NCAA regulations), and both intramural and Division I athletes were more likely to play fantasy sports for money (49% and 31%, respectively) than were non-athletes (13%). Female student athletes reported rates of prior-year sports wagering at about 6% across all survey years. Betting on a college game involving one's own team remains relatively low, perhaps owing to the strict penalties for student athletes

who do not adhere to NCAA policies prohibiting sports wagering, as well as to recent NCAA prevention efforts.

Gambling and Sports Gambling Among Professional Athletes

Empirical data pertaining to gambling by professional athletes have been limited to European studies. Grall-Bronnec and colleagues (2016) assessed 1,236 professional athletes (professional ice hockey, rugby, handball, basketball, football, indoor football, volleyball, and cricket teams in Spain, France, Greece, Ireland, Italy, Sweden, and the United Kingdom). The investigators reported that 57% of athletes gambled at least once during the previous year and that the prevalence of current problem gambling was 8% on the basis of endorsing at least one item on the Lie/Bet Questionnaire (Johnson et al., 1997). Problem gambling status was found to be significantly associated with betting on one's own team (odds ratio = 4.1).

Current and Former Athletes and Sports Betting

Weiss and Loubier (2008) randomly sampled 300 adults in Colorado and Connecticut and found that 13% of former high school and college athletes and 13% of current athletes (any organized league, including professional athletes) reported gambling-related problems.

An additional analysis of the survey data (Weiss & Loubier, 2008) indicated that among those identified as disordered gamblers (score of 3 or more on the South Oaks Gambling Screen; Lesieur & Blume, 1987), former athletes were more likely to participate in skill-based forms of gambling, including sports gambling and poker card playing, whereas non-athletes were more likely to partake in gambling activities that were based predominately on chance factors. Not surprisingly, former athletes were more likely to wager on the sport they had once played.

Future Research Needs

Older prevalence studies on sports betting most certainly underestimate its popularity, given that these studies were conducted in a gambling era that is largely distinct from the current sports betting landscape characterized by expanding sports betting options and new technologies. Thus, there is a need for comprehensive contemporary studies. The association between method and modes to place a sports bets (e.g., online betting, micro in-game betting, mobile betting, and fantasy gambling) and gambling involvement, including problem gambling, is a critical question for future surveys to address. Moreover, the possible causal link between sports betting and problem gambling, as well as the additional harm posed by the presence of individual- and technology-based risk factors, cannot be determined from correlational studies, which is the state of nearly all studies that we reviewed. As a result, we suggest the need for longitudinal studies.

The study of how public health responses may alter the sports betting landscape is another important area of assessment. For example, does banning micro-event

betting reduce the risk of developing a gambling problem? Additional harm or risk reduction measures that merit research attention include the role of setting limits on the time and amount of bets, of self-exclusion programs, and of increasing an individual's knowledge about betting odds (National Council on Problem Gambling, 2018). Moreover, the impact of wagering promotions on altering sports betting behaviour and the risk of developing into a PGSB is only beginning to be studied (Hanss, Mentzoni, Griffiths, & Pallesen, 2015; Hing, Lamont, et al., 2013; Lopez-Gonzalez et al., 2017). Promotions may have specific effects on problem gamblers (Hing, Lamont, et al., 2015). A related open research question is whether "gamble responsibly" messages are effective in reducing high-risk betting behaviours (Lamont et al., 2016).

Clinical studies are a significant research need. Historically, they have suggested that it is rare for those with a gambling disorder to identify sports betting as the preferred game (e.g., Stinchfield & Winters, 2001). Yet, the few clinical studies that have been more recently published suggest a strong link between sports betting and harms. Australia is witnessing an increase among young men seeking treatment for problems resulting from online sports betting (Blaszczynski & Hunt, 2011). Estévez et al. (2017) compared online to offline sports bettors among patients with a gambling disorder under treatment in a Barcelona, Spain, area hospital. Online sports bettors made greater maximum bets and incurred increased financial debts sooner compared with offline-only bettors. Among disordered gamblers receiving treatment in Florida, 8.6% of the total sample reported that their preferred form of gambling was sports wagering (Derevensky, 2018).

The characteristics of PGSBs suggest that interventions should target young adult males and take into account the higher educational and income levels of this group. More research is needed to establish optimal intervention approaches to discourage problem gamblers from engaging in high-risk sports betting such as online and micro-betting, to help them avoid sports betting inducements (e.g., sign-up bonuses, "free" bets), and to challenge their beliefs that one can readily earn money from sports gambling. Adjustments to assessment and treatment approaches are needed to meet the needs of this newest generation of individuals with a gambling disorder resulting from sports betting.

Additional research needs are as follows: (1) methodological designs that isolate problem behaviours associated with sports betting from possible links to other forms of gambling; (2) research that delves deeper than the previous literature did into psychological, social, and cultural variables linked to sports betting; (3) examination of the origins and extent of sports betting by children and adolescents; (4) exploration of the differential influences of possible functional values of gambling behaviour (e.g., coping-based, escape-based); (5) examination of the impact on sports betting involvement as a function of major league sports leagues and professional teams partnering with gambling operators and casinos; (6) examination of the impact of new sports wagering television and radio shows and advertisements on gambling behaviour, as well as the role that government can play in regulating the promotion of sports betting; and (7) treatment research that includes the role of co-occurring

disorders and the strategies to address the risk factors of problem gambling (e.g., impulsive betting patterns) that can compromise treatment.

Moving Forward

Sports are an important part of many cultures and it seems likely that sports wagering will continue to grow, given the significant technological advances; governments that permit, regulate, and license sports wagering operators; and many major professional sports leagues that partner with gambling operators. The characteristics of typical sports gamblers are that they are male, younger, and unmarried; they have peers who gamble on sports, a perception and belief that they are knowledgeable about sports, and an increased likelihood of substance use (alcohol and drugs); and they engage in multiple forms of gambling. These characteristics of sport bettors are also associated with those who show harms from sports betting. Features of sports betting related to gambling problems are excessive sports wagering, mobile wagering, micro-betting (instantaneous and live propositional betting), and fantasy sports wagering. The expectation of a significant increase in sports wagering and its concomitant related problems places attention on policy makers and regulators, as well as on clinical service providers, to adjust assessment and treatment approaches to meet the growing needs of this new generation of individuals with a gambling disorder. Our review of the literature supports the viewpoint that jurisdictions that permit legal sports betting have valid concerns about a growing culture of high-risk sports bettors (Gordon et al., 2015; Thomas et al., 2012).

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