

COMPREHENSIVE REVIEW

A systematic review of combined student- and parent-based programs to prevent alcohol and other drug use among adolescents

NICOLA C. NEWTON¹, KATRINA E. CHAMPION¹, TIM SLADE¹, CATH CHAPMAN¹,
LEXINE STAPINSKI¹, INA KONING², ZOE TONKS¹ & MAREE TEESSON¹

¹NHMRC Centre of Research Excellence in Mental Health and Substance Use, National Drug and Alcohol Research Centre, UNSW Australia, Sydney, Australia, and ²Faculty of Social and Behavioural Sciences, Utrecht University, Utrecht, The Netherlands

Abstract

Issues. Alcohol and other drug use among adolescents is a serious concern, and effective prevention is critical. Research indicates that expanding school-based prevention programs to include parenting components could increase prevention outcomes. This paper aims to identify and describe existing combined student- and parent-based programs for the prevention of alcohol and other drug use to evaluate the efficacy of existing programs. **Approach.** The PsycINFO, Medline, Central Register of Controlled trials and Cochrane databases were searched in April 2015 and additional articles were obtained from reference lists. Studies were included if they evaluated a combined universal intervention for students (aged 11–18 years old) and their parents designed to prevent alcohol and/or other drug use, and were delivered in a school-based setting. Risk of bias was assessed by two independent reviewers. Because of the heterogeneity of the included studies, it was not possible to conduct a meta-analysis and a qualitative description of the studies was provided. **Key Findings.** From a total of 1654 screened papers, 22 research papers met inclusion criteria, which included 13 trials of 10 programs. Of these, nine programs demonstrated significant intervention effects in terms of delaying or reducing adolescent alcohol and/or other drug use in at least one trial. **Conclusion.** This is the first review of combined student- and parent-based interventions to prevent and reduce alcohol and other drug use. Whilst existing combined student- and parent-based programs have shown promising results, key gaps in the literature have been identified and are discussed in the context of the development of future prevention programs. [Newton NC, Champion KE, Slade T, Chapman C, Stapinski L, Koning I, Tonks Z, Teesson M. A systematic review of combined student- and parent-based programs to prevent alcohol and other drug use among adolescents. *Drug Alcohol Rev* 2017;36:337-351]

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The use of alcohol and other drugs (AOD) is widely recognised as a major global health problem [1]. Substance use is particularly problematic among adolescents, with recent Australian research indicating that among adolescents aged 12–17 years old, approximately three-quarters have tried alcohol, one in 10 put him/herself at risk of alcohol-related harm on a monthly basis and one in six has tried an illicit drug [2]. These data are particularly worrying given that early substance use initiation is associated with an increased risk for short- and long-term alcohol-related harms [1], development

of substance use disorders [3] and comorbid mental health disorders, such as anxiety and depression [4]. The need for effective prevention is therefore critical.

There are three common approaches to prevention: ‘universal’, ‘selective’ and ‘indicated’. Universal programs are designed for, and applied to, everyone in a given setting; selective programs are only delivered to specific adolescents, based on their risk of developing a substance use disorder; and indicated programs are targeted at individuals who are experiencing early signs of substance use problems [5]. Universal programs offer

Nicola C. Newton BPsych (Hons), PhD, Senior Research Fellow, Katrina Champion BAPsych (Hons), PhD, Research Associate, Tim Slade BPsych (Hons), PhD, Associate Professor, Cath Chapman BAPsych (Hons), PhD, Senior Research Fellow, Lexine Stapinski BPsych (Hons), MCLinPsych, PhD, Research Fellow, Ina Koning MSc, PhD, Assistant Professor, Zoe Tonks BScPsych (Hons), Research Assistant, Maree Teesson BPsych (Hons), PhD, Professor. Correspondence to Dr Nicola Newton, NDARC, UNSW Australia, NSW 2052, Australia. Tel: +612 9385 0159; Fax: +612 9385 0222; E-mail: n.newton@unsw.edu.au

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the advantage of avoiding stigmatisation that can occur through singling out high-risk individuals, and these programs have the potential for greater effects and dissemination at the population level [5]. Existing universal approaches to AOD prevention have traditionally focussed on the adolescents themselves. In terms of program efficacy, a recent Cochrane review conducted by Foxcroft and Tsertsvadze [6] concluded that there were some beneficial effects of universal alcohol prevention programs for young people. That is, 6 out of 11 studies of alcohol-specific interventions showed positive effects for alcohol use outcomes when compared with a standard curriculum. In addition, 15 out of 39 generic programs (those that do not specifically target alcohol use) demonstrated significant reductions in alcohol use. In terms of universal prevention for illicit substances, another recent systematic review found small yet positive effects of universal prevention programs targeting illicit drug use [7].

According to the literature, the most effective universal AOD prevention programs adopt a harm-minimisation goal, are underpinned by a comprehensive social influence approach and can be implemented with high fidelity [7–9]. One way of achieving high fidelity is the utilisation of interactive delivery techniques, such as the Internet, which can guarantee complete and consistent program delivery [10]. Internet-based programs also have the potential to increase accessibility and sustainability [11], while improving student engagement through the inclusion of audio-visual elements, personalised and tailored feedback and links to social media, creating an interactive environment [12]. This is important given that the use of interactive elements has been identified as a key ingredient of effective AOD prevention [13,14]. In terms of delivery location, school-based programs are ideal as a school setting offers both the infrastructure to deliver curriculum-based AOD education and the appropriate social and learning environment to attenuate risk factors for AOD use at a developmentally appropriate age [15,16]. Furthermore, students spend a large proportion of their time at school [17], providing a unique opportunity for educators to reach large audiences while keeping costs low [18,19]. Although understanding of the effective ingredients of school-based AOD prevention programs has grown over the past decade, the effect sizes of most existing universal adolescent prevention programs are low, or modest at best [6,7,11,20]. As such, research is now turning towards ways in which the effectiveness of school-based AOD prevention programs can be increased.

One means of achieving this has been to target parents alongside students, to address risk factors associated with peer, social and family influence [14,21,22]. In recent years, there has been accumulating evidence indicating that parents can play a pivotal role in delaying the onset and use of AOD [23–25]. Specific parenting factors that

have been shown to influence adolescent AOD use include having clear alcohol-specific rules, open parent–child communication, limited parental supply of alcohol and high parent–child relationship quality [24,26–28]. Research also suggests that parents can continue to exert influence over the developmental course of the adolescent years [29], even when the strong impact of peer influences on AOD use begins to emerge [30]. Importantly, results from a recent systematic review indicate that parent-based interventions (i.e. those focused solely on parents) can be effective in preventing AOD use by improving parent–child communication, rule-setting and monitoring. Overall, the review concluded that 19 out of the 39 identified trials of parent-based prevention programs demonstrated some beneficial effect for AOD use outcomes in young people. These results lend support to the inclusion of parental components in AOD prevention programs for adolescents [28].

Considering the recent emergence of this evidence, as well as the notion that the effects of universal programs may be increased by adding parent-based components [31,32], there is a strong rationale to review the evidence for combined student- and parent-based prevention programs. Previous reviews have examined the efficacy of combined student and parent-based prevention programs for alcohol use [33–37]. For example, Foxcroft and Tsertsvadze [36] found that 9 out of 12 universal family-based prevention programs for alcohol misuse among young people were effective, demonstrating small but generally consistent effects. Another review examining multi-component prevention programs in preventing alcohol misuse [33] found that 12 out of a total of 20 trials showed evidence of effectiveness. However, these previous reviews focused solely on alcohol use and did not specifically examine combined student- and parent-based interventions delivered in school settings. Therefore, the aim of this paper is to conduct a systematic review to evaluate the evidence for combined student- and parent-based programs to prevent and reduce AOD use among adolescents in school settings. To our knowledge, this will be the first review to examine the efficacy of combined prevention approaches for both AOD use.

Method

Data sources and study selection

We conducted this systematic review in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement [38]. We searched the PsycINFO, Medline and Central Register of Controlled trials and Cochrane Review databases for

studies published between 2000 and April 2015. The following categories of search terms were used: ‘alcohol and drugs’, ‘adolescents’, ‘parents’ and ‘intervention’ (a copy of the specific search terms used can be found in the Supporting Information). Following deletion of duplicated articles, the titles and abstracts of 1654 papers were independently reviewed, and full copies of potentially relevant papers were obtained. Additional papers were also identified from the reference list of these papers.

Eligibility criteria and data extraction

Studies were included if they reported the results of a randomised trial of an alcohol and/or other drug prevention program that included both student and parent components. Programs with any type of delivery method (e.g. Internet-based, face-to-face, CD-ROM) and that targeted any substance were considered. Studies were excluded if they did not evaluate a universal program, were not targeted at adolescents, were not delivered in a school-based setting, did not include both student and parent components or did not assess AOD outcome measures. Studies that were delivered outside of normal school hours (e.g. during the evening), but within a school setting, were eligible to be included. Only studies that were published in English were included. Data extraction and determination of the eligibility of studies was conducted independently by two reviewers,

with any disagreement resolved by consensus. Figure 1 illustrates the search strategy and study selection process.

Risk of bias

Risk of bias was evaluated independently by two assessors using a modified version of the Cochrane Collaboration’s tool for assessing risk of bias [39], which is commonly employed to assess the quality of school-based randomised trials in systematic reviews in this field [33,36]. This tool covers six domains of potential bias: sequence generation; allocation concealment; blinding of participants, personnel and outcome assessors; incomplete outcome data; selective outcome reporting and other sources of bias. Given double-blinding is not feasible for school-based trials of this sort, this criterion was not assessed. Thus, trials were assessed across five domains and scored from 1–3 on each domain (1 = high risk, 2 = unclear risk, 3 = low risk). Any discrepancies between the raters were resolved by consensus. Scores were summed across the five domains to give a total score of risk bias for each study, with a possible range of 5–15. Higher scores indicate higher study quality and lower risk of bias.

Outcome measures

The primary outcomes of interest were levels of AOD use at any, or across all, follow-up assessment occasions.

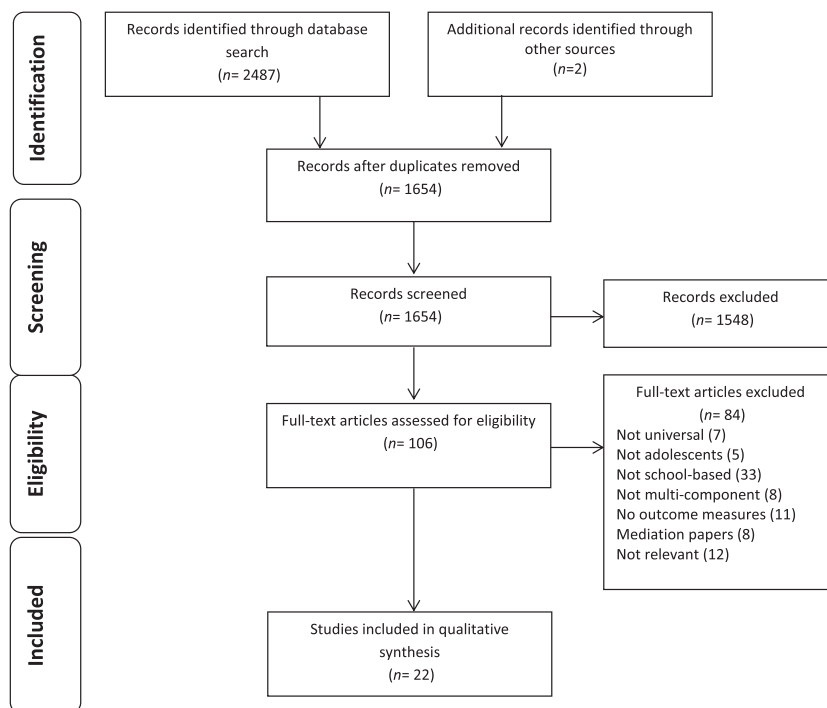


Figure 1. Flow chart of search strategy and study selection.

Analysis

Where possible, effect sizes and odds ratios were extracted from papers. If effect sizes were not reported, the corresponding author of the paper was contacted requesting this information. Odds ratios were reported for dichotomous outcome measures, and effect sizes were reported for the continuous outcome measures. Because of the small number of included studies and the heterogeneity of program type, quality, outcome measures and follow-up occasions, it was not possible to conduct a meta-analysis. The authors of the current paper therefore chose to report the results in a systematic narrative review.

Results

Description of included studies

Overall, 22 research papers met inclusion criteria, which included 13 separate trials of 10 programs. Figure 1 provides details of the study selection process and a summary of excluded studies. All programs were universal, that is, they were delivered to all students regardless of their risk for substance use [40,41], and one program included both universal and selective components [42]. Nearly two-thirds (62%, $n = 8$) of trials were conducted in the United States. Most trials (69%, $n = 9$) included standard health education as the control condition; however, three studies (23%) used a 'minimal contact' condition consisting of four information booklets on adolescent development, and one (0.8%) included an 'assessment only' condition [43]. Of the 10 programs that were identified, two programs (20%) had been trialled more than once; the Project Northland intervention was evaluated in three trials [44–46] and the Strengthening Families Program was trialled on two separate occasions [43,47]. The results of six programs (60%) were reported across multiple research papers. The follow-up assessment periods of the included studies ranged from immediately post-test to 78 months. Table 1 provides a summary of the delivery method, session length, program goals and outcome data for each included trial.

Risk of bias

Total risk bias scores and the number of domains rated as low risk for each included study are provided in Table 2. Although no study was rated as low risk on all five domains, 7 of the 22 identified papers (32%) were at low risk of bias on four of the five domains. Selective outcome reporting was mostly unclear (64%) primarily because of the majority of studies failing to refer to a published protocol. There has been some

critique of family-based AOD prevention programs in the literature [48] in relation to data analysis and selective outcome reporting, which is reflected in the high-risk ratings for some risk bias domains for some of the studies in this review.

Program content

In terms of program content, three programs (30%) focussed on alcohol only, six (60%) addressed AODs and one (10%) focussed on tobacco only. Although two trials assessed methamphetamine use, the interventions were generic in nature and did not specifically include content on methamphetamine in the intervention [49]. The student components in all 10 programs utilised some form of social influence, social learning and/or life skills training principles. The parent components in the majority of studies (70%, $n = 7$) aimed to equip parents with generic skills (e.g. parental monitoring, parent-child bonding, and communication), while other interventions (30%, $n = 3$) included AOD-specific parenting strategies (e.g. rule-setting) and/or AOD-specific information. Five programs (50%) included additional components, for example rule setting by school personnel, print media campaigns and community action groups (see Table 1).

Delivery method

An examination of the mode of delivery of the student components indicates that half ($n = 5$) were solely implemented in a school setting during class time (see Table 1). Two student interventions (20%) were delivered in a school setting, but outside of school hours, and three interventions (30%) included both classroom lessons and out-of-school sessions. Four (40%) interventions were delivered by teachers, three (30%) were delivered by a trained professional, two (20%) were delivered online and one intervention (10%) utilised both teachers and professionals for program delivery. Four programs (40%) included additional activities and/or information to be completed by students at home with their parents. The parent components of the included programs were all delivered outside of school hours. Four interventions (40%) consisted exclusively of face-to-face meetings delivered by trained professionals, and two (20%) consisted of only home-based reading materials and/or activities. The other four interventions (40%) included professional-delivered training sessions and home-based information or activities to be completed with students.

Efficacy of included studies

Of the 10 programs, nine demonstrated significant intervention effects in terms of delaying or reducing

Table 1. Program description and outcome data for included trials.

Program	Trial	Substance/s	Sample	Student/parent intervention	Additional components	Delivery methods	Program orientation/goals	Control	Substance use outcomes
Project Northland	Perry <i>et al.</i> , 2002	Alcohol	United States 12-18 yrs, n= 3151 students. Schools: 10 intervention, 10 control. Parental participation: Yr 1: 76%, Yr 2: 33%	Six-year intervention Phase 1 (Grades 6-8). <i>Students:</i> 21 classroom lessons; 8 activity books (completed with parents). <i>Parents:</i> 8 activity books (completed with students); information notes/postcards; 2 information nights Interim Phase (Grades 9-10). <i>Students:</i> 5 classroom lessons. Phase 2 (Grade 11-12). <i>Students:</i> 6 classroom lessons; peer action teams <i>Parents:</i> 11 information postcards; communication campaign.	Print media campaigns (e.g. posters), peer leadership programs and community action teams to reduce access to alcohol.	<i>Students:</i> Teacher- and peer-delivered, both in and outside of school hours. <i>Parents:</i> Self-directed, completed at home with student; family night held at school	Cognitive behavioural and social influence principles, aims to encourage both parent-child communication and peer interaction.	Standard health education	<i>Phase 1:</i> Growth in tendency to use alcohol ^a , INT<CO*; Growth in past week alcohol use, NS; Growth in past month alcohol use, INT<CO*; Growth in binge drinking, INT<CO*; <i>Interim Phase:</i> Growth in tendency to use alcohol, INT>CO*; Growth in past week alcohol use, NS; Growth in past month alcohol use, INT>CO**; Growth in binge drinking, INT>CO**; <i>Phase 2:</i> Growth in tendency to use alcohol, NS; Growth in past week alcohol use, NS; Growth in past month alcohol use, INT>CO**; Growth in binge drinking, INT>CO**;
Project Northland	Komro <i>et al.</i> , 2008	Alcohol	United States ^b 11-14 yrs, n =4259 students. Schools: 10 intervention, 12 control. Parental participation: Yr 1: 73%, Yr 2: 53%, Yr 3: 51%	Three year intervention <i>Students:</i> 25 classroom lessons; 2 x 2hr family fun events. <i>Parents:</i> 4 activity booklets, 4 activity pamphlets, 4 game packets, 13 x postcards (2 hours of home-based activity with students per year); 2 x 2hr family fun events	Peer leadership and youth-planned community service projects; and community organising and environmental neighbourhood change component.	<i>Students:</i> Teacher- and peer-delivered, both in and outside of school hours. <i>Parents:</i> Self-directed, completed at home with student, family night held at school	Cognitive behavioural and social influence principles, aims to encourage both parent-child communication and peer interaction.	Standard health education	Growth of alcohol use over time, NS; Growth of drug use over time, NS.

Table 1 (continued)

Program	Trial	Substance/s	Sample	Student/parent intervention	Additional components	Delivery methods	Program orientation/goals	Control	Substance use outcomes
Project Northland	West <i>et al.</i> , 2008		Croatia 10-14 yrs, <i>n</i> = 1981 students. Schools: 13 intervention, 13 controls. Parental participation: NR	Three-year intervention. <i>Students</i> : 21 classroom lessons, 4 activity books (completed with parents). <i>Parents</i> : 8 activity books (completed with students); information notes/postcards, 2 information nights/skills training sessions.	-	<i>Students</i> : Teacher- and peer-delivered, both in and outside of school hours. <i>Parents</i> : Self-directed, completed at-home with student; family night held at school.	Uses cognitive behavioural and social influence principles, aims to encourage both parent-child communication and peer interaction.	Standard health education	Tendency to use alcohol (whole sample) at 12-months: INT < CO*, at 24-months: NS. Tendency to use alcohol (females only) at 12-months: INT < CO*, at 24-months: INT < CO*.
Resilient Families Program	Shortt <i>et al.</i> , 2007	Alcohol	Australia 12-15 yrs, <i>n</i> = 2315 students. Schools: 12 intervention, 12 control. Parental participation: Quiz: 12%, Group session: 6%, Handbook: 50%	<i>Students</i> : 10 x 45-min classroom lessons. <i>Parents</i> : 1 x 2hr information/quiz evenings; 8 x 2hr group information sessions; 1 x parent handbook	-	<i>Students</i> : Teacher-delivered, in school hours. <i>Parents</i> : Professional-delivered	Aims to develop students' relationship skills and equip parents with parenting skills and support networks.	Standard health education	Lifetime alcohol use at 14-months: NS, 24-months: INT < CO** (AOR=0.78); Frequent alcohol use at 24-months: INT < CO* (AOR=0.69); Heavy alcohol use at 24-months: INT < CO** (AOR=0.75).
Iowa Strengthening Families Program (ISFP)	Spoth <i>et al.</i> , 2001; 2004; 2006; 2009; 2012	Alcohol, tobacco, cannabis	United States 11-13 yrs, <i>n</i> = 446 students. Schools: 11 intervention, 11 control. Parental participation: 67%	<i>Students</i> : 7 x 2hr sessions (1hr with parent). <i>Parents</i> : 7 x 2hr sessions (1hr with student)	-	<i>Students</i> : Professional-delivered, outside school hours. <i>Parents</i> : Professional-delivered	Biopsychosocial model and related risk/protective factor models. It aims to improve parent-child bonding and quality of parent-child relationships and to increase resiliency in youth.	Minimal contact controls (Mailed 4 leaflets on adolescent development)	Lifetime alcohol use ^c at 48-months: INT < CO*, 72-months: INT < CO**; Lifetime drunkenness at 48-months, INT < CO*, 72-months: NS; Lifetime tobacco use at 48-months: INT < CO*, 72-months: INT < CO**; Lifetime cannabis use at 48-months: INT < CO**, 72-months: INT < CO**; Lifetime illicit substance use at 72-months: INT < CO* (OR=2.34) ^d . Frequency of drinking at 48-months: INT < CO** (ES=0.26); Frequency

Table 1 (continued)

Program	Trial	Substance/s	Sample	Student/parent intervention	Additional components	Delivery methods	Program orientation/goals	Control	Substance use outcomes
Strengthening Families Program for Parents and Youth ages 10-14 (SFP 10-14) (Formerly ISFP; see above)	Riesch <i>et al.</i> , 2012	Alcohol, tobacco and 'other drugs'	United States 10-14yrs, <i>n</i> = 167 student-parent dyads. Schools: 9 intervention, 7 control. Parental participation: 49% completed full intervention	<i>Students</i> : 7 x 2hr sessions (1hr with parent). <i>Parents</i> 7 x 2hr sessions (1hr with student)	-	<i>Students</i> : Professional-delivered, outside school hours. <i>Parents</i> : Professional-delivered.	Bio-psychosocial vulnerability model. It aims to increase parental skills in nurturing, and communication, and prosocial and resistance skills in youth.	Assessment only	of tobacco use at 48-months: INT<CO** (ES=0.31); Alcohol composite use ^e at 48-months: INT<CO* (ES=0.38); Tobacco composite use at 48-months: INT<CO** (ES=0.29). Past-year methamphetamine use at 78-months: INT<CO**.
Life Skills Training (LST) + SFP 10-14	Spoth <i>et al.</i> , 2002; 2005; 2006; 2008	Alcohol, tobacco, cannabis	United States 12-15 yrs, <i>n</i> = 1677 students. Schools: 12 student-only intervention, 12 combined intervention, 12 control. Parental participation: 57%. Booster: 39%	<i>Students</i> : SFP 10-14: 7 x 2hr sessions (1hr with parent), 4 booster sessions (one year later). LST: 15 x 45min classroom lessons, 5 booster lessons (one year later) ^g . <i>Parents</i> : SFP 10-14: 7 x 2hr sessions (1hr with student), 4 x booster sessions (one year later).	-	<i>Students</i> : SFP 10-14: Professional-delivered, outside school hours. LST: school-based, teacher-delivered. <i>Parents</i> : SFP 10-14: Professional-delivered.	SFP 10-14: Biopsychosocial model and related risk/protective factor models. It aims to increase parental skills in nurturing, and communication, and prosocial and resistance skills in youth. LST: social learning theory and problem behaviour theory. It aims to promote social resistance, self-management, and general social skills and to provide knowledge.	Minimal contact controls (Mailed 4 leaflets on adolescent development)	Substance initiation index at 18-months: INT<CO*, 30-months: NS, rate of change, INT<CO*, at 66 months, INT<CO*, rate of change: INT<CO**, Alcohol initiation at 18-months: INT<CO**, rate of change: INT<CO**, Tobacco initiation at 18-months: NS, 66 months: INT<CO**, rate of change: INT<CO**, Cannabis initiation at 18-months: INT<CO**, 66-months: INT<CO**, rate of change: NS. Regular alcohol use at 30-months:

Table 1 (continued)

Program	Trial	Substance/s	Sample	Student/parent intervention	Additional components	Delivery methods	Program orientation/goals	Control	Substance use outcomes
Prevention of Alcohol Use in Students (PAS) program	Koning <i>et al.</i> , 2009; 2011; 2013	Alcohol	The Netherlands 12-13 yrs, <i>n</i> = 3490. Schools: 5 each for parent-only, student-only and combined interventions, 4 control. Parental participation: >80%.	<p><i>Students</i>: 4 classroom lessons, 1 booster lesson (one year later).</p> <p><i>Parents</i>: 1 information session; 1 rule-setting session; 1 information leaflet; 2 booster sessions.</p>	-	<p><i>Students</i>: Online + hard-copy booster, in school hours.</p> <p><i>Parents</i>: Professional-delivered</p>	Theory of planned behaviour and social cognitive theory. It focuses on alcohol related rule-setting among parents and aims to increase refusal skills among students.	Standard health education	<p>NS; Weekly drunkenness at 30-months; INT<CO**; Drunkenness initiation, rate of change: INT<CO**; Frequency of alcohol use, drunkenness, tobacco use, cannabis use at 66-months; NS. Past-year methamphetamine use at 54-months; INT<CO**; 66-months: NS. Lifetime methamphetamine use at 54-months: INT<CO*; 66-months: INT<CO**.</p> <p>Onset of heavy weekly alcohol use at 10-months: INT<CO** (OR=0.36), 22-months: NS, 34-months: INT<CO* (OR=0.69); Onset of weekly alcohol use at 10-months: INT<CO** (OR=0.67), 22-months: INT<CO** (OR=0.71), 34-months: INT<CO** (OR=0.69); Heavy weekend drinking at 50-months: INT<CO** (OR=0.48); Amount of drinking at 50-months: INT<CO (d=-0.75)**.</p>
Healthy School and Drugs (HSD) program ^h	Malmberg <i>et al.</i> , 2014; 2015	Alcohol, tobacco and cannabis	The Netherlands 11-15 yrs, <i>n</i> = 2454 students. Schools: 7 student-only intervention, 9 combined intervention, 7 control. Parental participation: NR	<p><i>Students</i>: 10 classroom lessons. <i>Parents</i>: 1 information session^a</p>	A regulation component involving rule setting for substance use at school, and a monitoring and counselling component: training session for school personnel.	<p><i>Students</i>: Online, in school hours.</p> <p><i>Parents</i>: Professional-delivered</p>	Attitude-Social Influence-Self-Efficacy model. It aims to increase knowledge and refusal skills among students, and to provide parents with information on substance use.	Standard health education	Alcohol, cannabis and tobacco use at 8, 20 and 32-months: NS.

Tobacco

Table 1 (continued)

Program	Trial	Substance/s	Sample	Student/parent intervention	Additional components	Delivery methods	Program orientation/goals	Control	Substance use outcomes
Health-Related Information and Dissemination Among Youth (HRIDAY) intervention	Reddy <i>et al.</i> , 2002		India 12 yrs, <i>n</i> = 4776 students. Schools: 10 student-only intervention, 10 combined intervention, 10 control. Parental participation: NR	<i>Students:</i> 20 classroom activities, 10 information posters; HRIDAY project booklet. <i>Parents:</i> 6 information and activity booklets to share with students (only in subsample of 10 schools).	Debates within and between schools on banning tobacco sponsorship; round table discussions.	<i>Students:</i> Teacher-delivered, in school hours. <i>Parents:</i> Self-directed	Social influence principles, health information about smoking and teaching refusal skills.	Standard health education	Lifetime alcohol use at post-test: INT < CO **; Lifetime tobacco use post-test: INT < CO **
Going Places program	Simons-Morton <i>et al.</i> , 2005	Alcohol and tobacco	United States 12-15 yrs, <i>n</i> = 1484 students. Schools: 3 intervention, 4 control. Parental participation: NR.	Three-year intervention <i>Students:</i> 36 classroom lessons; homework requiring parent involvement. <i>Parents:</i> 1 x 20min video, 1 information booklet	Enhanced school environment component: social marketing strategies e.g. posters, short videos, assemblies, to improve school climate and reinforce student achievement.	<i>Students:</i> Teacher-delivered, in school hours. <i>Parents:</i> Self-directed	Social learning and social competence principles. It aims to increase problem solving, communication and conflict resolution skills among students, and increase parental monitoring.	Standard health education	Smoking progression over time (baseline to 40-months): INT < CO **; Alcohol use over time: NS
Preparing for the Drug Free Years	Spoth <i>et al.</i> , 2001; 2004; 2006	Alcohol, tobacco and cannabis	United States 11-13 yrs, <i>n</i> = 429 students. Schools: 11 intervention, 11 control. Parental participation: 56%	<i>Students:</i> 1 x 2hr training session with parents. <i>Parents:</i> 5 x 2hr training sessions (4 parents only, 1 with students).	-	<i>Student:</i> Professional-delivered, outside school hours (incl. audio-visual material). <i>Parent:</i> Professional-delivered (incl. audio-visual material).	Social development model and social learning principles, aims to develop prosocial family bonding.	Minimal contact controls (mailed 4 leaflets on adolescent development)	Lifetime alcohol use ^c at 48- and 72-months: NS; Lifetime drunkenness, at 48- and 72-months: NS; Lifetime tobacco use at 48-months: NS, at 72-months: INT < CO **; Lifetime cannabis use at 48- and 72-months: NS. Frequency of drinking at 48-months: INT < CO ** (ES=0.28); Frequency of tobacco use at 48-months: NS; Alcohol composite use at 48-months: INT < CO **

Table 1 (continued)

Program	Trial	Substance/s	Sample	Student/parent intervention	Additional components	Delivery methods	Program orientation/goals	Control	Substance use outcomes
The Adolescent Transitions Program	Connell <i>et al.</i> , 2007	Alcohol, tobacco and cannabis	United States 11-17 yrs, n = 998 students (n=500 intervention, n=498 control). Parent participation: Family Resource Centre: NIR, Family Check Up: 23%	Students: 6 classroom lessons; parent-student activities. Parents: Family Resource Centre: brief consultations, feedback, books and videotapes.	Family Check-Up: 3 MI sessions, targeted at high-risk families, but offered to all).	Students: Professional-delivered, both in and outside of school hours. Parents: Face-to-face and telephone, professional-delivered.	Social learning principles and life skills training. Aims to support parents' supervision and involvement of their children and increase problem solving and coping skills in students.	Standard health education	(ES=0.27), Tobacco composite use at 48-months: NS. Past-year methamphetamine use at 78-months, NS. Growth in alcohol, tobacco, and cannabis use over time (baseline to 60-months): INT<CO**

*P < 0.05, **P < 0.01.

AOR, adjusted odds ratio; CO, control group; INT, Intervention group; MI, motivational interviewing; NR, not reported; NS, no significant difference between intervention and control groups. OR, odds ratio.

^aTendency to use alcohol: this outcome is based on eight items that focus on actual alcohol use and intention to use alcohol.

^bIn the Komro *et al.* (2008) study, Project Northland was adapted for an urban, low-income and multi-ethnic population and was trialled in Chicago. In the West *et al.* (2008) trial, Project Northland was adapted for a Croatian context.

^cThe lifetime use results refer to 'relative reduction rates of new user proportions'. That is, the percentage reduction in the intervention group versus control group students who initiated the substance use behaviour between baseline and the 48 month follow-up.

^dSpoth and colleagues [82] found that the ISFP intervention reduced substance use through a 'protective shield' of reduced exposure. That is, the ISFP was associated with reduced exposure to illicit substance use (1.25 < OR < 2.37) that was, in turn, associated with reduced substance use (2.87 < OR < 6.35) at the 72 month follow-up, with positive effects also extending into young adulthood (age 21).

^eThe 'alcohol composite use' index consisted of four items (lifetime use, lifetime use without parental permission, lifetime drunkenness and past month use). The tobacco composite use index included four items (lifetime use of cigarettes, lifetime use of chewing tobacco, past month use of cigarettes, past month use of chewing tobacco). Alcohol and other drug use were secondary outcomes of this study and did not provide sufficient numbers for modelling. Therefore, the authors calculated basic proportions using exact tests, and these results are reported in Table 1.

^fThis trial also compared a 'LST only' intervention group for students to the control group. However, as the primary interest of the present review is combined student and parent interventions, the results for the 'LST only' condition are not reported in Table 1.

^gThis study also included an 'e-learning condition' for students only; however, as the primary interest of the present review is combined student and parent interventions, the results for this condition are not reported in Table 1.

Table 2. Risk of bias summary for included studies

Program	Trial	Number of domains rated low-risk	Total score
Project Northland	Perry <i>et al.</i> , 2002	2	12
	Komro <i>et al.</i> , 2008	2	12
	West <i>et al.</i> , 2008	0	8
Resilient Families Program	Shortt <i>et al.</i> , 2007	2	12
	Toumbourou <i>et al.</i> , 2013	3	13
Iowa Strengthening Families Program Preparing for the Drug Free Years	Spoth <i>et al.</i> , 2001;	4	14
	Spoth <i>et al.</i> , 2004	3	13
	Spoth <i>et al.</i> , 2006	1	11
	Spoth <i>et al.</i> , 2009	4	14
Strengthening Families Program for Parents and Youths ages 10–14 (Formerly ISFP)	Spoth <i>et al.</i> , 2012	3	12
	Riesch <i>et al.</i> , 2012	1	11
Life Skills Training + SFP 10–14	Spoth <i>et al.</i> , 2002	2	11
	Spoth <i>et al.</i> , 2005	2	11
	Spoth <i>et al.</i> , 2008	2	12
Prevention of Alcohol Use in Students program	Koning <i>et al.</i> 2009	4	14
	Koning <i>et al.</i> 2011	4	14
	Koning <i>et al.</i> 2013	4	14
Healthy School and Drugs program	Malmberg <i>et al.</i> , 2014	4	13
	Malmberg <i>et al.</i> , 2015	4	13
Health-Related Information and Dissemination Among Youth intervention	Reddy <i>et al.</i> , 2002	0	9
Going Places program	Simons-Morton <i>et al.</i> , 2005	0	10
The Adolescent Transitions Program	Connell <i>et al.</i> , 2007	2	12

IFSP, Iowa Strengthening Families Program; SFP 10–14, Strengthening Families Program for Parents and Youths ages 10–14.

adolescent AOD use in at least one trial. Although only nine programs included specific content about alcohol use, trials of all 10 programs assessed alcohol consumption via student questionnaires. Results indicated that 8 of the 10 included programs in this review were efficacious in reducing alcohol consumption. Effects were varied among the trials, and included reductions in alcohol initiation, heavy or ‘binge’ drinking, lifetime alcohol use and frequent use, with effects lasting from post-test up to 72 months. In one trial of Project Northland [44], the program was effective in reducing only female students' tendency to use alcohol up to 24 months. Of the seven trials that assessed tobacco use, six were associated with some reduction in smoking over time, including reductions in the initiation of smoking, lifetime use, frequency of use and smoking progression. In one study [50], intervention effects were observed only at post-test; however, effects persisted until 40, 48, 66 and 72 months post-baseline in the five other studies [47,51–53]. Finally, of the six trials assessing cannabis use, three [42,47,52,54] reported significant intervention effects in terms of reducing cannabis use among adolescents. One intervention was effective in reducing the growth of cannabis use over time and another in delaying cannabis initiation at both the 18 and 66 month follow-up assessments. Although the Strengthening

Families Program was not effective in addressing cannabis use in one trial [43], another trial showed a significant reduction in lifetime cannabis use until 48 month follow-up [47]. There were no clear differences in the efficacy of interventions that targeted a single substance, for example, alcohol only, and those that targeted multiple substances.

Discussion

A number of combined student- and parent-based programs to prevent and reduce adolescent AOD use were found. Out of the 10 programs identified, nine appeared to demonstrate positive effects in reducing targeted substance use outcomes in at least one trial. Furthermore, of the nine programs that appeared to show a reduction in AOD outcomes, effects lasted from post-test to 72 months, thereby suggesting that these programs can continue to have long-term effects. In general, these results indicate that school-based programs which include both student and parent components are a potentially efficacious means of reducing AOD use among adolescents. However, given the relatively small body of evidence, further research is needed on the effectiveness, as well as the cost-effectiveness, of adding

parent-based components to student interventions to prevent and reduce AOD use among adolescents.

In the present review, one intervention failed to demonstrate significant effects at all, and two programs that were evaluated in multiple trials, were effective in one trial but not in the other. Although positive outcomes were observed in both the earlier and later phases of the original trial of Project Northland [46], iatrogenic effects were found when students were in grades 9 to 10. That is, the intervention group showed significantly greater growth over time than the control students in their tendency to use alcohol, past month alcohol use and binge drinking. In addition, no intervention effects were observed in Komro and colleagues trial of Project Northland [45], which the authors attribute to the fact that the adapted version of the intervention was not relevant for minority, urban, low-income adolescents in Chicago. These findings highlight the need to replicate programs in contexts that differ from the original study sample. Despite the importance of replication in prevention science [55,56], only two included programs had been evaluated more than once. Replication enhances external validity [57] by allowing researchers to rule out the possibility that findings from an initial trial were because of chance [58,59], and to determine whether a prevention program can be generalised to new settings and contexts or make an impact on a larger scale [60,61]. Ultimately, replication of combined student- and parent-based AOD prevention programs is essential in order to better understand under what conditions, and with whom, a program works best [62].

The present findings also have implications in terms of mode of delivery. Despite the numerous advantages of Internet-based delivery methods [11], only two student intervention components and no parent components were delivered online. Previous research has demonstrated the efficacy of online universal school-based programs in reducing AOD use among adolescents [11], and evidence is continuing to emerge [63]. The growth in the number of people with access to the Internet, almost 40% of the world's population are now online [64], coupled with benefits in terms of increased fidelity, engagement and sustainability, make the Internet a medium of growing importance for AOD prevention. Internet-based programs are advantageous in that trained professionals are not required for their implementation, meaning that intervention delivery is less labour intensive and more feasible [65,66]. Interestingly, in the present review, the Healthy School and Drugs program, which consisted of online lessons for students, was not found to be effective [67,68]. The lack of effects for the Healthy School and Drugs program may also be because of the limited uptake of the intervention by parents which was delivered in addition to, rather than as a part of, existing

commitments for parents at school. Rates of parental participation varied between studies (ranging from 6% to 80%) and overall, uptake by parents was low (see Table 1). Indeed, many of the included studies cited difficulties in recruiting parents to the study and engaging them in the intervention. Attempts to increase parental participation by addressing barriers, such as lack of time, costs, childcare and transport issues, are critical for the success of combined student and parent interventions. Future trials that integrate parent-based components within existing meetings at school, such as in the effective combined Prevention of Alcohol Use in Students intervention [69], or that utilise online delivery methods, have the potential to reduce barriers to uptake among parents. At present, there is no combined model for students and parents that adopts an online approach to AOD prevention despite the existence of numerous effective online AOD prevention programs for students [10,11,70–72]. Integrating online evidence-based parent components with existing evidence-based student interventions has the potential to improve prevention outcomes as well as ease of access, quality of implementation, scalability and sustainability. Although initial development of an online parent intervention can be costly, implementation and dissemination costs are low. Therefore, a critical next step is to develop and evaluate a combined online student- and parent-based prevention program for AOD use.

Limitations

The present review has a number of limitations that should be considered. First, there was great heterogeneity in the outcomes assessed, the reporting of results and the follow-up assessment periods in the included trials. Therefore, a meta-analysis was not possible, and a qualitative description of the studies was provided. Few trials reported effect sizes and/or odds ratios, and many did not include sufficient information for calculation of effect size. This limited our ability to compare the efficacy of the combined student and parent-based programs included in the present review with student-only interventions examined in previous reviews. Although we are unable to directly compare effect sizes of student-only versus combined student- and parent-based interventions, 9 out of the 10 identified programs reported significant reductions in alcohol and/or drug use. This compares to six of 11 identified student-only programs in Foxcroft and Tsertsvadze's [6] systematic review of universal prevention programs for alcohol use. Few studies in this review directly compared student-only versus combined student- and parent-based interventions. In Koning and colleagues trial [69,73,74], the

combined parent and student intervention was found to delay the onset of drinking, but no effects were found for the stand-alone student program. In another trial [49,52,54,75], the combined intervention (SFP 10–14 + LST) demonstrated stronger results than the student intervention alone. Although further research is needed, the present results highlight the potential efficacy of combined student and parent prevention approaches.

A second limitation is that some interventions included additional program components, rather than solely consisting of student and parental components, such as print media campaigns and ‘community action teams’ (see Table 1). Future research should examine the specific mechanisms through which these interventions are related to student outcomes, including the relative contribution of these additional program components. Furthermore, a detailed review of mediation effects would be required to examine what elements of the student and/or parent-based programs are driving the effects, and in what order the student and parent components should be delivered [76].

Third, although the tool used to assess risk of bias [39] is commonly employed in this field [33,36], it does not assess all potential sources of bias (e.g. psychometric properties of outcome measures, sample size, program implementation and fidelity). In addition, we did not assess the risk of publication bias in the present study, and we did not register the present review or publish the review protocol.

A final limitation commonly encountered in AOD prevention is that the outcome measures relied on student self-report. However, self-report is well accepted in substance use prevention studies and has been shown to be reliable and valid [77–79].

Conclusion

The results from the present review highlight the potential efficacy of combined student- and parent-based programs in preventing and reducing AOD use among adolescents. However, the present findings also suggest that research and further development in this area is needed. Specifically, this review indicates that, despite the advantages of Internet-based delivery, and acknowledgement of the important role parents play in adolescent AOD use, there are currently no combined student- and parent-based online interventions. Future research that builds on existing online prevention platforms to develop a combined prevention intervention for students and their parents has the potential to not only improve student outcomes, but also to increase program fidelity and sustainability.

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Competing interests

IK led the development and evaluation of the combined Prevention of Alcohol use in Students program. She derives no financial income from the PAS intervention.

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Supporting Information

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