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Problem Gambling Prevention for Children, Adolescents and Young Adults: a Narrative Literature Review

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Keywords

Adolescent; child; young adult; primary prevention; gambling

Abstract

Aim: Numerous consequences of problem gambling (PG) affect individuals and families, so prevention of PG among the youngest is of high importance. This review points to the preventive interventions for children, adolescents and young adults based on multidimensional constructs to draw a comprehensive picture of this growing field. **Materials and Methods:** PubMed and Google Scholar were utilized to research literature and 17 studies met inclusion criteria. **Results:** Results show that PG prevention for adolescents and children are mostly school-based programs, which are primarily effective in improving the knowledge about gambling, correcting cognitive misconceptions, superstitious thinking and strengthening healthy attitudes. Programs that produce behavioural changes are those with an integrated prevention approach. Prevention among young adults is based on brief interventions providing feedback to those involved. **Conclusion:** The methodology in applied studies varies greatly, making it difficult to draw firm conclusions. Future studies on PG preventive interventions should follow consistent measurement of prevention outcomes, as exact behavior changes.

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Introduction

Why focus on problem gambling preventive interventions for children, adolescents and young adults?

Definitions and diagnostic criteria of addictive disorders have undergone numerous changes in the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) and the Eleventh Revision of the International Classification of Diseases (ICD-11) since their forerunners were published over 20 years ago. Gambling and gaming disorders are increasingly being accepted as addictive disorders [1].

The prevalence of gambling disorder (GD) globally is between 0.01 to 10.6 % in the adult population [2-3]. Adolescence is a critical period of brain sensitivity for developing problem gambling (PG) [4]. Due to the dynamic developmental period, the term problem gambling is used for GD in childhood and adolescence [5]. Problem gambling is a persistent gambling behavior that remains despite adverse consequences in significant areas of everday life and negatively affects functioning [6]. Globally, 0.2 % - 12.3 % of adolescents meet the criteria for PG and 10 % - 15 % are at risk of developing severe problems caused by gambling activities [7]. The risk

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for developing PG is higher in males, ethnic minorities, those with positive family history, older adolescents, online gamblers, with positive attitudes toward gambling, psychoactive substance usage, low socioeconomic status, and sensation seeking behaviour [8,9]. About ten percent of children gamble before the age of 15, and about one percent of them are already problem gamblers. The earlier they start gambling, the greater the risk of developing a more severe form of PG [10]. Numerous psychological, social, and financial consequences of PG affect individuals and families, e.g., dropping out of school, social isolation, deviant behaviour, lack of money, mental health disturbances, and comorbid addictions [11,12].

Today, more than half of gambling activities occur online, which is convenient and attractive for the youngest [13,14]. Online gambling is associated with more severe consequences and higher prevalence of PG [15,16]. The problem of online gambling has been on the rise since the beginning of the COVID-19 pandemic because time spent online has increased, treatment has never been less accessible, and legislation is failing to keep up with this growing trend [17-19]. Therefore, prevention of PG among the youngest is more necessary than ever [20,21].

Most of prevention interventions are based on the harm reduction model [22]. The model focuses on identifying risky behaviour and protective factors [23]. Its main objective is to raise awareness and knowledge about at-risk behaviour to delay the onset of gambling in children and adolescents [23].

This review points to the existing preventive interventions for children, adolescents and young adults based on multidimensional constructs that include psychological and psychosocial aspects to draw a comprehensive picture of this growing field. In this review, we focus on: 1) PG prevention interventions for children, adolescents and young adults 2) The outcomes and specific characteristics of these interventions.

Over the last twenty years, numerous review articles have been written on preventive interventions for addiction in children and adolescents. Most of these review articles focus on substance abuse, while a smaller number of review articles relate to PG [24]. There are several review papers on school-based preventive programs for children and adolescents and few reviews related to preventive interventions for young adults [25-27]. However, very few reviews attempt to synthesize all quality existing preventive interventions for the mentioned young age groups [28]. This narrative review aims to integrate comprehensive knowledge on quality preventive interventions for children, adolescents, and young adults, with an emphasis on the latest literature. The specific objective of this review is to analyze preventive interventions aimed at children, adolescents, and young adults and detaily discuss their specific features and differences.

The review structure includes four themes:

1. PG prevention programs for children (1-13 years) and their outcomes
2. PG prevention programs for adolescents (14-19 years) and their outcomes
3. PG prevention programs for both children (1-13 years) and adolescents (14-19 years)
4. PG preventive interventions for young adults (20-24 years) and their outcomes

Materials and Methods

We utilized PubMed and Google Scholar to research literature and identify publications that address PG preventive interventions for children, adolescents and young adults. Key search terms used were: problem(atic) gambling, pathological gambling, gambling disorder, children, adolescents, youth, young adults, students, prevention, programs, intervention. The literature search was limited to last twenty years because the first significant original scientific articles on PG in young age groups emerge during that time period. Literature review identified 2,456 papers (all articles identified from the full lists of PubMed and Google Scholar searches when using above-mentioned keywords) mostly originating from the USA, Canada, Portugal, Italy, Croatia, China and Spain.The two reviewers reached a consensus on including seventeen (17) studies in this review, which met inclusion criteria:

1. Publications in English or availability of an English translation
2. Peer-reviewed journals
3. Studies of children, adolescents and/or young adults
4. Studies (regardless of a design) focused on primary or secondary PG prevention

Studies that used at least one outcome measure of preventive intervention: knowledge on gambling (true facts on profit of gambling industry, definition of gambling, epidemiology data etc.), attitudes (strong determination to resist gambling, gambling associating with negative emotions), misconceptions (the illusion of control over the outcome of a game, believing that gambling can result in substantial earnings, etc.), developing psychosocial skills, gambling and PG prevalence, PG severity, etc.

Studies without evaluations of prevention outcomes, qualitative studies and studies of adult humans were the basis of exclusion criteria. Both reviewers then independently conducted a focused literature review of full-texts of included articles.

Results

Problem gambling prevention programs for children

Todirita and Lupu's program uses specially designed software for children to overcome gambling misconcep-

tions, build healthy attitudes and develop critical, independent thinking through real-life situations created by the software [29]. The authors believe that using software is a fun and inexpensive way to correct cognitive distortions about gambling in elementary school students. The program is led by specialist in gambling. The effectiveness of software was compared with rational emotive education (REE) and with control group. REE focuses on learning problem-solving skills while boosting one's emotional resilience by helping recognize irrational beliefs and replacing them with rational beliefs [29]. The difference between groups was assessed through an instrument composed of 38 questions that covered illusion of control, misconceptions, attitudes, and cognitive errors. Results show the software improves knowledge more than rational emotive education (REE) [29]. This software-based program is effective in improving the correct knowledge about gambling and correcting cognitive misconceptions both in long and short-term [29].

The Walther's program is composed of four units intended for gambling, internet use, online communication, and playing computer games [30]. Each unit lasts for 90 minutes. It is based on interactive discussion about one's own behavior regarding abovementioned activities and how to recognize excessive use and addiction [30]. In gambling unit children learn about gambling by sharing their own experience, through real cases and a game show. The program is led by trained teachers. The goal of the unit is to recognize gambling among other games, identify gambling disorder, understand how addiction arises from gambling, understand the actual odds of winning, identify most common misconceptions about gambling, and recognize the profits of the gambling industry [30]. Measured outcomes in the evaluation study included lifetime gambling, gambling frequency, gambling knowledge and misconceptions through questions specifically designed for this research. Problem gambling was also assessed using the Gambling Attitudes and Beliefs Scale. The results were compared to control group. Walther's program seems to increase knowledge about gambling and improve accurate gambling attitudes in the short-term. It reduces the number of those currently engaging in gambling, but does not reduce lifetime gambling [30]. Effectiveness in causing

Table 1. Studies of problem gambling prevention programs for children and their outcomes

Program	Participants	Study	Objectives	Program description	Evaluation	Short-term outcomes	Long-term outcomes
Todirita and Lupu, 2013.	Romania, n = 81 (29 in software IG[a], 28 in REE IG, 24 in CG[b]) (age 12 - 13)	case-control study	- education about gambling misconceptions	- educational meetings assisted with software	-effectiveness - at the end - 10-week follow-up - 38-item questionnaire about illusion of control, misconceptions, attitudes, cognitive errors	- increases corrected knowledge on gambling - reduces gambling misconceptions	- increases corrected knowledge about gambling - reduces gambling misconceptions
Walther et al., 2013.	Germany, n = 2,109 (888 in IG, 1221 in CG) (mean age = 12) -	case-control study	- education - changing gambling misconceptions - reducing gambling behaviour	- lesson on how to recognize gambling activities, PG symptoms, addictive potential of gambling, real chances for winning, gambling industry	- effectiveness - at the end - specifically designed questions about lifetime gambling, gambling frequency, gambling knowledge, misconceptions - attitudes and misconceptions are assessed using Gambling Attitudes and Beliefs Scale	- increases corrected knowledge on gambling - improves gambling attitudes - reduces gambling prevalence	

permanent positive behavioural changes and long-term results are not tested [30].

Problem gambling prevention programs for adolescents

Williams' program conveys content in an entertaining manner (e.g., interesting videos, engaging program providers with attractive teaching style) and empasizes the practical usage of knowledge and changing gambling stimulating factors in real situations [31]. The program consists of five lessons. In the first lesson, students learn about the history of gambling. In the second lesson, they learn how to recognize PG and where to find help for addictive bahaviour, decreasing misconceptions about gambling such as the illusion of control over the outcome of game or misunderstanding the randomness of winning. The fourth lesson focuses on decision-making, problem-solving and teaching how to approach life as a smart gambler, meaning that at any given moment of gambling, one knows the odds and whether there is a possibility of losing. In the fifth lesson, students learn about the obstacles to make correct decisions, with an emphasis on peer pressure [31]. Besides the intervention and control groups, it introduces the booster group, which includes a quiz one month after the last program lesson with the aim of repeating learnt material [31]. Assessment was conducted using scales specifically designed for this research to gather information about students' attitudes towards gambling, their knowledge about gambling, acquired decision-making and problem-solving skills, involvement in risky activities, and data on gambling activity. Cognitive distortions were measured using the Gambling Fallacies scale developed by Moore and Ohtsuka [31]. Problem gambling in the past year was measured using the DSM-IV-Multiple Response-Juvenile [31]. The study shows the programe increases knowledge about gambling, creates more healthy attitudes towards gambling, reduces gambling misconceptions, improves decision-making and problem-solving skills with behavioural changes in short and long term (with the best results in the booster group). The program seems helpful for all adolescent groups, including those students with PG-related problems [31].

Donati's program focuses on knowledge about gambling, gambling misconceptions, probabilistic reasoning, superstitious thinking, combining different learning methods, such as playing real games, using presentations, videos, and discussions [32]. The program consists of two units, each lasting two hours with a one-week interval. The program is led by trained psychologists [32]. Gambling behavior was measured using the South Oaks Gambling Screen-Revised for Adolescents (SOGS-RA) and questions adapted from the DSM-III criteria for PG symptoms. The validated scale Questionnaire of Attitudes and Knowledge About Gambling, was utilized for assessing knowledge and misconceptions. Probabilistic reasoning was evaluated using the Gambler's Fallacy Task. Perception of economic profit in the gambling industry was assessed using the validated scale Gambling Attitude Scale. The Superstitious Thinking Scale was used to measure superstitious thinking [32]. The study evaluation includes intervention and control group. It strengthens the protective factors (correcting knowledge about gambling, reducing superstitious thinking, learning about gambling economic profitability), in both non-risk and at risk gamblers (except for gambling misconceptions which are not reduced in the at risk gamblers group). The results show the reduced overall number of adolescents engaging in gambling and at-risk/problem gamblers at the follow up [32].

Canale's web-based program consists of identifying problem gamblers, providing feedback about gambling assessment and interactive activities [33]. This web program aims to reduce gambling and correct attitudes and beliefs about gambling. It consists of online assessment, feedback, and interactive online training activities. The first step involves collecting data about participants and their gambling patterns. Next, the students receive information about the severity of their gambling [33]. Following this, the student is provided with a list of consequences of gambling and a set of activities to mitigate these consequences. Subsequently, students engage in a three-week online training, which essentially is a gambling quiz. The key difference between the intervention and control groups is that the intervention group completes the online training [33]. Gambling behavior was measured using the SOGS-RA, while attitudes towards gambling were assessed using the Gambling Attitude Scale. The study shows that the intervention reduces gambling problems and frequency in the frequent gamblers group. The program corrects misconceptions related to the profitability of gambling in that group [33].

Calado's program is a weekly program that aims to address all risk factors for the onset of PG, such as poor knowledge, sensation seeking, and underdeveloped decision-making skills, based on establishing strong relationship between a trainer and a participant [8]. The program is based on didactic units about gambling given by specially trained experts. These units consist of introduction games, quizzes, discussions, real-life situations, fostering critical thinking, reducing sensation seeking and learning to work in pairs. The results were compared with a control group. Gambling behavior was assessed using tailored questions for the purpose of this study, such as how often one gambled in the last two months. Other instruments included validated scales: the Questionnaire of Misconceptions and Knowledge About Gambling, DSM-IV-Multiple Response-Juvenile, Attitudes Towards

Gambling Scale, and Brief Sensation Seeking Scale [8]. The program seems to increase knowledge about gambling, strengthen healthy attitudes, reduce misconceptions, and the number of at-risk and problem gamblers, and decrease the total hours spent gambling per week. These findings are stable after a 6-week follow-up. The intervention does not affect gambling frequency and the amount of money spent gambling, and does not reduce sensation seeking [8].

In Tani's program, which highlights importance of educating teachers about the harmful effects of gambling among adolescents, teachers transfer their knowledge about gambling during their daily work with students, without a special designed gambling intervention [34]. All involved teachers undergo comprehensive education on gambling and its harmful consequences [34]. Outcome measures for teachers included knowledge, attitudes, and misconceptions, assessed through questions about types of gambling games, risks associated with gambling, and knowledge about gambling advertising. To assess students' gambling behavior, the SOGS-RA was used. The Gambling Related Cognitions Scale was employed to evaluate cognitive distortions, and attitudes were assessed using the Gambling Attitude Scale. The longitudinal study shows that it reduces the prevalence of at-risk gamblers and problem gamblers, and enables overcoming gambling misconceptions. The trained teachers improved their knowledge compared to control [34].

Dodig Hundrić's program is based on workshops to educate students and help them improve their coping skills, peer resistance, self-advocacy, problem solving skills, critical thinking [35]. The program also tries to strengthen parents' support in the form of an interactive lecture on multiple aspects of gambling [35]. The program comprises nine sessions led by specially trained experts, usually spanning over nine weeks with each session lasting about 45 minutes. Additionally, there is a two-hour interactive talk with parents and another two-hour interactive session involving the entire school personnel. First, students get to know the program facilitators. Then, they learn about gambling and its harm. Following that, they delve into misconceptions about gambling. They learn essential life skills, such as resisting peer pressure. In the end, they consolidate what they have learned and receive a certificate of program completion. The program was implemented in several different high schools with the aim of testing the universality of the program, i.e., whether it is applicable to students in grammar schools as well as to students from technical schools. The evaluation study is uncontrolled. The questions were specially designed for these outcomes measures: gambling behavior, knowledge on gambling, problem-solving skills, resisting peer pressure skills. Validated scales used in this study were: the Gambling-Related Cognitive Beliefs Scale, the Generalised Self-Efficacy Scale, Problem Gambling Severity Scale [35]. The study shows that the program increases knowledge and decreases gambling illusion of control, probabilistic reasoning, and superstitious thinking. It applies to all students regardless of PG risk, gender, type of high school program, gambling behaviour, and school success. It reduces the prevalence of sports betting and lottery among male adolescents, but with overall low mean scores for gambling frequency. Results show that the program is less effective in improving coping skills [35].

Chóliz's program is led by a trained psychologist and consists of two sessions which are delivered through videos based on real-life testimonies of individuals struggling with gambling disorder. One is dedicated to onsite gambling, and the second one focuses on online gambling [36]. The main outcomes were the monthly frequencies of gambling, at-risk gambling, and PG symtoms according to DSM-V criteria. The results of this uncontrolled study show the program may reduce students' participation in both online and onsite gambling and decrease the percentage of at-risk gamblers [36].

Donati's program focuses on the education of healthcare workers to produce a positive impact on students [37]. Training for program facilitators (healthcare workers and psychologists) consists of education about gambling, instruction on probabilistic reasoning, teaching methods for implementing knowledge to students [37]. The program for students consists of lessons in which students solve tasks related to gambling, followed by a discussion and finally summarizing what they have learned. Instruments to assess outcome measures for program's providers were: the Gambling Related Knowledge Scale – For Adolescents, the Probabilistic Reasoning Scale. Results of this uncontrolled study show there is a notable improvement in accurate understanding of gambling and a marked decrease in probability reasoning among program facilitators. Outcomes for students were measured by validated scales: the Gambling Related Knowledge Scale – For Adolescents , the Random Events Knowledge Test – Youth Version, the Non-Gambling Task, the Superstitious Thinking Scale, the Gambling Expectancies Questionnaire, the Gambling Related Cognitions Scale – Revised for Adolescents, the Gambling Task, the Gambling Behaviour Scale for Adolescents [37]. It seems that the program provided by healthcare professionals may induce improvement in students' correct knowledge about gambling, knowledge about random events and probabilistic reasoning, as well as a significant decrease in superstitious thinking and gambling misconceptions. Long term results indicate a reduction in the gambling frequency and the severity of gambling-related problems [37].

Table 2. Studies of problem gambling prevention programs for adolescents and their outcomes

Program	Participants	Study	Objectives	Program description	Evaluation	Short-term outcomes	Long-term outcomes
Williams et al., 2010.	USA, n = 1,240 (911 in standard IG[a], 342 in booster IG, 291 in CG[b]) (mean age = 16)	case-control study	- education - improving decision-making, problem-solving skills - reducing gambling behaviour	- lessons on gambling history, random chance, misconceptions, risk factors, problem-solving, decision-making skills - booster quiz game	- effectiveness - at the end - 4-month (average) follow-up - specifically designed scales for this research: attitudes towards gambling, their knowledge about gambling, acquired decision-making and problem-solving skills, involvement in risky activities, and data on Gambling activity - Gambling Fallacies scale developed by Moore and Ohtsuka - DSM-IV-Multiple Response-Juvenile for PG in the past year	- increases corrected knowledge on gambling - improves healthy gambling attitudes - improves decision-making and problem–solving skills Decreases: - gambling misconceptions - prevalence of gamblers - overall gambling frequency - rates of problem gambling	- increases corrected knowledge on gambling - improves attitudes towards gambling - improves decision-making and problem–solving skills Decreases: - gambling misconceptions - prevalence of gamblers - overall gambling frequency - rates of problem gambling
Donati et al., 2014.	Italy, n = 181 (119 in IG, 29 in CG) (mean age = 15.95)	case-control study	- education - changing gambling misconceptions - reducing gambling behaviour	- lessons on how to recognize gambling activities, events coincidence, emotions experienced during gambling	- efficacy - at the end - 6-month follow-up - validated scales were utilized: South Oaks Gambling Screen-Revised for Adolescents, Questionnaire of Attitudes and Knowledge About Gambling, Gambler's Fallacy Task, Gambling Attitude Scale, The Superstitious Thinking Scale	- increases knowledge - reduces gambling misconceptions - gives true perception of gambling economic profitability - reduces superstitious thinking	- increases corrected knowledge - reduces gambling misconceptions - gives true perception of gambling economic profitability - reduces superstitious thinking - reduces gamblers and at-risk/problem gamblers prevalence

Canale et al., 2016.	Italy, n = 168 (95 in IG, 73 in CG) (mean age = 15).	- case-control study	- reducing gambling behaviour - changing attitudes	- online interactive activities on luck- and skill-based activities, gambling misconceptions, quiz	- efficacy - at the end - gambling outcomes were measured using validated scales: South Oaks Gambling Screen–Revised for Adolescents and Gambling Attitude Scale	- improves attitudes towards gambling profitability Decreases: - gambling-related problems - gambling frequency	
Calado et al., 2020.	Portugal, n = 111 (56 in IG, 55 in CG) (mean age = 17.64)	case-control study	- education - changing gambling misconceptions - reducing sensation seeking - reducing gambling behaviour	- various educational methods on gambling and decision-making skills	- efficacy - at the end - 6-week follow-up - outcome measure assessed by questions about gambling behavior and validated scales: Questionnaire of Misconceptions and Knowledge About Gambling, DSM-IV-Multiple Response-Juvenile, Attitudes Towards Gambling Scale, Brief Sensation Seeking Scale	- increases corrected knowledge about gambling - improves attitudes on gambling Reduces: - number of hours spent gambling per week - gambling misconceptions - prevalence of at-risk/problem gamblers	- increases corrected knowledge about gambling - improves attitudes on gambling Reduces: - gambling misconceptions - at-risk/problem gamblers prevalence
Tani et al., 2021.	Italy, n = 33 teachers and n = 393 students (15 teachers, 219 students in IG, 18 teachers and 174 students in CG) (mean age 16.25 - 16.55)	case-control study	- education - changing gambling misconceptions - reducing gambling behaviour	- interactive lessons and discussions led by teachers	- effectiveness - 7-month follow-up - outcomes for students are measured by: South Oaks Gambling Screen-Revised for Adolescents, Gambling Related Cognitions Scale, Gambling Attitude Scale.		Reduces: - gambling behaviour - misconceptions about gambling profitability

Table 2. *(continued)*

Program	Participants	Study	Objectives	Program description	Evaluation	Short-term outcomes	Long-term outcomes
Dodig Hundrić et al., 2021.	Croatia, n = 629 (mean age 15.67)	uncontrolled pre-post study	- reducing gambling behaviour - increase knowledge, critical thinking, problem-solving, decision-making, self-efficacy, peer-pressure resistance - gain universality - parents and school personnel education	- workshops for students and lesson for school personnel on adolescent risk behaviours, gambling consequences, misconceptions, practicing critical thinking, problem-solving skills, resisting peer pressure - lecture for parents about gambling industry, risk factors, prevalence and consequences of students gambling	- effectiveness - at the end - outcome measures: gambling behavior, knowledge on gambling, problem-solving skills, resisting peer pressure skills, cognitive distortions (the Gambling-Related Cognitive Beliefs Scale), problem gambling (Problem Gambling Severity Scale), self-efficacy (Generalised Self-Efficacy Scale) Parents' knowledge not tested.	- increases knowledge Reduces: - illusion of control - superstitious thinking - frequency of sports betting and lotto - enhances perceived self-efficacy - universal	
Chóliz et al., 2022.	Spain, n = 2372 high school students (age 14 - 19)	uncontrolled pre-post study	- education - changing attitudes on gambling - reducing gambling behaviour	- sessions based on 28 short videos about gambling features, economic aspects, gamblers types, addiction development, online gambling, gambling promotion, responsible gambling, addiction prevention	- effectiveness - 1 month after the end of program - outcomes: gambling frequencies, at-risk gambling, PG symtpoms according to DSM-V criteria		Reduces: - monthly frequency of onsite and online gambling - prevalence of at-risk gambling and gambling disorder (not among participants aged 18-19 years) - frequency of meeting all DSM-V criteria for GD among gamblers (reducing PG symptoms)

Donati et al., 2022.	Italy, n = 44 health professionals, 1894 high school students (mean age = 15.68)	uncontrolled pre-post study	- education - changing gambling misconceptions - improving gambling attitudes - gambling behaviour reduction	- lessons, group discussions, exercises, role playing led by health professionals	- effectiveness - 1 week after the end - 4-5 months follow-up - instruments for outcome measures: *Gambling Related Knowledge Scale – For Adolescents* , the *Random Events Knowledge Test – Youth Version* , the *Non-Gambling Task* , the *Superstitious Thinking Scale*, the *Gambling Expectancies Questionnaire*, The *Gambling Related Cognitions Scale – Revised for Adolescents,* the *Gambling Task,* the *Gambling Behaviour Scale for Adolescents*	- increases protective (knowledge) and decreases risk factors (superstitious thinking, gambling misconceptions) Reduces: - gambling misconceptions - false choices prevalence	Reduces: - PG severity - at-risk problem gamblers and non-risk gamblers prevalence

[a]intervention group, [b]control group

Problem gambling prevention programs for both children and adolescents

Program "Don't Gamble Away our Future" aims to educate primary and high school students and their families about PG consequences [38,39]. The program for students last 45 minutes and includes various activities, mostly lectures and discussions. Parent education packets contain project information and link to the interactive website providing additional information about the project and PG [38,39]. Taylor and Ren both describe the effectiveness of "Don't Gamble Away our Future", but Ren's study is a longitudinal follow up of improved and repeated version of Taylor's program [38,39]. PG is assessed by using the Modified South Oaks Gambling Screen for Teens and knowledge was tested using questions specially designed for this research [38]. The program seems to improve students' knowledge about gambling and its consequences. Primary school students have better posttest results than high school students, and males better than females. Parental knowledge is not evaluated [39]. Long-term results show that repeating the intervention twice increases gambling knowledge and reduces gambling prevalence [39].

Table 3. Studies of problem gambling prevention programs for both children and adolescents and their outcomes

Program	Participants	Study	Objectives	Program description	Evaluation	Short-term outcomes	Long-term outcomes
Taylor & Hillyard, 2009. "Don't Gamble Away our Future"	USA, n = 8,455 (age 12 years or older)	uncontrolled pre-post study	- education of students, families, school personnel	- lecture, discussion and interactive activities about gambling - presentations and information packets for parents	- efficacy - at the end - outcome measures: PG (Modified South Oaks Gambling Screen for Teens), knowledge (specially designed questions) - parents' knowledge not tested	- increases knowledge	
Parham et al., 2019.	USA, n = 73 (age 11 - 18)	uncontrolled pre-post study	- education - improving decision-making skills	- gambling lectures, discussions and role-playing	- efficacy - at the end - outcome measures: students knowledge and gambling behavior (specifically designed questionnaire)	- increases knowledge	
Ren et al., 2019.	USA, n = 16,421 (age 8 - 18)	retrospective uncontrolled pre-post study	- as Taylor & Hillyard + reducing gambling prevalence	- as Taylor & Hillyard	- efficacy - several times during a five-year period - outcome measures: PG (Modified South Oaks Gambling Screen for Teens), knowledge (specially designed questions)	- see Taylor & Hillyard	- multiple interventions increase knowledge - receiving intervention twice reduces gambling prevalence

Parham's program is specifically designed for ethnic minorities in Baltimore, USA, where most students belong to some ethnic minority [40]. The pilot project of the mentioned program did not show significant success in reducing gambling risk factors among included students. However, feedback obtained from the project material and feedback from clinicians and students during a focus group after the pilot project led to content modification to suit the urban minority youth [40]. Additionally, adjustments were made to ensure the program's format was suitable for integration into a standard school setting. The modified content uses simpler language to minimize reading challenges, which are often more prevalent in economically disadvantaged communities. Before the implementation of program, mental health experts underwent a three-hour lecture-based training [40]. The curriculum was conducted once a week over a span of three weeks, with each session lasting up to 60 minutes. The scenario of interactive activities includes characters with similar everyday problems as students participating in the program. Also, program tries to promote student engagement through group tasks and discussions, updating presentations, integrating practical knowledge, and supplying students with a workbook [40] (Table 3). Students knowledge and gambling behavior were assessed by using the questionnaire designed specifically for the purposes of this study. Results of uncontrolled study suggest that this kind of program may correct knowledge about gambling, but it seems there is no reduction in gambling behavior [40].

Problem gambling preventive interventions for young adults

Larimer examines efficacy of two different kinds of interventions which are led by trained clinical psychology graduate students [41]. One intervention group tests Personalized Feedback Intervention (PFI) and the second intervention group tests PFI + cognitive-behavioural intervention (CBI). PFI is based on the feedback related to gambling assessment according to the principles of motivational interviewing. The intervention is adapted to the personal goals of each participant. The sessions last up to 90 minutes. All participants are provided with feedback about their gambling behavior, a set of skills to minimize gambling, and a list of referrals for PG [41]. CBI includes gambling triggers, cognitive distortions, coping with triggers, assertiveness, homework and gambling diaries. CBI consists of four lessons, each lasting one hour. Screening instruments used in evalution are: the SOGS and The Gambling Quantity and Perceived Norms scale for gambling behavior. Results show PFI is associated with reduced gambling frequency. PFI and PFI + CBI are both associated with reduced gambling consequences and PG symptoms in comparison with control group. CBI only group is not included in the study [41].

Neighbors' Personalized Normative Feedback (PNF) intervention is based on correcting misconceptions about one's own participation in gambling by comparing oneself to peers [42]. A trained expert assesses an individual's gambling characteristics, such as frequency of gambling and money wagered, and confronts them with the habits of other students. The goal is to confront young adults suffering from PG with the characteristics of their peers' gambling in order to correct perceived norms [42]. If one's perceived norms about others' gambling habits are corrected, it will result in behavioral changes, specifically reducing participation in gambling activities. When the affected individuals realize they gamble excessively compared to their peers, they may reduce their gambling behaviour [42]. Main outcome is to reduce gambling behavior, which is assessed using the SOGS, the Gambling Quantity and Perceived Norms Scale, the Gambling Problems Index, the Measure of Identification With Groups [42]. The results show effects in reducing perceived and actual lost and won quantities after a 3-month follow-up. Also, PG prevalence is reduced after a 3-month follow-up. All intervention effects, except reduced PG, remained at 6-month follow-up. Finally, the changes in perceived gambling norms after 3 months mediate the effects of intervention [42].

In Petry's study, three different interventions are compared in terms of reducing gambling behavior, which was assessed using validated scales such as the SOGS, the National Opinion Research Center DSM-IV Screen for Gambling Problems, the Addiction Severity Index-Gambling, the TimeLine Followback, and The Treatment Service Review [43]. The first is 15 min-Brief Advice intervention which involves a therapist who explains to a student his/her level of gambling compared to other students and advises him/her how to reduce gambling. It seems that the intervention reduces severity of gambling and days spent gambling. The second is Motivational Enhancement Therapy (MET), which is based on increasing motivation for change, and includes 50-minute personalized feedback about the student's gambling [43]. Results show it reduces gambling severity and invested money over time. The third group, which undergoes three CBT sessions in addition to MET, also shows a reduction in gambling severity and gambling days [43].

Marten's 10 min-PFI provides paper feedback on the comparison of an individual's and peers' gambling behaviour, refers to risky situations and gambling related problems, gives gambling and PG assessment (hours spent gambling, amount of money wagered, and losses from gambling), and tries to correct cognitive misconceptions

Table 4. Studies of problem gambling preventive interventions for young adults and their outcomes

Program	Participants	Study	Objectives	Program description	Evaluation	Short-term outcomes	Long-term outcomes
Petry et al., 2009.	USA, 117 college students, problem and pathological* gamblers.	case-control study	- gambling behaviour reduction	- Brief Advice: consultations about gambling features - MET: session on personalized gambling consequences and life goals - MET+CBT: MET session followed by CBT session about personal gambling triggers and coping skills	- efficacy - after 6 week - after 9 months - outcome measures included gambling behavior (South Oaks Gambling Screen, National Opinion Research Center DSM-IV Screen for Gambling Problems, Addiction Severity Index-Gambling, TimeLine Followback, The Treatment Service Review		6 week follow up: - gambling severity decreased in all three interventions - decline in days gambling in all three interventions - MET reduces money wagered 9-month follow up: - gambling severity decreased in all three interventions - decline in days gambling in all three interventions - MET reduces money wagered
Larimer et al., 2012.	USA, 147 college students, at risk and pathological* gamblers (PFI = 52; CBI = 44; control = 51)	case-control study	- education on gambling - gambling behaviour reduction	- PFI intervention: feedback on survey results including gambling patterns, expectations from gambling, negative consequences, illusions of control. - CB intervention: sessions on cognitive distortions, illusion of control, assertiveness, relapse prevention	- efficacy - after 6 week - outcome measure: gambling behavior (SOGS, The Gambling Quantity and Perceived Norms scale)		6 months follow up: - PFI reduces gambling fre quency - PFI reduces perceived norms about gambling - PFI and CBI reduce PG - PFI and CBI exert reduction of symptoms of pathological[a] gambling - CBI reduces illusions of control
Neighbors et al, 2015.	USA, 252 college students, at risk and problem gamblers	case-control study	- gambling behaviour reduction	- PNF: feedback, assessment and real data on individual's and peers' gambling characteristics and gambling frequency	- efficacy - after 3 months - after 6 months - main outcome: gambling behavior (SOGS, Gambling Quantity and Perceived Norms Scale, The Gambling Problems Index, The Measure of Identification With Groups)		3-month follow up: Reduces: - quantity lost - gambling problems Change: - perceived norms for quantity won and lost during gambling 6-month follow up: Reduces: - gambling problems Change: - perceived norms for quantity won and lost during gambling

Martens et al., 2015.	USA, 333 college students, at-risk gamblers (PFI = 111, education only = 113, control = 109)	case-control study	- gambling behaviour reduction	- PFI: feedback about social norms, assessment about PG, gambling behaviour, gambling related problems, personal high risk situations and cognitive misconceptions.	- efficacy - after 3 months - the main outcome measure: gambling behavior (SOGS, the Gambling Timeline Followback, the Problem Gambling Index)	3-month follow-up: Reduces: - gambling related problems - money wagered

[a]Gambling disorder according to the terminology today; MET – Motivational Enhancement Therapy; PFI – Personalized Feedback Intervention; CBI – cognitive-behavioural intervention

[44]. Furthermore, there is education-only group that receives only educational content about gambling without any feedback on their behavior. They are provided with general information about the prevalence of gambling among youth, risk factors for PG, the harms of gambling, and instructions how to reduce gambling behavior [44]. The main goal of PFI is to reduce risky gambling behavior, which was measured in the evaluation study using: the SOGS, the Gambling Timeline Followback, the Problem Gambling Index. Three-month follow-up shows that the PFI may exert reduction in gambling behaviour (money wagered and related problems) in comparison to education-only group [44].

Discussion

PG prevention for adolescents and children is based on preventive programs held in schools. Using the school environment in prevention seems logical because children and adolescents spend much of their time in schools, and peer pressure mimics at-risk behaviours [45]. However, the most significant disadvantage of school-based programs is their implementation in this setting, due to the strict and tight curriculum, which does not leave enough time for other important activities [45]. Due to the mentioned, there is a tendency to use modernly designed computer tools and softwares to achieve the desired goal in the shortest time possible, as the software in Todirita and Lupu's program [29]. Computer technologies have been in use for the prevention of substance abuse for many years, and they show some advantages comparing to standard non-computer preventive interventions, as the learning material and pace of learning can be customized according to the specific goal and one's need [46]. Novel computer-based interventions for substance abuse prevention, such as virtual reality and game-based interventions, are also increasingly being developed due to their ability to mimic interaction, stimulate fast learning, and their immersiveness [47]. Based on the substance abuse prevention methods, it is necessary to more extensively develop computer-based interventions for PG prevention, as seen in the Todirita and Lupu program [29].

Online and web-based programs are becoming increasingly popular both among professionals and affected individuals [33]. Canale's program is the only web-based prevention PG program included in the review, which positively affects gambling attitudes and reduces gambling behaviour. The above is in support of previous works showing that web-based interventions are effective in harm reduction in severe addiction [33]. There are many reasons why online programs demonstrate success in addiction prevention, and one is having a chance to

connect with previously overlooked and neglected populations, such as students from socially and economically deprived areas who do not attend school regularly [48]. Since the prevalence of online gamblers is increasing, it seems appropriate that web-based preventive interventions are used as secondary prevention of PG [15].

Most preventive interventions for children and adolescents are led by teachers, as Tani's teacher-led program [34]. Previous studies show the teacher-led programs have positive and lasting effects on mental health in students [49]. School-based PG prevention programs with school teachers as program leaders are effective in both education and behavioural changes, and as a cheaper mode of gambling prevention [34]. However, additional work needs to be done on the motivation and preeducation of school teachers to participate in PG prevention programs [34] since studies show they underestimate the importance of PG, and its factual epidemiological burden and severity [34,35]. Research in the future should determine whether such programs produce better outcomes than programs run by mental health professionals, as presented in Chóliz's program [36]. However, experts argue that multidisciplinary approaches are essential to broaden intervention success and improve long-term results. The extensive collaboration between teachers and mental health professionals could yield the best results in preventing PG among students [50].

Some prevention programs for children and adolescents also include their parents, as part of more comprehensive prevention (Taylor's and Dodig Hundrić's program [35,38]. It has been shown that PG among children occurs more often in families with positive gambling history [51,52]. However, both programs did not evaluate outcomes on parents' gambling knowledge and behaviour, nor their consequent impact on children's gambling knowledge and behaviour. Such programs are the future of PG prevention because prevention involving parent support has proven successful in preventing substance abuse [53]. Future family-based interventions should adhere to certain common principles: fostering positive parent-child relationships, employing positive discipline techniques, ensuring monitoring and supervision, and promoting the communication of healthy family expectations [54]. Research in the prevention of substance abuse show that behavioral parent training, family skills training, in-home family support, brief family therapy, and family education may be effective in reducing addictive behavior in youth [53]. This kind of family-based interventions for PG are still lacking in the literature [35].

Some subgroups are more vulnerable to PG-related problems than others, like immigrants and ethnic minorities [40,55,56]. Moreover, the heaviest burden caused by the consequences of risky behavior is borne by marginalized groups [57]. Members of ethnic minorities very often do not have a chance to attend school regularly, so there is a greater need for specific prevention programs. Parham's prevention program, which improves gambling knowledge, is the school program specifically intended for socially and economically disadvantaged ethnic minorities [40]. The program should be further improved in order to exert behavioral change but thanks to its minority suitable content and its careful delivery, it could serve as a model for programs oriented to other affected subgroups [40]. The literature lacks of PG preventive interventions indicated for immigrants and refugees [56].

All included programs examined short-term efficacy and some exclusively (Dodig-Hundrić, Choliz, Canale [33,35,36]. In short-term, prevention programs are primarily effective in improving the knowledge about gambling, correcting cognitive misconceptions, superstitious thinking and strengthening healthy attitudes (Donati's both programs) [32,37]. Some programs also positively affect skill-learning such as coping skills, decision-making skills, self-advocacy as Williams' and Dodig Hundrić's [31,35]. It is thought that programs which teach various problem-solving and decision-making skills, in addition to education, have the biggest potential for positive behavioural change [58]. Some programs managed to achieve positive behavioural changes even in the short-term as Chóliz's, Dodig Hundrić's, Calado's, Canale's, Williams'program [30,32,33,35,36]. The programs that have maintained this at follow-up are Williams, Calado's and Donati's program [30,33,37]. Programs that achieved at least one form of gambling behaviour reduction, exclusively at follow-up, are Chóliz's , Tani's and Donati's programs [32,34,36,37]. It seems that programs which produce behavioural changes are those with multiple aspects and an integrated prevention approach as Williams, Calado's, Dodig Hundrić's and Donati's programs [8,31,32,35,37]. These programs also aim to influence vital life skills, such as decision-making. Furthermore, they aim to involve parents and teachers of affected students. These programs recognize the importance of repeating learned content, so the program is revisited multiple times, striving to be as interactive as possible to help students remember the material more easily [31,35] .

Prevention among young adults is based on brief interventions that provide feedback to those involved. Brief interventions such as PFI, motivational interviewing-based interventions and CBT interventions seem to be effective in reducing gambling behaviour among youth with risky behaviour. It seems that PFI is somewhat more effective in reducing the frequency of gambling and gambling-related problems and is the more suitable intervention for students due to its shorter duration than CBT [41,43].

While most preventive methods for substance abuse are primary and universal, being more comprehensive, most PG interventions for young adults are secondary and specifically indicated, which involve youth already exhibiting PG [27,28,59]. In this way, many young adults are not included in prevention or serious consequences have already emerged [28]. Prevention of substance abuse among young adults include multiple perspectives as legal regulations, direct prevention at the point of substance consumption, and mass media campaigns [59]. Also, as written in previous reviews, most prevention efforts for young adults take place in colleges, raising the question of how to prevent PG among those young people who do not attend college [27]. Therefore, future interventions should focus on quality universal prevention for PG among young adults, which do not yet exist in most countries [28].

It is shown that short interventions based on motivational interviewing and normative feedback are effective in reducing other addictive behaviour and also show success in different ethnic subgroups [60-62]. Therefore, these interventions could use as comprehensive secondary prevention of multiple addictions in the most vulnerable groups [42].

All preventive programs included in this literature review have clearly defined measurement goals (Tables 1-4). However, many preventive programs for children and adolescents use non-validated instruments to assess prevention outcomes. Additionally, the number of participants varies significantly among studies, and some studies lack a control group. Therefore, it is challenging to compare the quality of programs and assess their actual effectiveness. Programs for college students mostly utilize validated scales for assessing gambling behavior, the SOGS being the most commonly used. All studies for college students are controlled and analyze the obtained results based on PG severity.

The limitations of this review is a non-systematic approach and the diversity of included programs for children and adolescents. The strengths of the review are its integrative and comprehensive approach, classifying preventive interventions by age, evaluation of outcome measures, and detailed description of methods for each included preventive intervention.

Conclusion

The conclusions of this integrative narrative review are in line with conclusions of other reviews on this topic. The most effective preventive programs for children and adolescents are school-based programs, and for young adults are brief interventions such as PFI. However, the methodology in applied studies varies greatly, making it difficult to draw firm conclusions. A small number of problem gamblers, different outcomes assessment, and short follow-up periods (if any) are significant limitations that need to be addressed in future research. This review emphasizes the need for the development of preventive interventions specifically targeted towards ethnic minorities, immigrants, and refugees, as well as interventions that involve parental support, which truly lack in the literature.

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Conflict of Interest

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