

## COMPREHENSIVE REVIEW

## A systematic review of school-based alcohol and other drug prevention programs facilitated by computers or the Internet

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### Abstract

**Issues.** The use of alcohol and drugs amongst young people is a serious concern and the need for effective prevention is clear. This paper identifies and describes current school-based alcohol and other drug prevention programs facilitated by computers or the Internet. **Approach.** The Cochrane Library, PsycINFO and PubMed databases were searched in March 2012. Additional materials were obtained from reference lists of papers. Studies were included if they described an Internet- or computer-based prevention program for alcohol or other drugs delivered in schools. **Key Findings.** Twelve trials of 10 programs were identified. Seven trials evaluated Internet-based programs and five delivered an intervention via CD-ROM. The interventions targeted alcohol, cannabis and tobacco. Data to calculate effect size and odds ratios were unavailable for three programs. Of the seven programs with available data, six achieved reductions in alcohol, cannabis or tobacco use at post intervention and/or follow up. Two interventions were associated with decreased intentions to use tobacco, and two significantly increased alcohol and drug-related knowledge. **Conclusion.** This is the first study to review the efficacy of school-based drug and alcohol prevention programs delivered online or via computers. Findings indicate that existing computer- and Internet-based prevention programs in schools have the potential to reduce alcohol and other drug use as well as intentions to use substances in the future. These findings, together with the implementation advantages and high fidelity associated with new technology, suggest that programs facilitated by computers and the Internet offer a promising delivery method for school-based prevention. [Champion KE, Newton NC, Barrett EL, Teesson M. A systematic review of school-based alcohol and other drug prevention programs facilitated by computers or the Internet. *Drug Alcohol Rev* 2013;32:115–123]

**Key words:** prevention, school, Internet, review, alcohol.

### Introduction

The use of alcohol and other drugs by young people is a serious public health concern and the burden of disease, social costs and harms associated with this use are significant [1–5]. The most recent statistics in Australia show that approximately one-quarter of Australian teenagers (between the ages of 14–19 years) have tried an illicit drug, two-thirds (65%) have consumed a full serve of alcohol in the past year and almost one-fifth (20%) have consumed alcohol at levels that put them at risk of injury at least once in the past month (defined as more than four drinks on a single occasion) [1]. These figures are concerning, given that early initiation to

drug use (i.e. before the age of 18) is a risk factor for developing substance use disorders and comorbid mental health problems in adulthood [6,7]. In light of this research the need for effective prevention is clear.

In recent years we have seen a substantial increase in the development of school-based prevention programs for alcohol and other drug use. Despite this, the majority of these programs have shown limited effects, particularly in terms of impacting on behaviour and reducing or preventing substance use [8,9]. This is most likely due to the many obstacles that impact on successful program implementation [10,11]. These include limited resources in terms of teachers, money and time allocated to deliver drug prevention, as well as the fact

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Received 13 June 2012; accepted for publication 3 September 2012.

that programs are often adapted to the school/class environment thereby losing their effective ingredients. A study by Ennett and colleagues [12] found that only 14% of programs delivered in schools have the correct content and modes of delivery identified in the literature as being effective.

Computer- and Internet-based prevention programs have the potential to overcome these obstacles and offer many advantages over traditional drug prevention methods. First, since professionals are not required to deliver the programs, they are less restrictive in their availability and offer increased feasibility of use in settings where professional and teaching time is limited. Even when combined with some direct contact or facilitation from professionals, the burden on professionals is alleviated as it reduces the amount of time they need to dedicate to individuals [13]. Second, once a program is developed there is a reduction in implementation costs, ease of updating materials and increased potential to engage large numbers of individuals and overcome geographical and socio-economic constraints. Third, they can ensure a high degree of implementation fidelity as consistent and complete delivery of materials can be guaranteed. Finally, specific to drug education, computers and the Internet have the potential to increase self-disclosure and reduce stigmatisation about drug use, by enhancing perceptions of privacy and anonymity [14]. In a school environment however, although participants are likely to feel less vulnerable disclosing information online than in a face-to-face setting [15], some students may still have privacy concerns about whether their personal information will be accessed by teachers or parents.

In recent years, a large number of reviews of computer-based treatment programs have been conducted, with results indicating they can be effective in terms of outcome and cost by addressing and reducing alcohol and tobacco use [16–33]. However, none of these existing reviews have specifically focussed on adolescents or on programs delivered in school-based settings. Moreover, these reviews have been limited to treatment and therapy interventions and no reviews have reported specifically on Internet-based programs designed to *prevent* alcohol and drug use. This study will address these gaps in the literature by reviewing the evidence on, and establishing whether school-based prevention programs facilitated by the computer or the Internet have the potential to reduce *and* prevent the use of alcohol and other drugs in adolescents.

## Methods

### Data sources

The Cochrane Library, PsycINFO and PubMed databases were searched in March 2012, using the following

keywords: ‘online OR web-based OR internet OR computer’, ‘drug OR alcohol OR cannabis OR ecstasy OR marijuana OR substance OR amphetamine OR psycho stimulant’, ‘school OR school-based’ and ‘intervention OR prevention OR program OR education’. The titles and abstracts of the 2574 articles identified were independently reviewed and full copies of potentially relevant papers were obtained to determine if they met the inclusion criteria. Reference lists of individual papers were manually searched for further publications. Programs were included if they were an Internet- or computer-based prevention program for alcohol or other drugs, and if they were delivered at school. Programs targeting school aged students that were implemented in the home or community were excluded, as were those delivered to university or college students. Figure 1 displays a flow chart of the search strategy and study selection process.

### Study quality

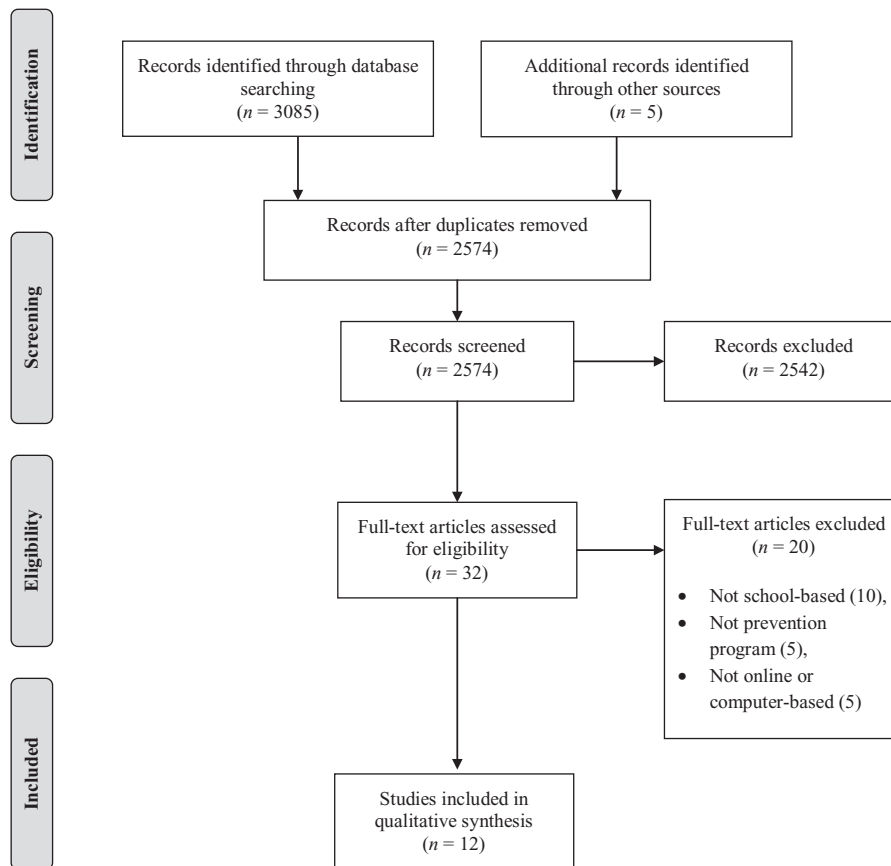
Study quality was evaluated using a validated tool for assessing the quality of randomised controlled trials [34]. This instrument has been designed to measure the quality of trials across a broad range of subject areas [35], and has been used previously in reviews of school-based interventions for anxiety and depression [36] and drug and alcohol use [37]. Studies were rated against three key criteria: randomisation, double-blinding, and withdrawals and drop-outs, and given an overall score ranging from 0 to 5. As reported previously [38], school-based interventions rarely receive scores above 3 as double-blind conditions and full randomisation are often not possible.

### Outcome measures

The primary outcome evaluated was alcohol and drug consumption, at immediate post-intervention and later follow-up occasions. Differences between control and intervention groups were also reported for a range of secondary outcome measures including drug-related knowledge, attitudes, harms and intentions to use.

### Analysis

Effect sizes are reported for continuous outcomes and odds ratios are reported for dichotomous outcomes. Effect size was estimated using Cohen’s *d* [39], which is calculated by subtracting the mean intervention score from the mean control score, and dividing this by the pre-intervention pooled standard deviation. Where available, effect sizes and odds ratios were extracted from papers, or were provided by the authors of the paper on request. Due to the small number of studies



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

and the heterogeneity of study quality, outcome measures and follow-up occasions, it was not possible to combine the results into a meta-analysis. For this reason we chose to report the results in a systematic review.

## Results

Overall, 12 trials of 10 programs were identified. All programs were universal, that is, they were delivered to all students in a year group regardless of their level of risk for alcohol or drug use. The programs tended to be based on principles of social influence theory. The ‘social influence approach’ delineates that young people initiate drug use as a result of external pressure from peers, family and the media, and that young people are not adequately equipped to deal with such pressure [40]. Therefore, the goal of this approach is to teach adolescents to resist drugs by providing them with information, resistance skills and normative education [41,42]. Two programs were based on principles of social cognitive theory, in which students are taught skills to enhance self-efficacy and develop negative expectancies about alcohol and drug use

[43], and two interventions drew on the Transtheoretical Model of Change, which posits that health behaviour change occurs through the progression of six stages of change [44].

Of the 12 trials, seven evaluated an Internet-based program and five assessed interventions delivered via CD-ROM. The majority of trials were conducted in Australia and the USA. All trials were mixed gender and most targeted students in their first two years of high school (13–15 years of age). Eight trials collected data post intervention and the follow-up period in the studies ranged from 6 to 34 months. Most control groups received health education as usual, with the exception of the *Drugs 4 Real* trial, which included a video component, the *Smoking Zine* trial which included a web evaluation control task, and controls in the *Head On* trial, which received the Life Skills Training program. Overall, study quality was weak, with no studies scoring above 3 (Table 1). This is comparable to other prevention reviews [37,38] and can likely be explained by the difficulties achieving full randomisation and double-blind conditions in school-based interventions. Of the identified programs, only the *CLIMATE Schools: Alcohol Module* and the *Consider*

**Table 1. Primary and secondary outcome data for identified trials**

Program	Trial	Substance	Sample	Intervention	Orientation	Control	Substance use post-intervention ES/OR	Substance use follow-up ES/OR	Secondary outcomes ES/OR	Quality rating
Consider This	Buller <i>et al.</i> 2008 [45]	Tobacco	Australia, 10–16 yrs, n = 2077	Online, 6 lessons	Social cognitive principles	Standard health education	30-day smoking prevalence (whole cigarette), ES 0.05* (lower in INT than CO)	—	Future smoking intentions PI, OR 0.01	2
		Tobacco	USA 10–14 yrs n = 1234	Online, 6 lessons	Social cognitive principles	Standard health education	30-day smoking prevalence (whole cigarette), ES 0.23	—	Future smoking intentions PI, OR 0.13* (INT lower than CO)	2
Smoking Zine	Norman <i>et al.</i> 2008 [46]	Tobacco	Canada 14–16 yrs n = 1402	Online, 5 stages	Social cognitive principles, LAL, TTM	Web evaluation task	—	Cigarette use, OR 1.27; Cigarette use among non-smokers, OR 0.79* (lower in INT than CO)	Resistance (whole sample), OR 1.03 and resistance among baseline smokers, OR 1.22* (higher in INT than CO); Behavioural intentions to smoke, OR 1.04 and behavioural intentions among baseline smokers, OR 0.82* (lower in INT than CO)	3
ASPIRE	Prokhorov <i>et al.</i> 2008 [47]	Tobacco	USA 15–16 yrs n = 1574	CD-ROM, 5 lessons + booster	TTM	Standard health education	—	Smoking initiation at 18-month F/U, OR 2.87* (lower in INT than CO); Cigarette smoking behaviour at 18-month F/U, ES 0.12* (lower in INT than CO)	Decisional balance, ES 0.25* (INT higher than CO); Temptation to smoke, ES 0.20* (INT lower than CO); Self-efficacy, ES 0.02; Resistance skills, ES 0.26, all at 18-month F/U	2
CLIMATE Schools: Alcohol	Vogl <i>et al.</i> 2009 [48]	Alcohol	Australia 13 yrs n = 1466	CD-ROM, 6 lessons	Harm-minimisation; social learning principles	Standard health education	Average alcohol consumption, ES 0.25; Binge drinking, ES 0.11	Average alcohol consumption at 6-month F/U, ES 0.24* and 12-month F/U, ES 0.23* (lower in INT than CO for females only); Binge drinking at 6-month F/U, ES 0.20* and 12-month F/U, ES 0.20* (lower in INT than CO for females only).	Alcohol knowledge at 6-month F/U, ES 0.73 and 12-month F/U, ES 0.52; Alcohol harms at 6-month F/U, ES 0.08 and 12-month F/U, ES 0.20* (INT lower than CO for females only); Alcohol expectancies at 6-month F/U, ES 0.27 and 12-month F/U, females, ES 0.41*, and males, ES 0.30*, (INT lower than CO).	3
	Newton <i>et al.</i> 2009 [49]	Alcohol	Australia 13 yrs n = 764	Online, 6 lessons	Harm-minimisation; social learning principles	Standard health education	Average alcohol consumption, ES 0.09* (lower in INT than CO); Binge drinking, ES 0.06	Average alcohol consumption at 6-month F/U, 0.09; Binge drinking at 6-month F/U, ES 0.05	Alcohol knowledge, ES 0.69* (INT higher than CO); Alcohol harms, ES 0.08; Alcohol expectancies, ES 0.20, all at 6-month F/U	2

CLIMATE Schools: Alcohol & Cannabis	Newron <i>et al.</i> 2009 [50] Newron <i>et al.</i> 2010 [51]	Alcohol, cannabis	Australia 13 yrs <i>n</i> = 764	Online, 12 lessons (incl. 2 booster lessons)	Harm-minimisation; social learning principles	Standard health education	Average alcohol consumption, ES 0.18; Binge drinking, ES 0.90; Frequency of cannabis use, ES 0.18	Average alcohol consumption at 6-month F/U, ES 0.16* and 12-month F/U, ES 0.38* (lower in INT than CO); Binge drinking at 6-month F/U, ES 0.05* and 12-month F/U, ES 0.17* (lower in INT than CO); Frequency of cannabis use at 6-month F/U, ES 0.19* lower in INT than CO and 12-month F/U, ES 0.31	Alcohol knowledge at 6-month F/U, ES 0.75* and 12-month F/U, ES 0.76* (INT higher than CO); Cannabis knowledge at 6-month F/U, ES 0.56* and 12-month F/U, ES 0.61* (INT higher than CO); Alcohol harms at 6-month F/U, ES 0.04 and 12-month F/U, ES 0.26; Cannabis harms at 6-month F/U, ES 0.04 and 12-month F/U, ES 0.12; Alcohol expectancies at 6-month F/U, ES 0.16 and 12-month F/U, ES 0.3; Cannabis attitudes at 6-month F/U, ES 0.03 and 12-month F/U, ES 0.21.	3
Combined PAS Intervention	Koning <i>et al.</i> 2009 [52] Koning <i>et al.</i> 2011 [43]	Alcohol	Netherlands 12–13 yrs <i>n</i> = 3368	Online, 4 lessons and/or parent education + booster	Social learning principles	Standard health education	—	Onset of heavy weekly alcohol use at 10-month F/U, OR 0.36*, 22-month F/U, OR 0.80 and 34-month F/U, OR 0.69* (less use in INT than CO); Onset of weekly alcohol use at 10-month F/U, OR, 0.67*, 22-month F/U OR 0.71* and 34-month F/U, OR 0.69* (less use in INT than CO); Frequency of monthly drinking at 10 and 22-month F/U <sup>a</sup>	—	3
TTM Intervention	Aveyard <i>et al.</i> 2001 [53]	Tobacco	UK 13–14 yrs <i>n</i> = 8352	CD-ROM, 3 lessons	TTM	AO	—	Weekly smoking at 24-month F/U, OR 1.06; Positive change of stage at 24-month F/U, OR 1.25	—	2
Head On	Marsch <i>et al.</i> 2007 [54]	Tobacco, alcohol, cannabis	USA 12 yrs <i>n</i> = 272	CD-ROM, 15 lessons	Social learning principles	Life Skills Training program	Frequency of smoking <sup>a,b</sup> (INT higher than CO); Frequency of drinking <sup>c</sup> ; Frequency of marijuana use <sup>d</sup>	—	Drug-related knowledge <sup>a,b</sup> (INT higher than CO); Intentions to use alcohol, cigarettes and marijuana <sup>b</sup> ; Attitudes towards drug use <sup>d</sup> ; Likelihood of refusal <sup>e</sup>	0
Refuse to Use	Duncan <i>et al.</i> 2000 [55]	Cannabis	USA, 15 yrs, <i>n</i> = 65	CD-ROM, 1 lesson	Social learning principles	Standard Health Education	—	—	Efficacy to refuse marijuana <sup>a,b</sup> (INT higher than CO); Intention to refuse <sup>a,b</sup> (INT higher than CO)	3
Drugs 4 Real	Lord & D'Amante [56]	Alcohol, Cannabis, Tobacco	USA, 12–14 yrs, <i>n</i> = 295	Online, 6 visits	Social learning principles	AO; Video control	Drug-related knowledge <sup>a,b</sup> (INT higher than CO); Intentions to use alcohol, cigarettes and marijuana <sup>b</sup> ; Attitudes towards drug use <sup>c</sup> ; Likelihood of refusal <sup>a</sup>	—	—	1

\*Significant difference at  $P < 0.05$  between intervention and control groups. <sup>a</sup>Authors were contacted, but effect size was unable to be calculated. For each trial, ESs and ORs are reported at post-intervention and/or each follow-up occasion. For the Norman *et al.* trial [46], the ORs reported by the authors were averaged across post-intervention, 3-month and 6-month scores. In the Koning *et al.* study [43,52], only the combined parent/student intervention was significantly different from the control group. For the TTM intervention [53], positive change of stage was defined as a movement to a stage where acquisition of smoking was less likely, or cessation more likely. AO, assessment only; CO, control group; ES, effect size; F/U, follow up; INT, intervention group; LAI, Likelihood of Action Index; OR, odds ratio; PI, post intervention; TTM, Trans-theoretical Model of Change.

This program had been evaluated more than once. Effect size or odds ratios were unable to be calculated for three trials [54–56], and therefore are not included in the results below (but are described in Table 1).

#### Primary outcomes

Table 1 presents outcome data relating to alcohol or drug use for each trial. Five trials targeted tobacco and three were associated with some reduction in smoking. In one trial [45], there was only a small effect at post intervention and in another [46] the intervention was only effective at reducing cigarette use among non-smokers at baseline. A third trial [47] was associated with a medium effect at the 18-month follow up. All four trials that measured alcohol consumption were associated with some reduction in alcohol use at post intervention and/or follow up. Effect size (ES) was small at post intervention (ES 0.09) and similarly modest at follow up (ES 0.16–0.38 and odds ratio 0.36–0.71). Two trials [48,51] were associated with positive outcomes relating to the frequency of binge drinking. Of the seven programs, only one targeted cannabis. This program was associated with a significant reduction in the frequency of cannabis use at 6-month follow up with a small effect size (0.19).

#### Secondary outcomes

Table 1 displays data for the secondary outcomes measured in each trial. Three trials measured future intentions to use tobacco. Of these, one was associated with a small reduction in intentions to smoke post intervention, and another found a larger effect, but only among smokers at baseline. All three trials that assessed drug-related knowledge demonstrated a significant increase in knowledge in the intervention groups compared with controls. Effect size for positive results ranged from modest to large (0.69–1.33). Of the three trials that assessed attitudes towards cannabis and alcohol, one found a reduction in positive expectancies and attitudes, with the strongest effects occurring at 12-month follow up (ES 0.4 females, ES 0.3 males). One trial was associated with a reduction in alcohol-related harms, however only for females and only at 12-month follow up [48], and another was associated with an increase in resistance skills, but only among baseline smokers [46]. Finally, one study found a small, yet significant increase in decisional balance relating to tobacco use, as well as a reduction in temptations to smoke.

### Discussion

Overall, we identified 10 computer- or Internet-based programs that have been trialled for the prevention of

alcohol and drug use in schools, and obtained effect size and/or odds ratios for seven of these programs. Six of the seven programs achieved a reduction in alcohol or drug use at post intervention and/or follow up, two were associated with decreased intentions to smoke in the future and two programs significantly increased alcohol- and drug-related knowledge. The results of the present review indicate that existing computer- and Internet-based programs in schools are a potentially efficacious method of delivering drug and alcohol prevention to adolescents.

Effect size and odds ratios for drug and alcohol use were small. Of the 6 trials that assessed drug and alcohol consumption at follow up, 5 showed lasting effects, ranging from 6 months to 34 months. Although effects were modest, this is comparable to effect size reported in a recent review of Internet-based interventions for the treatment of substance use in young adults [20]. The effect sizes were also similar to those reported for Internet-based interventions for anxiety and depression in adolescents, with the exception of those that involved an additional motivational interviewing or informational component, which showed greater effects [57]. Results from the present review also compare favourably with traditional, non-computerised programs such as those reported in a recent review of Australian school-based prevention programs [37]. This suggests that computer- and Internet-based interventions can be as effective, if not more effective, as school-based programs delivered without computers.

Overall, effect size and odds ratios for secondary outcomes were similarly modest. The greatest effects were achieved in relation to drug- and alcohol-related knowledge, with effectiveness persisting at 6- and 12-month follow ups for three trials. Previous systematic reviews of school-based programs and Internet-based interventions have tended to exclude secondary outcomes such as knowledge, intentions to use and attitudes. Therefore, a clear strength of this review is the inclusion of a wide range of secondary outcomes, enabling a more comprehensive review, and providing a more complete picture of the impact of school-based online prevention programs.

This is also the first review to focus specifically on computer- and Internet-based programs for the *prevention* of alcohol and drugs in schools. Other trials have evaluated Internet-based programs among university and college students, and others have assessed the efficacy of implementing computer- and Internet-based programs in the home or community, and among older populations. However, given the link between the early onset of drug use and later substance use disorders in adulthood [7], it is important to implement and evaluate online programs that are delivered to adolescents while they are still at high school, before they initiate drug use.

Although the number of trials identified in this review is small, the results have implications for the delivery of alcohol and drug prevention in schools. The results of this review support the use of the Internet as a potentially efficacious means of overcoming the obstacles associated with the implementation of traditional prevention programs. Specifically, Internet- and computer-based programs offer increased accessibility and feasibility of use and high implementation fidelity. When considering these advantages in conjunction with the present results, Internet-based program delivery appears to be a promising framework for the provision of school-based education and prevention in the future.

As well as establishing whether Internet-based programs are efficacious in preventing alcohol and drug use, it is critical to gauge why these programs might be having an effect. One factor that may be associated with program success is the number of sessions included in the intervention. All programs in this review that produced significant results were comprised of between 4 and 12 lessons. In comparison, the Transtheoretical Model of Change Intervention [53], which only consisted of three lessons, failed to produce effects. An additional factor that has been cited previously as contributing to program success, is the inclusion of booster sessions [41]. In the present review, all three programs that included booster lessons [43,47,50–52] showed significant effects. Program orientation may also have had an impact on the efficacy of trials in terms of alcohol and drug use. Five of the six programs that found significant reductions in substance use were orientated around social learning or social cognitive principles. This suggests that some of the effective ingredients in Internet-based prevention programs are normative education, resistance skills training and reducing positive expectancies [41,42]. However, it is important to note there may be reasons why young people use alcohol and drugs, other than peer pressure and poor resistance skills. For example, it is possible that teenagers may have realistic positive expectancies about alcohol or drug use, and may actively desire to alter their conscious state [58]. Therefore, future prevention programs that address these potential motivations, in addition to social influence factors, may produce larger intervention effects for adolescents. A final factor possibly associated with program efficacy in the present review is the inclusion of a parenting component. Although only one program included a parent intervention [43,52], program effects for this trial persisted at 34-month follow up. In recent years, research has suggested that adding a parental component to universal prevention programs can strengthen program effects [53,59]. Therefore, future trials may benefit from adding a parental component to existing Internet-based programs for drug and alcohol prevention.

A potential limitation of the present study is that the trials included in the review relied solely on student self-report. However, studies have found the self-report of behaviours such as substance use among adolescents is highly consistent with behavioural observations, as long as confidentiality and anonymity is assured [60]. A further limitation is the small number of studies included in the review, differences in outcome measures assessed and the unavailability of data to calculate effect sizes for three of the identified programs. Additionally, only two of the 10 programs had been evaluated more than once. This highlights a clear need for cross-validation and replication studies of these existing programs, to provide further support for the effectiveness of Internet-based prevention for alcohol and other drugs, delivered in schools. Finally, of the 12 trials included in this review, only two [48,55] analysed results separately for males and females, and only one of these [48] had available data to calculate effect size. The importance of distinguishing between males and females has been noted in the literature [58], and is supported by the differential effect these interventions had by gender. Therefore, where sample size and power are adequate to do so, future evaluations should attempt to consider results for males and females separately, especially in countries where the recommended drinking guidelines differ for males and females.

## Conclusion

Despite the significant harms associated with alcohol and other drug use and the need for effective and practical prevention programs, there are relatively few trials of school-based alcohol and other drug prevention programs facilitated by computers or the Internet. Among those that do exist, it appears that the use of computers and the Internet can be effective in overcoming traditional obstacles to implementation and have the potential to reduce the uptake and use of alcohol and drug use in adolescents. These promising results, together with the numerous implementation advantages and high fidelity associated with new technology, suggest that Internet-facilitated programs offer a promising delivery method for school-based prevention.

## Acknowledgements

Funding for this paper was supported by an NHMRC project grant APP1004744. Dr Nicola Newton is a UNSW Vice Chancellor Post-Doctoral Research Fellow and Professor Maree Teesson is funded on Australia National Health and Medical Research Council Research Fellowship.

## Competing interests

Dr Nicola Newton and Professor Maree Teesson led the development and evaluation of the Climate Schools programs. They derive no financial income from the Climate Schools website.

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