

Systematic Review of Preventive Programs for Reducing Problem Gambling

Behaviors among Young Adults

Grande-Gosende, Aris* (ORCID ID: 0000-0003-2270-321X); López-Núñez, Carla** (ORCID ID: 0000-0001-8897-275X); García-Fernández, Gloria* (ORCID ID: 0000-0003-0770-0555); Derevensky, Jeffrey*** (ORCID: 0000-0001-6947-2987); Fernández-Hermida, José Ramón* (ORCID ID: 0000-0003-1792-0033).

*Addictive Behaviors Research Group, Department of Psychology, University of Oviedo (Spain)

**Department of Psychology, Universidad Loyola de Andalucía (España)

***International Centre for Youth Gambling Problems and High-Risk Behaviors, McGill University (Montreal, Quebec, Canada)

Correspondence concerning this article should be addressed to

Aris Grande Gosende,

Addictive Behavior Research Group. Faculty of Psychology. University of Oviedo.

Plaza Feijóo s/n, 33003, Oviedo (Asturias, Spain).

Tel.: 0034 985 104 189

Email: agrandegosende@gmail.com; grandearis@uniovi.es

Compliance with Ethical Standards

Funding

Funding for development of this study was provided by the Council of Health from the Principality of Asturias (FUO-205-17) and by a Predoctoral Grant BP16071 from the Council of Education and Culture from the Principality of Asturias (Spain). The funding sources had no role in the study design, collection, analysis or interpretation of the data, in writing the manuscript, or the decision to submit the paper for publication.

Conflict of interest

The authors report no conflict of interests with respect to the content of this manuscript.

Ethical approval

This article does not contain any studies with human participants or animals performed by any of the authors.

Systematic Review of Preventive Programs for Reducing Problem Gambling Behaviors among Young Adults

Abstract

Young adulthood is a developmental period from late adolescence to one's late twenties or early thirties. Prevalence studies internationally have reported that individuals in this age group tend to have the highest rates of problem gambling. However, much of the prevention work designed to minimize the risk of problem and disordered gambling has been primarily focused on school settings and aimed at high school students. The objective of this study was to summarize the existing literature on the effectiveness of prevention programs aimed at reducing the prevalence of gambling problems in young adults. A systematic review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Six electronic academic databases were consulted in order to examine the studies conducted during the last 20 years. After removing duplicates and adhering to the inclusion and exclusion criteria, nine studies were included in this review. All studies targeted college or university students and followed a selective or indicated prevention strategy. A *Personalized Normative Feedback* approach was incorporated in most of the studies, which had generally good results in reducing and/or minimizing at-risk or problem gambling. The limited number of studies included in this review highlights the need to address scientific quality standards before proceeding with the design, implementation and widespread dissemination of these preventive programs as well as the need to ensure the program's efficacy prior to implementation.

Keywords: gambling; prevention; young adults; systematic review.

Introduction

Gambling has become a widespread recreational activity. Whether purchasing lottery tickets, gambling in land-based venues or online, gambling has become a socially acceptable activity. Although most people gamble in a responsible way, a small but identifiable group develop problematic gambling behaviors (Black & Shaw, 2019). The last systematic review of problem gambling worldwide indicates that prevalence of past-year adult problem gambling varies from 0.1% to 5.8%, depending on the country, the screening instruments used and the time frame adopted, with Asia and Europe showing the greatest variations (Calado & Griffiths, 2016). Gambling behaviors of young adults, as a developmental stage beginning in late adolescence to one's late 20s or early 30s (Petry, 2002), has become increasingly important due to the high prevalence rates of gambling and problem gambling levels (Arcuri, Lester, & Smith, 1985; Monaghan, Blaszczyński, & Nower, 2009; Shaffer, Hall, & Vander Bilt, 1999; Welte, Barnes, Tidwell, Hoffman, & Wieczorek, 2015; Winters, Stinchfield, Botzet, & Anderson, 2002). College or university students are the most frequently studied subgroup of young adults. Based on recent meta-analytic procedures (Nowak & Aloe, 2018), the estimated probable pathological gambling among college students ranges from 3% to 32%, with an average estimated rate of 10% for probable pathological gambling. This developmental group has been shown to be more likely to engage in a wide variety of potentially risky behaviors, including excessive use of alcohol, and to exhibit more consequences of severe gambling patterns (Engwall, Hunter, & Steinberg, 2004; Karlsson & Hakansson, 2018). Compared with the general population, this subgroup shows higher vulnerability to gambling exposure, due to the combination of both normative risky behaviors and reaching the legal age for gambling, which increases its accessibility more than any other time in their life. Given the relatively

high rates of gambling problems among young adults, developing preventive strategies for this group is of utmost importance.

As a result, substantial interest has arisen in developing preventive initiatives for this population (Keen, Blaszczynski, & Anjoul, 2017). Although prevention efforts are critical in protecting youth, adults and seniors from presenting gambling problems, the specific type of prevention approaches to be used remains unclear (Derevensky, Gupta, Dickson, & Deguire, 2005). Gambling prevention initiatives have traditionally focused on school-age children due to the educational community's concern over adolescent risky behaviors and the high accessibility to samples of young population in early educational stages (Keen et al., 2017; Ladouceur, Goulet, & Vitaro, 2013). Evaluations of many of these gambling educational/prevention programs have proved them to be effective in increasing knowledge and modifying erroneous beliefs about gambling in the short-term. According to a universal prevention strategy, it is supposed that an increase in knowledge about the risks associated with gambling and understanding probability would be a protective factor in the development of disordered gambling. However, several difficulties concerning long-term follow-ups from childhood to adolescence and adulthood remain.

As previously noted, most programs have focused on school-age children and adolescents, within school settings (Derevensky, 2012; Keen et al., 2017; Kourgiantakis, Stark, Lobo, & Tepperman, 2016; Ladouceur et al., 2013; Oh, Ong, & Loo, 2017) or have failed to follow a detailed, systematic and rigorous procedure (Oh et al., 2017). To our knowledge, there has been no systematic review conducted to date on preventive programs in young adulthood. The primary goal of this review was to critically assess the existing literature on the effectiveness of prevention programs

aimed at reducing the prevalence of gambling problems among young adults as well as identifying the specific preventive components used.

Method

This systematic review adheres to the systematic search protocols recommended in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher, Liberati, Tetzlaff, Altman, & PRISMA Group, 2009). In order to ensure the quality standards, a protocol was designed and registered in the International Prospective Register of Systematic Reviews (PROSPERO, ID: CRD42018105206).

Literature Search Procedure

A systematic and comprehensive search was conducted in June 2018. The authors searched six electronic academic databases (PubMed, ISI Web of Science, Scopus, ScienceDirect, PsycINFO and Cochrane) to identify potentially eligible studies, by combining the following terms: “prevention”, “gambling”, “program”, “youth”, “young adults”, “young people” and “college students”, as well as all their derivatives. A data filter was applied in order to select published papers from the last 20 years (1998-2018). All documents written in Spanish, English and French were included. A hand search was also conducted to detect another source of peer and non-peer-reviewed publication using the same search terms in Google and Google Scholar. In order to reduce the risk of publication bias, the authors also consulted the websites of several official bodies including the European Monitoring Centre of Drugs and Drug Addiction (EMCDDA), the National Plan on Drugs (*Plan Nacional Sobre Drogas, PNSD*) of the Ministry of Health, Social Services and Equality of Spain, the Director General for the Gambling Management (*Dirección General de Ordenación del Juego*) of the Spanish Government, as well as other relevant international websites from Canada (Problem

Gambling Institute of Ontario at the Centre for Addiction and Mental Health, Responsible Gambling Council of Ontario, and the International Centre for Youth Gambling Problems and High-Risk Behaviors at McGill University, Montreal), United States (National Center for Responsible Gaming, Beverly, MA) and Australia (Gambling Research Australia, State of Victoria). The authors also searched for ongoing and unpublished studies via ClinicalTrials.gov (www.clinicaltrials.gov) and the World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP) (apps.who.int/trialsearch/). Finally, the bibliographies of all documents consulted were searched to identify any potential information that could be incorporated into our analysis using a snowball method.

Inclusion and Exclusion Criteria

Studies that were considered for inclusion in this review had to:

- a) Be prevention programs focused primarily on gambling problems; and,
- b) Be prevention programs that described the program in detail and whose efficacy has been scientifically demonstrated through the use of pre-post intervention analyses; and,
- c) Include a target population of young adults, aged between 18 – 35 years old; and,
- d) Include primary data in the report.

Studies were excluded if they:

- a) Were reviews, editorials or opinion pieces that did not provide original information; or,
- b) Only reported qualitative data; or,
- c) Could not be obtained in Spanish, English or French; or,

- d) Included a sample of adolescents younger than 18 years of age or adults over 35 years old; or,
- e) Included prevention programs whose primary focus was not related to gambling or problem gambling.

Study selection

The original search identified 1,385 references. After removing duplicates, 945 papers were examined by two independent reviewers to evaluate their eligibility. A total of 18 papers were retained based on their relevance by title and abstract. Both reviewers applied the inclusion and exclusion criteria independently in order to examine potentially eligible papers considering their full texts. Disagreements between reviewers were discussed and resolved with the mediation of a third reviewer. Finally, 8 studies were included for the review. Then, a snowball method was followed in order to locate any additional studies. A total of 6 further studies were found, 1 of which adhered to the inclusion criteria. The total sample comprised 9 studies for the review (Figure 1). Information on the reviewed studies is detailed in Table 1.

Data collection and analyses

Data abstracted included the following: 1) Contact information (reference of the study and country); 2) Main goal of the program; 3) Participants' characteristics (sample size, gender and age); 4) Method (setting, study design, prevention initiative, measuring instruments and duration); and, 5) Outcome measures at both short- and long-term follow-up.

Risk of bias as well as quality of the studies were assessed using the Cochrane Handbook for Systematic Reviews of Interventions (Higgins & Green, 2011). Each

study was assessed in relation to the reported biases: selection, performance, detection, attrition and reporting.

Results

Participants' characteristics

The main study characteristics are described in Table 1. Regarding participants' characteristics, all interventions included undergraduates or college students, with a mean age between 19 - 23 years old (range between 17 and 34). Participants were predominantly men, with only one study reporting a higher percentage of females than males (Williams & Connolly, 2006). The sample size ranged between 28 and 470 participants. Almost all studies were done in the U.S., with the exception of one study that was carried out in Canada (Williams & Connolly, 2006).

Risk of bias and quality of the studies

Risk of bias as well as quality of the studies were assessed using the Cochrane Handbook for Systematic Reviews of Interventions (Higgins & Green, 2011). Results suggest that most of the included studies were at low risk of bias in all the assessed domains, with three studies (Lostutter, 2009; Takushi et al., 2004; Williams & Connolly, 2006) not meeting the criteria (Figure 2). Lostutter (2009) recruited participants on a volunteer basis using the Psychology Department's subject pool, and therefore reported that the risk of selection bias was unclear as this was not a true random sample. It was not possible to determine the random order of assigning participants into intervention and control groups (Higgins & Green, 2011). Furthermore, an unclear risk was found in the Takushi et al. (2004) study. Despite the fact that the protocol was available, not all the pre-specified outcomes of interest were reported, rather only pilot results were provided. Williams and Connolly (2006) had two domains

that reported high risk and four domains that reported unclear risk. In this study, participants were selected based on the clinician's or the participant's choice and availability. Also, the specific intervention was known by the staff in advance. Moreover, the researchers stated that some of the statistically significant differences between the intervention and control groups could be attributed to the fact that participants interested in gambling started preferentially enrolling in the section of introductory statistics that the intervention included. This issue is relevant since the primary goal of the study was to examine the influence of improved knowledge of odds and mathematical expectations on gambling behavior. Unclear performance and detection bias were also found, as blinding of personnel, participants and assessors was not described.

Study Design

Most of the studies incorporated randomized controlled trials (RCTs), with two studies stratified by gender (Martens, Arterberry, Takamatsu, Masters, & Dude, 2015) as well as by gender and gambling severity (Neighbors et al., 2015) into one of the included conditions. Only one study did not comprise an RCT design (Williams & Connolly, 2006), as it included three different conditions (intervention, math-control and non-math control groups); however, the assignment of the participants to the different conditions was not randomized.

Intervention sessions of the gambling prevention programs were wide ranging in number and duration of sessions. Based on the research that reported this information, most of the interventions included a single session. The Larimer et al. (2012) study included 4 to 6 group sessions while Petry, Weinstock, Morasco and Ledgerwood (2009) also had 4 intervention sessions (MET + CBT group). The variability was even higher when the duration of the interventions was considered, which ranged from 10

(Martens et al., 2015; Petry et al., 2009) to 60-90 (Larimer et al., 2012) minutes per session.

Four studies reported short-term assessments at either 1-week (Celio & Lisman, 2014) or 1-month (Hopper, 2005; Lostutter, 2009; Petry et al., 2009) post-intervention. Six out of nine studies reported long-term assessments, specifically, at 3-months (Martens et al., 2015; Neighbors et al., 2015; Takushi et al., 2004), 6-months (Larimer et al., 2012; Neighbors et al., 2015; Williams & Connolly, 2006), and 9-months (Petry et al., 2009). It should be noted that three studies failed to report any follow-up assessments (Celio & Lisman, 2014; Hopper, 2005; Lostutter, 2009).

Main measuring instruments

Only one (Celio & Lisman, 2014) of the nine studies failed to assess problem gambling severity, with two studies including one screening questionnaire (Martens et al., 2015; Williams & Connolly, 2006), and six investigations including two screening instruments (Hopper, 2005; Larimer et al., 2012; Lostutter, 2009; Neighbors et al., 2015; Petry et al., 2009; Takushi et al., 2004). Furthermore, a variety of self-reported questionnaires were used to explore both at-risk and problem gambling rates among participants. Based on DSM-III, the South Oaks Gambling Screen (SOGS) questionnaire (Lesieur & Blume, 1987) was used in four studies (Hopper, 2005; Lostutter, 2009; Neighbors et al., 2015; Takushi et al., 2004). On the other hand, the National Opinion Research Center DSM-IV Screen for Gambling Problems (NODS) (Gerstein et al., 1999) was administered in two of the studies (Larimer et al., 2012; Petry et al., 2009) and another four studies (Hopper, 2005; Larimer et al., 2012; Lostutter, 2009; Neighbors et al., 2015) used the Gambling Problem Index (GPI) (Neighbors, Lostutter, Larimer, & Takushi, 2002). This last questionnaire assesses negative consequences associated with problem gambling, with higher scores indicating

greater problematic gambling behavior (Lostutter, 2009). Researchers also included additional assessment instruments. For example, Takushi et al. (2004) used the Gambling Severity Index (GSI) (Lesieur & Blume, 1992), and Martens et al. (2015) and Williams and Conolly (2006) administered the Canadian Problem Gambling Index (CPGI) (Ferris & Wynne, 2001). Finally, Petry et al. (2009) applied the Addiction Severity Index – Gambling section (ASI-G) (Lesieur & Blume, 1991; Petry, 2007) for assessing gambling problems among participants. Although Celio and Lisman (2014) was the only study that did not use any instrument for assessing disordered gambling, changes in behavioral risk-taking were analyzed using two analog measures of gambling.

It is noteworthy that most of the studies that incorporated a Personalized Normative Feedback (PNF) approach (Celio & Lisman, 2014; Hopper, 2005; Larimer et al., 2012; Lostutter, 2009; Neighbors et al., 2015) measured the effects of the intervention with the Gambling Quantity and Perceived Norms Scale (GQPN) (Neighbors et al., 2002). This instrument assesses the money spent on gambling and the gambler's beliefs about other college students' gambling behavior, in terms of frequency, and money won and lost.

Type of intervention

The majority of the studies (Hopper, 2005; Larimer et al., 2012; Lostutter, 2009; Martens et al., 2015; Neighbors et al., 2015; Petry et al., 2009; Takushi et al., 2004) were built in the framework of indicated prevention for college students who display signs of at-risk or problem gambling behaviors. Consequently, these programs usually aim to prevent the development of a more severe gambling disorder in the future (Institute of Medicine, Division of Mental Health Behavioral Medicine, 1990). On the other hand, only one study evaluated the efficacy of a selective prevention program, by

focusing on young adults who had gambled in the month prior to the assessment (Celio & Lisman, 2014). Finally, Williams and Connolly (2006) developed a universal prevention program, aimed at increasing the knowledge of odds and probability associated with different gambling activities to all participants, whether they were gamblers or not.

Regarding the type of interventions, it should be noted that the Personalized Normative Feedback (PNF) approach, also referred to as Personalized Feedback Intervention (PFI), was used in most of the studies (Celio & Lisman, 2014; Larimer et al., 2012; Martens et al., 2015; Takushi et al., 2004), but a computerized tracking method was also implemented (Hopper, 2005; Lostutter, 2009; Neighbors et al., 2015). Of the seven studies addressing PNF interventions, six of them were under the framework of indicated prevention (Hopper, 2005; Larimer et al., 2012; Lostutter, 2009; Martens et al., 2015; Neighbors et al., 2015; Takushi et al., 2004) and one under a selective prevention approach (Celio & Lisman, 2014). The format of PNF includes a brief intervention that is usually developed in a single session, with an average duration between 10 minutes and 1 hour. Commonly, this strategy elicits a behavioral change by correcting misperceptions of 'typical' behaviors as well as by facilitating a salient discrepancy between perceived and actual norms (Celio & Lisman, 2014; Collins, Carey, & Sliwinski, 2002; Lewis & Neighbors, 2006). This strategy usually addresses the following three topics: first, the individual's gambling behavior; second, the participant's perception of the gambling behavior of his/her referent group, in terms of gender, age and/or origin (e.g., college students); and third, the real gambling behavior of the reference group. It is suggested that college-age gamblers tend to over-estimate others' gambling behavior, in terms of quantity of money wagered and/or time spent on gambling. Comparing the participant's perception to the actual behavior of the

normative group can modify normative beliefs, thus, producing changes in the participant's own gambling behavior (Lostutter, 2009).

The included studies also differed in the types of behavioral interventions. The Cognitive Behavioral Therapy (CBT) approach was used as a comparative intervention in two indicated prevention studies (Larimer et al., 2012; Petry et al., 2009), with a duration between three and six sessions of 1 hour each. The main components of this CBT program addressed functional analysis, cognitive distortions, illusions of control, coping with triggers and relapse prevention strategies. It is worth noting that some other studies also included these topics in an educational condition (Martens et al., 2015; Takushi et al., 2004). In the same way, Petry et al. (2009) used the Motivational Enhancement Therapy (MET) as a target intervention as well as in combination with the CBT approach. During a 50-minute individual session, therapists offered personalized feedback about the participant's gambling behavior. Afterwards, they explored the positive and negative consequences of gambling and discussed an action plan, taking their life goals and values into account.

Despite the fact that most programs addressed knowledge about gambling as a secondary component of the preventive programs, two studies focused specifically on this issue. On the one hand, Celio and Lisman (2014) targeted misperceptions of gambling among college students, in combination with the PNF intervention. Williams and Connolly (2006) focused on improving students' mathematical knowledge related to probability. Specifically, the intervention group differed from the control group in that its content focused on probabilities associated with gambling and included practical labs with reference to specific games of chance, as well as probability concepts taught without a gambling framework. This intervention group also differed from the non-math control group, who were enrolled in either an introductory history or sociology class.

Program effects

The seven studies that used the PNF in their prevention programs generally showed positive results. First, lower risk-taking outcomes in analog measures of gambling were obtained in the short-term assessments (Celio & Lisman, 2014). Moreover, a decrease in the perception of other students' gambling behavior was also obtained by using the PNF strategy, both in short- (Celio & Lisman, 2014; Hopper, 2005) and long-term (Larimer et al., 2012; Neighbors et al., 2015) outcomes. Furthermore, Larimer et al. (2012) reported that the reduction of the discrepancy between the perceived and the actual frequency of gambling behavior mediated the decrease in one's own gambling frequency. Only Lostutter (2009) reported no effect of PNF intervention on modifying perceived norms, possibly due to the application format of his intervention (a web-based application). In the same way, although Hopper (2005) did not find any change in gambling frequency or amount of money wagered at the short-term follow-up, several outcomes regarding reductions in both gambling frequency (Larimer et al., 2012; Takushi et al., 2004) and in the money wagered or lost (Martens et al., 2015; Neighbors et al., 2015) were found in other studies at long-term follow-up. Finally, long-term outcomes showed a reduction in problem gambling behaviors when the PNF approach was incorporated (Lostutter, 2009; Martens et al., 2015; Neighbors et al., 2015; Takushi et al., 2004). However, a number of studies revealed no differences between PNF and control groups (Lostutter, 2009; Takushi et al., 2004) or education/brief advice conditions (Lostutter, 2009; Martens et al., 2015), suggesting the additional effectiveness of other non-specific factors (Hopper, 2005).

In addition to the PNF approach, other interventions also showed positive results regarding both short- and long-term outcomes. Prevention programs using CBT demonstrated a reduction in both illusions of control and gambling consequences at the

long-term follow-up assessment (Larimer et al., 2012). The CBT intervention also provided benefits on some indices of gambling participation when combined with the MET approach (Petry et al., 2009). Moreover, the MET condition alone significantly decreased the problem gambling severity scores and the quantity of money wagered (Petry et al., 2009). The Brief Advice condition was likewise more efficacious than the control group and other experimental conditions in reducing gambling behavior in one of the studies (Lostutter, 2009), and showed benefits in some indices of gambling at the short-term assessment in the research by Petry et al. (2009). Finally, Williams and Connolly (2006), who examined the influence of improving mathematical knowledge based on a gambling framework, found that the intervention group increased their ability to calculate gambling odds and resistance to gambling fallacies at the long-term assessment. However, these improvements did not reflect an overall reduction in gambling behavior.

Discussion

In spite of the fact that young adults have traditionally shown the highest rates of at-risk and problem gambling behavior among adults, most gambling prevention research has been conducted on children and adolescents in school-based settings (Keen et al., 2017; Ladouceur et al., 2013). The present study aimed to address this gap in the literature by examining the efficacy of gambling prevention programs developed for young adults. Three key findings were found. First, all the analyzed studies included prevention strategies targeting young adults enrolled in college settings. Second, such gambling prevention programs mostly followed a selective or indicated prevention strategy under the scope of a harm-reduction model. And third, the existing literature revealed that the PNF approach is the preferred strategy for reducing at-risk or problem

gambling among young adults, showing at least a moderate positive effect in most of the included studies.

The majority of the studies included were under the scope of a harm-reduction framework through which gambling is viewed as a socially acceptable activity that needs to be developed in a responsible way (Ariyabuddhiphongs, 2013; Derevensky, Gupta, Hardoon, Dickson, & Deguire, 2003). Prevention strategies following the harm-reduction model have been identified as useful for gamblers that are capable of making informed choices by weighing the perceived personal benefits of gambling against the associated negative consequences (Dickson, Derevensky, & Gupta, 2004). The nine studies included in this review showed that gambling prevention programs for undergraduates had, in general, good short-term results in reducing illusions of control, increasing knowledge, and decreasing both gambling behaviors and severity rates under the scope of selective or indicated prevention. Only one study (Williams & Connolly, 2006) developed a universal prevention strategy aimed at protecting both gamblers and non-gamblers from the negative consequences of gambling by mainly increasing knowledge and correcting misperceptions or erroneous beliefs, thus assuming that an improvement in knowledge could delay the onset of the first exposure to gambling (which may have been too late). Regarding the type of intervention, most of the studies revealed that the PNF approach is an effective, low cost, and easily disseminated intervention for reducing at-risk gambling as a harm-reduction preventive strategy (Marchica & Derevensky, 2016; Peter et al., 2019). However, it should be implemented with certain caution. Several researchers and clinicians have warned about the use of PNF for the treatment of disordered gambling, due to its lower intervention effects than in-person multi-session treatments (Peter et al., 2019). Moreover, the PNF model may have unintended consequences when targeting low-frequent gamblers by producing a

‘boomerang effect’ (see Marchica & Derevensky, 2016; Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007).

The analyses throughout this systematic review have highlighted some methodological limitations that should be overcome in future research. Firstly, only a limited number of gambling prevention programs were found for this age group. Also, there is a wide array of preventative programs that are being implemented in educational settings or community samples without any formalized assessments having been carried out. Most of these unpublished programs often lack a strong theoretical orientation and/or have been implemented without an empirical evaluation (Derevensky et al., 2003). Only a few of them have been designed under science-based principles or have been systematically tested (Derevensky, 2012; Derevensky et al., 2003; Dickson, Derevensky, & Gupta, 2002; Ferland & Blanchette-Martin, 2013; St-Pierre, Temcheff, Derevensky, & Gupta, 2015). Both the educational system and stakeholders should consider the importance of developing best practices in gambling prevention, harm minimization and harm reduction, with long-term scheduling and realistic funding support to ensure a reliable implementation that allows us to draw clear conclusions (Ladouceur et al., 2013).

Secondly, the wide variability should also be noted of the instruments that are used for assessing problem gambling severity, the periods for follow-up assessments, and the type of outcomes when comparing these prevention programs. Moreover, all studies were carried out in the U.S. or Canada, with a surprising absence of peer-reviewed studies in Europe. Considering that gambling habits may vary depending on cultural contexts, the country’s historical background, or policy issues (Calado & Griffiths, 2016), future studies that focus on assessing the effectiveness of prevention programs in young adults in other countries would be advantageous.

Lastly, all the included studies targeted college students. This is likely due to the ease of accessibility and availability of this captive audience. Whether college students are a truly representative population remains questionable. Not including other subsamples of young adults could limit the generalizability of the conclusions to the general population and therefore, the need to extend gambling prevention programs to other youth populations remains an issue. Future studies should also note that some other variables could lead to difficulties when recruiting potential participants at this stage (Meyer et al., 2015), such as the shame of admitting being a regular gambler or even the fear of being viewed as a disordered gambler. The use of computerized methods may facilitate the development of preventive strategies among the general young adult population, while maintaining the anonymity of participants.

Despite these limitations, the present systematic review indicates that gambling prevention programs show generally good results in the college-student population in reducing gambling frequency and gambling severity. However, ways of evaluating the efficacy of prevention programs must go beyond collecting data on university settings if we are to have confidence in our findings. The use of computerized methods for recruiting young adults from the general population, or the development of preventive programs in workplaces or even gambling venues, could improve the generalization of the results to other populations and the access to settings other than academic ones. Future research studies regarding the effectiveness of environmental preventive strategies (i.e., pop-up messages or limitations on the time of gambling sessions) could also be effective in reducing or limiting problem gambling rates. Finally, the presence of few studies in this systematic review highlights the need to develop more widespread prevention programs that incorporate rigorous methodological and stringent evaluation procedures before they are implemented and disseminated widely.

Tables and Figures

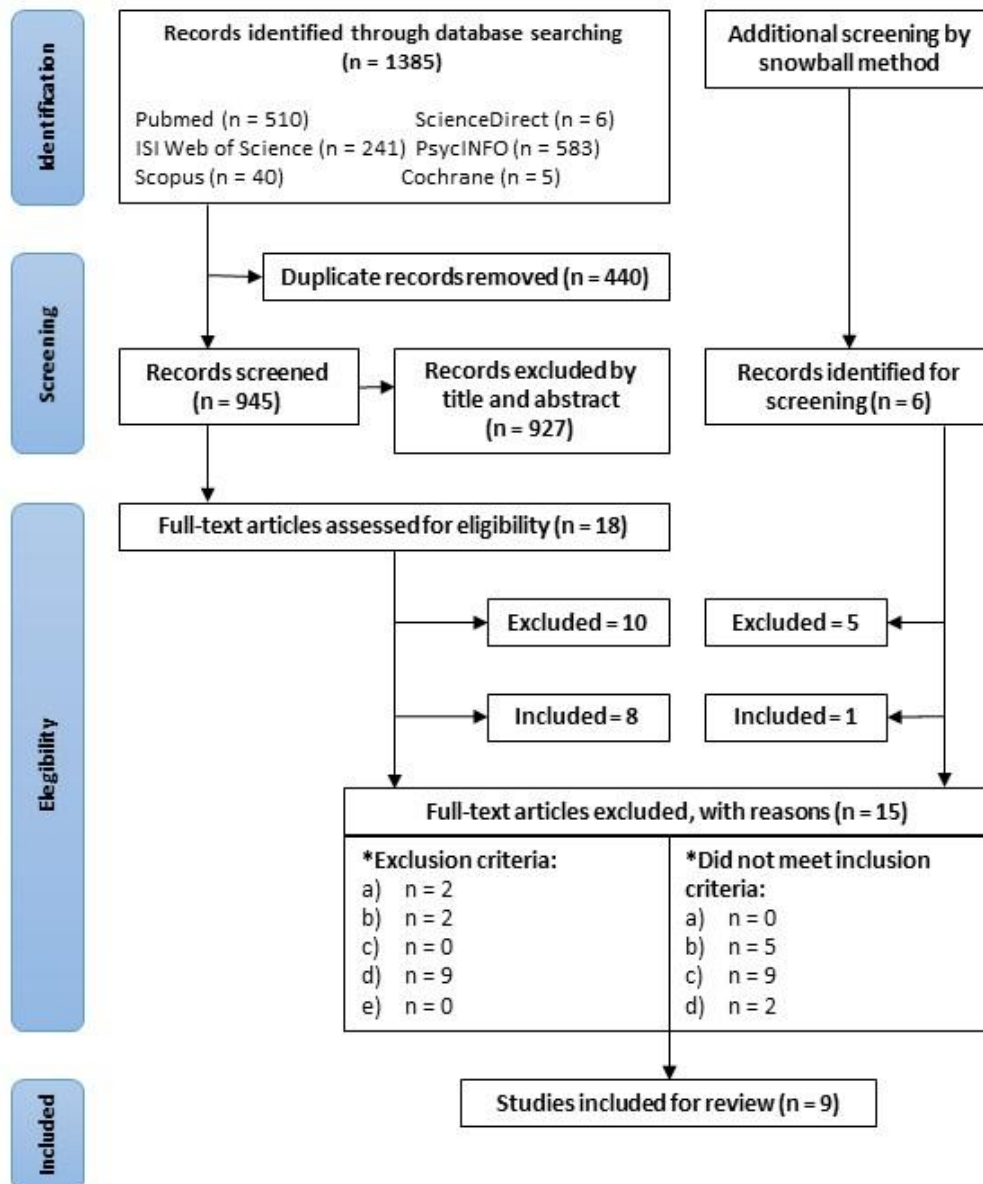


Figure 1. Literature search procedure flowchart, following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards and adapted from Keen et al. (2017).

Note. * = Lettering corresponds to listed criteria in text. Exclusion and inclusion criteria are not exclusive, thus, one article can be excluded for several reasons.

	Selection bias		Performance bias	Detection bias	Attrition bias	Reporting bias	Other bias
	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Other sources of bias
Study 1: Celio and Lisman (2014)	+	+	+	+	+	+	+
Study 2: Hopper (2005)	+	+	+	+	+	+	+
Study 3: Larimer et al. (2012)	+	+	+	+	+	+	+
Study 4: Lostutter (2009)	?	+	+	+	+	+	?
Study 5: Martens, et al. (2015)	+	+	+	+	+	+	+
Study 6: Neighbors, et al. (2015)	+	+	+	+	+	+	+
Study 7: Petry, et al. (2009)	+	+	+	+	+	+	+
Study 8: Takushi, et al. (2004)	+	+	+	+	+	?	+
Study 9: Williams and Connolly (2006)	-	-	?	?	+	?	?

Figure 2. Risk of bias summary of authors' judgments about each study. Adapted from (Ussher, Taylor, & Faulkner, 2008).

Note. Green dot = low risk of bias; Yellow dot = unclear risk of bias; Red dot = high risk of bias.

Table 1
Study characteristics

Program (reference, country)	Main goal	Participants	Method (study design, measuring instruments, duration)	Outcomes (short-term and long-term)
Celio and Lisman (2014). USA.	To evaluate the efficacy of a stand-alone personalized normative feedback (PNF) intervention targeting misperceptions of gambling among college students.	136 undergraduate gamblers. 55% males. Mean age 19 y.o. (range: 17 to 34).	<p><u>Setting:</u> Two conditions: (1) the personalized normative feedback condition (PNF); (2) the attention control condition (control).</p> <p><u>Study design:</u> Each individual was randomly assigned to one of two conditions.</p> <p><u>Measuring instruments:</u></p> <ul style="list-style-type: none"> - The Balloon Analogue Risk Task (BART) - The Pick-A-Card task (PAC) - Gambling Quantity and Perceived Norms scale <p><u>Duration:</u> 1 session.</p>	<p><u>Short-term:</u> After one week, participants receiving PNF showed a marked decrease in perception of other students' gambling, as opposed to participants in the control condition. PNF participants performed lower risk-taking on the two analog measures of gambling, compared to the control group.</p> <p><u>Long-term:</u> no outcomes.</p>
Hopper (2005). USA.	To examine the effectiveness of a brief, computerized, personalized normative feedback intervention for college gambling.	68 undergraduates who were gamblers or showed some signs of at-risk gambling. 90% males. Mean age 21.40 y.o.	<p><u>Setting:</u> Two conditions: (1) The personalized normative feedback condition (PNF); (2) only assessment (control group).</p> <p><u>Study design:</u> Participants were randomly assigned into one of two conditions.</p> <p><u>Measuring instruments:</u></p> <ul style="list-style-type: none"> - South Oaks Gambling Screen (SOGS) - Gambling Readiness to Change Scale (GRTC) - Gambling Problem Index (GPI) - Gambling Quantity and Perceived Norms Scale (GQPN) - Web-based survey <p><u>Duration:</u> Non-specified.</p>	<p><u>Short-term:</u> The intervention did not produce changes at one-month follow-up related to the quantity and the frequency of gambling behavior, and the participants' readiness to change their gambling behavior, compared with the control group. Participants in the intervention group decreased their normative perceptions about how much others gamble, more than in the control group.</p> <p><u>Long-term:</u> No outcomes due to high dropout rates at 3-month follow-up.</p>

Table 1 (continuation)

Study characteristics

Program (reference, country)	Main goal	Participants	Method (study design, measuring instruments, duration)	Outcomes (short-term and long-term)
Larimer et al. (2012). USA.	To evaluate the feasibility and efficacy of two approaches to indicated prevention of disordered gambling in a college population.	147 college students, scoring at-risk or probable pathological gambling. 65.3% males. Mean age 21.23 y.o. (range 19 - 25).	<u>Setting:</u> Three conditions: (1) the personalized feedback intervention (PFI); (2) the cognitive-behavioral intervention (CBI); (3) the assessment-only control (AOC). <u>Study design:</u> Randomized control trial. <u>Measuring instruments:</u> -Gambling frequency, expenditure and perceived norms (GQPN) -Gambling problems (GPI) -Pathological gambling (NODS) -Illusions of control (BACS) <u>Duration:</u> PFI 1 session, 60-90 minutes; CBI 4-6 group sessions, 60 minutes.	<u>Short-term:</u> More participants completed PFI (88.46%) compared to attending 1 session or more of CBI (59.09%). No short-term assessment. <u>Long-term:</u> At 6-month follow-up, both PFI and CBI were associated with reduced gambling consequences and DSM-IV criteria. PFI showed reductions in gambling frequency and perceived norms compared with AOC. Changes in perceived norms mediated the relationship between PFI and gambling frequency. CBI showed reductions in illusions of control.
Lostutter (2009). USA.	To test a web-based prevention program for disordered gamblers	168 college students scoring at-risk or probable pathological gambling. 29.7% females. Mean age 19.50 y.o.	<u>Setting:</u> Four conditions: (1) brief advice for gambling (BAG); (2) personalized normative feedback (PNF); (3) combined advice and norms (CAN); (4) assessment-only condition (AOC). <u>Study design:</u> Randomized control trial <u>Measuring instruments:</u> - South Oaks Gambling Screen (SOGS) - Gambling Problem Index (GPI) - Gambling Quantity, Perceived Norms Scale (GQPN) - Gambling Protective Behaviors Scale - Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST V3.0) - Know Limits Internet Survey Satisfaction Survey <u>Duration:</u> 1 session.	<u>Short-term:</u> Brief advice was more efficacious than the control group in reducing quantity of gambling. There was no effect of the PNF or CAN interventions alone on gambling behavior or perceived norms, nor were either of these interventions more efficacious than the control on any gambling outcome. At 1-month post-intervention follow-up, all groups reported reductions in their gambling behavior. All interventions combined were more efficacious than control for producing increases in long-term harm reduction protective behaviors and for using money limiting strategies. <u>Long-term:</u> No outcomes.

Table 1 (continuation)

Study characteristics

Program (reference, country)	Main goal	Participants	Method (study design, measuring instruments, duration)	Outcomes (short-term and long-term)
Martens, Arterberry, Takamatsu, Masters, and Dude (2015). USA.	To examine the efficacy of a personalized feedback only intervention (PFB) among at-risk college student gamblers.	333 college students scoring at-risk for problem gambling. Males: 62% PFB; 58% EDU; 59% AO. Mean age: 21.69 y.o. PFB; 22.19 y.o. EDU; 21.84 y.o. AO.	<u>Setting:</u> Three conditions: (1) personalized feedback only intervention (PFB); (2) education only (EDU); (3) assessment only (AO). <u>Study design:</u> Randomization of participants stratified by gender into one of the three conditions. <u>Measuring instruments:</u> - Gambling quantity/frequency (GTF) - Canadian Problem Gambling Index (CPGI) - Intervention fidelity <u>Duration:</u> 1 session, 10 minutes.	<u>Short-term:</u> No outcomes. <u>Long-term:</u> At 3-month follow-up, individuals in PFB reported fewer dollars gambled and fewer gambling-related problems than those in the AO condition. No differences were found between the PFB and EDU conditions.
Neighbors et al. (2015). USA.	To evaluate a computer-delivered PNF intervention for problem gambling college students.	252 college students scoring at-risk or problem gambling. 59.5% males. Mean age 23.10 y.o.	<u>Setting:</u> Two conditions: (1) a gender-specific normative feedback; (2) an attention-control feedback, control group. <u>Study design:</u> Randomization of participants stratified by gender and gambling severity. <u>Measuring instruments:</u> - South Oaks Gambling Screen (SOGS) - Gambling Quantity and Perceived Norms Scale (GQPN) - The Gambling Problems Index (GPI) - Measure of Identification With Groups <u>Duration:</u> 1 session, 1 hour.	<u>Short-term:</u> No outcomes. <u>Long-term:</u> At 3-month follow-up, significant intervention effects were found in reducing perceived norms for quantities lost and won, and in reducing actual quantity lost and gambling problems. At 6 month follow up, all intervention effects, except reduced gambling problems, remained stable.

Table 1 (continuation)

Study characteristics

Program (reference, country)	Main goal	Participants	Method (study design, measuring instruments, duration)	Outcomes (short-term and long-term)
Petry, Weinstock, Morasco and Ledgerwood (2009). USA.	To examine the efficacy of brief intervention strategies in college students	117 college students scoring problem and pathological gambling. Males: 78.1% Brief Advice; 86.7% MET; 90.5% MET + CBT; 85.3% Control. Mean age: 20.20 y.o. Brief Advice; 20.50 y.o. MET; 20.10 y.o. MET + CBT; 20.50 Control.	<u>Setting:</u> Four conditions: (1) brief advice; (2) motivational enhancement therapy (MET); (3) MET + cognitive behavioral therapy (MET + CBT); (4) assessment-only control. <u>Study design:</u> Randomized control trial. <u>Measuring instruments:</u> - National Opinion Research Center DSM-IV Screen for Gambling Problems (NODS) - Addiction Severity Index-Gambling section (ASI-G); - TimeLine Followback (TLFB) - Treatment Service Review (TSR) <u>Duration:</u> Brief advice: 1 session, 10 minutes; MET: 1 session; MET + CBT: 1 + 3 sessions.	<u>Short-term:</u> Compared to the assessment-only condition, those receiving any intervention had significant decreases in ASI-G scores and days and dollars wagered over time. The brief advice and MET+CBT conditions had benefits on some, but not all, indices of gambling. None of the interventions differed significantly from one another. <u>Long-term:</u> Gambling was assessed at baseline, week 6, and month 9 using the Addiction Severity Index-Gambling (ASI-G) module, which also assesses days and dollars wagered. The MET condition significantly decreased ASI-G scores and dollars wagered over time.
Takushi et al. (2004). USA.	To assess the effects of an intervention aimed to reduce gambling and drinking behavior in a group of at-risk gamblers.	28 college students scoring at-risk for problem gambling. 18 males and 3 females at follow-up. Age 18 – 21 y.o.	<u>Setting:</u> Two conditions: (1) personalized feedback intervention (PFI); (2) assessment-only control group. <u>Study design:</u> randomization of participants to conditions. <u>Measuring instruments:</u> - South Oaks Gambling Screen (SOGS) - Gambling Severity Index (GSI) - Gambler's Self-Report Inventory (GSRI) <u>Duration:</u> 1 session, 45 - 60 minutes.	<u>Short-term:</u> No outcomes. <u>Long-term:</u> At 3-month follow-up, a reduction in both groups was found in terms of gambling behavior (frequency and severity). Among the PFI group, a higher reduction in the number of episodes of drinking and gambling was found at the same time.

Table 1 (continuation)

Study characteristics

Program (reference, country)	Main goal	Participants	Method (study design, measuring instruments, duration)	Outcomes (short-term and long-term)
Williams and Connolly (2006). Canada.	To examine the influence of improved knowledge of odds and mathematical expectation on the gambling behavior of university students.	470 undergraduates. 55% females. Mean age 20.80 y.o.	<p><u>Setting:</u> Three conditions: (1) intervention group; (2) math-control group; (3) non-math control group.</p> <p><u>Study design:</u> Non-randomized control trial.</p> <p><u>Measuring instruments:</u></p> <ul style="list-style-type: none"> - Gambling Math Skill Scale - Gambling Fallacies Scale - Gambling Attitudes Scale - Gambling behavior in the prior 6 months - Canadian Problem Gambling Index (CPGI) <p><u>Duration:</u> Intervention group: 39 lectures (50 minutes) and 13 labs (50 minutes).</p>	<p><u>Short-term:</u> No outcomes.</p> <p><u>Long-term:</u> Students receiving the intervention demonstrated superior ability to calculate gambling odds as well as awareness of and resistance to gambling fallacies 6 months after the intervention. However, this improvement in knowledge and skill was not associated with any decreases in actual gambling behavior, the likelihood of being a problem gambler, attitudes toward gambling, or the amount of money or time spent in gambling.</p>

References

- Arcuri, A. F., Lester, D., & Smith, F. O. (1985). Shaping adolescent gambling behavior. *Adolescence*, *20*(80), 935-938.
- Ariyabuddhiphongs, V. (2013). Problem gambling prevention: before, during, and after measures. *International Journal of Mental Health and Addiction*, *11*(5), 568-582. doi: 10.1007/s11469-013-9429-2
- Black, D. W., & Shaw, M. (2019). The epidemiology of gambling disorder. In A. Heinz, N. Romanczuk-Seiferth & M.N. Potenza (Eds.), *Gambling Disorder* (pp. 29-48): Springer.
- 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. doi: 10.1556/2006.5.2016.073
- Celio, M. A., & Lisman, S. A. (2014). Examining the efficacy of a personalized normative feedback intervention to reduce college student gambling. *Journal of American College Health*, *62*(3), 154-164. doi: 10.1080/07448481.2013.865626
- Collins, S. E., Carey, K. B., & Sliwinski, M. J. (2002). Mailed personalized normative feedback as a brief intervention for at-risk college drinkers. *Journal of Studies on Alcohol*, *63*(5), 559-567. doi: 10.15288/jsa.2002.63.559
- Derevensky, J. (2012). *Teen gambling: Understanding a growing epidemic*. New York: Rowman & Littlefield Publishing.
- Derevensky, J. L., Gupta, R., Hardoon, K., Dickson, L., & Deguire, A. E. (2003). Youth Gambling. Some social policy issues. In G. Reith (Ed.), *Gambling: Who wins? Who loses?* New York: Prometheus Books.

Derevensky, J. L., Gupta, R., Dickson, L., & Deguire, A. E. (2005). Prevention efforts toward reducing gambling problems. In J. L. Derevensky & R. Gupta (Eds.), *Gambling problems in youth* (pp. 211-230). Boston, MA: Springer.

Dickson, L., Derevensky, J. L., & Gupta, R. (2004). Youth gambling problems: A harm reduction prevention model. *Addiction Research & Theory*, *12*(4), 305-316. doi: 10.1080/1606635042000236466

Dickson, L. M., Derevensky, J. L., & Gupta, R. (2002). The prevention of gambling problems in youth: A conceptual framework. *Journal of Gambling studies*, *18*(2), 97-159.

Engwall, D., Hunter, R., & Steinberg, M. (2004). Gambling and other risk behaviors on university campuses. *Journal of American College Health*, *52*(6), 245-256. doi: 10.3200/JACH.52.6.245-256

Ferland, F., & Blanchette-Martin, N. (2013). Universal, indicated, and selective prevention for youth gambling. In P. M. Miller, S. A. Ball, M. E. Bates, A. W. Blume, K. M. Kampman, D. J. Kavanagh, M. E. Larimer, N. M. Petry & P. De Witte (Eds.), *Comprehensive addictive behaviors and disorders, Vol. 3: Interventions for addiction* (pp. 875-881). San Diego, CA: Elsevier Academic Press.

Ferris, J. A., & Wynne, H. J. (2001). *The Canadian Problem Gambling Index*: Canadian Centre on Substance Abuse Ottawa, ON.

Gerstein, D., Volberg, R. A., Toce, M. T., Harwood, H., Johnson, R. A., Buie, T., . . . Engelman, L. (1999). Gambling impact and behavior study: Report to the national gambling impact study commission. *Chicago: National Opinion Research Center*.

Higgins, J. P. T., & Green, S. (2011). *Cochrane handbook for systematic review of interventions* version 5.1.0 [updated March 2011]. The Cochrane Collaboration. 2011. Available from www.cochrane-handbook.org.

Hopper, R. A. H. (2005). *A brief electronic personalized normative feedback intervention for the prevention of problematic gambling among college students*: Oklahoma State University.

Institute of Medicine, Division of Mental Health Behavioral Medicine. (1990). *Broadening the base of treatment for alcohol problems*: National Academy Press.

Karlsson, A., & Håkansson, A. (2018). Gambling disorder, increased mortality, suicidality, and associated comorbidity: A longitudinal nationwide register study. *Journal of Behavioral Addictions*, 7(4), 1091-1099. doi: 10.1556/2006.7.2018.112

Keen, B., Blaszczynski, A., & Anjoul, F. (2017). Systematic review of empirically evaluated school-based gambling education programs. *Journal of Gambling Studies*, 33(1), 301-325. doi: 10.1007/s10899-016-9641-7

Kourgiantakis, T., Stark, S., Lobo, D. S. S., & Tepperman, L. (2016). Parent problem gambling: A systematic review of prevention programs for children. *Journal of Gambling Issues*, (33), 8-29. doi: 10.4309/jgi.2016.33.2

Ladouceur, R., Goulet, A., & Vitaro, F. (2013). Prevention programmes for youth gambling: a review of the empirical evidence. *International Gambling Studies*, 13(2), 141-159. doi: 10.1080/14459795.2012.740496

Larimer, M. E., Neighbors, C., Lostutter, T. W., Whiteside, U., Crouce, J. M., Kaysen, D., & Walker, D. D. (2012). Brief motivational feedback and cognitive behavioral interventions for prevention of disordered gambling: a randomized clinical trial. *Addiction*, 107(6), 1148-1158. doi: 10.1111/j.1360-0443.2011.03776.x

Lesieur, H. R., & Blume, S. B. (1987). The South Oaks Gambling Screen (SOGS): A new instrument for the identification of pathological gamblers. *American Journal of Psychiatry*, *144*(9), 1184-1188. doi: 10.1176/ajp.144.9.1184

Lesieur, H. R., & Blume, S. B. (1991). Evaluation of patients treated for pathological gambling in a combined alcohol, substance abuse and pathological gambling treatment unit using the Addiction Severity Index. *British Journal of Addiction*, *86*(8), 1017-1028.

Lesieur, H. R., & Blume, S. B. (1992). Modifying the Addiction Severity Index for use with pathological gamblers. *American Journal on Addictions*, *1*(3), 240-247. doi: 10.3109/10550499209004026

Lewis, M. A., & Neighbors, C. (2006). Social norms approaches using descriptive drinking norms education: A review of the research on personalized normative feedback. *Journal of American College Health*, *54*(4), 213-218. doi: 10.3200/JACH.54.4.213-218

Lostutter, T. W. (2009). *A randomized clinical trial of a web-based prevention program for at-risk gambling college student*: University of Washington.

Marchica, L., & Derevensky, J. L. (2016). Examining personalized feedback interventions for gambling disorders: A systematic review. *Journal of Behavioral Addictions*, *5*(1), 1-10. doi: 10.1556/2006.5.2016.006

Martens, M. P., Arterberry, B. J., Takamatsu, S. K., Masters, J., & Dude, K. (2015). The efficacy of a personalized feedback-only intervention for at-risk college gamblers. *Journal of Consulting and Clinical Psychology*, *83*(3), 494. doi: 10.1037/a0038843

Meyer, C., Bischof, A., Westram, A., Jeske, C., Brito, S., Glorius, S., . . . Kastirke, N. (2015). The "Pathological Gambling and Epidemiology"(PAGE) study

program: design and fieldwork. *International Journal of Methods in Psychiatric Research*, 24(1), 11-31.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Medicine*, 6(7), e1000097. doi: 10.1371/journal.pmed.1000097

Monaghan, S., Blaszczyński, A., & Nower, L. (2009). Do warning signs on electronic gaming machines influence irrational cognitions? *Psychological Reports*, 105(1), 173-187. doi: 10.2466/PRO.105.5.173-187

Neighbors, C., Lostutter, T. W., Larimer, M. E., & Takushi, R. Y. (2002). Measuring gambling outcomes among college students. *Journal of Gambling Studies*, 18(4), 339-360. doi: 10.1023/A:1021013132430

Neighbors, C., Rodriguez, L. M., Rinker, D. V., Gonzales, R. G., Agana, M., Tackett, J. L., & Foster, D. W. (2015). Efficacy of personalized normative feedback as a brief intervention for college student gambling: a randomized controlled trial. *Journal of Consulting and Clinical Psychology*, 83(3), 500. doi: 10.1037/a0039125

Nowak, D. E., & Aloe, A.M. (2018). A meta-analytical synthesis and examination of pathological and problem gambling rates and associated moderators among college students, 1987–2016. *Journal of Gambling Studies*, 34(2), 465-498. doi: 10.1007/s10899-017-9726-y

Oh, B. C., Ong, Y. J., & Loo, J. M. Y. (2017). A review of educational-based gambling prevention programs for adolescents. *Asian Journal of Gambling Issues and Public Health*, 7(1), 4. doi: 10.1186/s40405-017-0024-5

Peter, S. C., Brett, E. I., Suda, M. T., Leavens, E. L. S., Miller, M. B., Leffingwell, T. R., . . . Meyers, A. W. (2019). A meta-analysis of Brief Personalized

Feedback Interventions for problematic gambling. *Journal of Gambling Studies*, 1-18.

doi: 10.1007/s10899-018-09818-9

Petry, N. M. (2002). A comparison of young, middle-aged, and older adult treatment-seeking pathological gamblers. *The Gerontologist*, 42(1), 92-99.

Petry, N. M., Weinstock, J., Morasco, B. J., & Ledgerwood, D. M. (2009). Brief motivational interventions for college student problem gamblers. *Addiction*, 104(9), 1569-1578. doi: 10.1111/j.1360-0443.2009.02652.x.

Petry, N. M. (2007). Psychometric properties of the Addiction Severity Index in pathological gamblers. *American Journal on Addiction*, 16, 272-282.

Schultz, P. W., Nolan, J. M., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2007). The constructive, destructive, and reconstructive power of social norms. *Psychological Science*, 18(5), 429-434.

Shaffer, H. J., Hall, M. N., & Vander Bilt, J. (1999). Estimating the prevalence of disordered gambling behavior in the United States and Canada: a research synthesis. *American Journal of Public Health*, 89(9), 1369-1376.

St-Pierre, R. A., Temcheff, C. E., Derevensky, J. L., & Gupta, R. (2015). Theory of planned behavior in school-based adolescent problem gambling prevention: a conceptual framework. *The Journal of Primary Prevention*, 36(6), 361-385. doi: 10.1007/s10935-015-0404-5

Takushi, R. Y., Neighbors, C., Larimer, M. E., Lostutter, T. W., Cronce, J. M., & Marlatt, G. A. (2004). Indicated prevention of problem gambling among college students. *Journal of Gambling Studies*, 20(1), 83-93. doi: 10.1023/B:JOGS.0000016705.58903.8f

Ussher, M. H., Taylor, A., & Faulkner, G. (2008). Exercise interventions for smoking cessation. *Cochrane Database of Systematic Reviews*(4). doi: 10.1002/14651858.CD002295.pub5.

Welte, J. W., Barnes, G. M., Tidwell, M. C. O., Hoffman, J. H., & Wieczorek, W. F. (2015). Gambling and problem gambling in the United States: Changes between 1999 and 2013. *Journal of Gambling Studies*, *31*(3), 695-715. doi: 10.1007/s10899-014-9471-4

Williams, R. J., & Connolly, D. (2006). Does learning about the mathematics of gambling change gambling behavior? *Psychology of Addictive Behaviors*, *20*(1), 62. doi: 10.1037/0893-164X.20.1.62

Winters, K. C., Stinchfield, R. D., Botzet, A., & Anderson, N. (2002). A prospective study of youth gambling behaviors. *Psychology of Addictive Behaviors*, *16*(1), 3. doi: 10.1037//0893-164X.16.1.3