Preventive Medicine 48 (2009) 579–584

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

Delivering prevention for alcohol and cannabis using the internet: A cluster randomised controlled trial

Nicola C. Newton [a,*], Gavin Andrews [b], Maree Teesson [a], Laura E. Vogl [a]

[a] National Drug and Alcohol Research Centre, University of New South Wales, Australia
[b] Clinical Research Unit for Anxiety and Depression, University of New South Wales, Australia

ARTICLE INFO

Available online 21 April 2009

Keywords:
Harm reduction
Alcohol education
Cannabis education
Prevention
Computerised lessons
School-based
Internet

ABSTRACT

Objective. To establish the efficacy of an internet based prevention program to reduce alcohol and cannabis use in adolescents.

Method. A cluster randomised controlled trial was conducted with 764 13-year olds from ten Australian secondary schools in 2007–2008. Half the schools were randomly allocated to the computerised prevention program ($n=397$), and half to their usual health classes ($n=367$). The Climate Schools: Alcohol and Cannabis prevention course is facilitated by the internet and consists of novel, evidence-based, curriculum consistent lessons aimed at reducing alcohol and cannabis use. Participants were assessed at baseline, immediately post, and at six months following the intervention.

Results. Compared to the control group, students in the intervention group showed significant improvements in alcohol and cannabis knowledge at the end of the course and the six month follow-up. In addition, the intervention group showed a reduction in average weekly alcohol consumption and frequency of cannabis use at the six month follow-up. No differences between groups were found on alcohol expectancies, cannabis attitudes, or alcohol and cannabis related harms.

Conclusions. The course is acceptable, scalable and fidelity is assured. It increased knowledge regarding alcohol and cannabis, and decreased use of these drugs.

Introduction

Alcohol and cannabis are the two most commonly used licit and illicit drugs in most developing countries, including Australia (Australian Institute of Health and Welfare, 2008; Office of National Drug Control Policy, 2008). The burden of disease associated with these drugs is considerable (Mathers et al., 1999), with alcohol coming second only to tobacco as the leading cause of drug related mortality, morbidity and economic costs (Collins and Lapsley, 2008). As such, the need for prevention in the area of alcohol and cannabis use is clear.

Although an array of school-based drug and alcohol prevention programs exist, the majority of these show minimal effects in reducing drug use and related harms (Tobler et al., 2000). Programs have been found to influence drug knowledge and sometimes attitudes and expectancies, but influencing behaviour is generally thought to be beyond the scope of school prevention programs (Gorman, 2003). Meta-analyses have shown small but significant effect sizes for alcohol and cannabis prevention programs in schools (Botvin et al., 2001a,b; Faggiano et al., 2008; Shope et al., 1996; Tobler et al., 1999; Tobler and Stratton, 1997). The most effective programs are those which use interactive delivery techniques, incorporate a social influence approach to prevention, teach competency and drug refusal skills, provide follow-up lessons, and adopt a harm minimisation approach to prevention (McBride et al., 2004; Soole et al., 2005; Tobler, 2000; Tobler et al., 1999; Tobler et al., 2000). However, correct implementation and dissemination of both content and delivery of these programs is low (Cuijpers, 2003; Ennett et al., 2003).

The Climate Schools model was developed to overcome these obstacles. The courses are contemporary cartoon-based educational programs based on a social influence approach and consistent with a harm minimisation framework. All courses are embedded within the school 'health' curriculum and delivered via the internet, thereby guaranteeing fidelity and consistent delivery (Schinke et al., 2004). This interactive classroom-based approach to prevention is therefore feasible, scalable and easy to implement.

The efficacy of the Climate Schools model for stress reduction (Van Vliet and Andrews, 2009) and alcohol misuse (Newton et al., 2009; Vogl et al., 2009) has been demonstrated. In one or both studies the Climate Schools: Alcohol module was more effective than usual classes in increasing alcohol related knowledge, decreasing positive expectancies about alcohol, and in decreasing average alcohol consumption, frequency of binge drinking (drinking in excess), and alcohol related harms.

This paper reports on the evaluation of a new integrated school-based drug education course for alcohol and cannabis use; the Climate

* Corresponding author. Fax: +61 02 9385 0222.
E-mail address: nickien@unsw.edu.au (N.C. Newton).

0091-7435/$ – see front matter © 2009 Elsevier Inc. All rights reserved.
doi:10.1016/j.ypmed.2009.04.009

Schools: Alcohol and Cannabis course. This paper describes the results six months after the completion of the course.

Method

Design

A cluster randomised controlled trial was implemented. Convenience sampling was used to select the schools. The ten schools who agreed to participate were randomly assigned to either the control condition (usual drug and alcohol education) or intervention condition (the Climate Schools: Alcohol and Cannabis course) using an online randomisation system (www.randomizer.org). Self report data was obtained on three separate occasions; at baseline, after both the alcohol and cannabis modules had been completed, and six months later. Students from the control schools completed the same pattern of assessments as shown in Table 1 below. All aspects of this trial were approved by the University of New South Wales Human Ethics Committee and the trial is registered with the Australian Clinical Trials Registry (ACTRN 012607000312448).

Course content

The Climate Schools: Alcohol and Cannabis course comprised the delivery of two sets of six 40 minute lessons aimed at decreasing alcohol misuse and cannabis use. The existing Climate Schools: Alcohol module was delivered immediately after the baseline assessment, and the new Climate Schools: Cannabis module (which included some repeat of the alcohol material) was delivered six months later. Each lesson included a 15–20 minute internet based lesson completed individually. Students followed a cartoon storyline of teenagers experiencing real life situations and problems with alcohol and cannabis. The second part of each lesson was a predetermined activity delivered by the teacher to reinforce the information learnt in the cartoons. Table 2 contains the contents of each lesson in the two modules. Specimen computer lessons can be viewed at www.climateschools.tv.

Control schools drug education

The control schools in the study received their usual health classes over the year. All schools except one received syllabus based alcohol, cannabis and drug education during the year. The programs used by schools were social influence programs based on harm minimisation strategies. No schools reported delivering these programs via computers or the internet.

Participants

Informed consent was obtained from parents of 944 students from ten Independent High Schools across the larger Sydney metropolitan area. Seven hundred and sixty four participants completed the baseline assessments; mean age was 13.08 years ($SD = 0.58$) and 60% were male. Five schools ($n = 397$) were randomly allocated to the intervention condition, and five schools ($n = 367$) were randomly allocated to the control condition. In Australia, there is no standardised measure of which to compare schools on socio-economic status, however, students who enrol in independent schools come predominately from high socio-economic backgrounds (Mukherjee, 1999).

Measures

A self report questionnaire was completed by all students online in a classroom setting where anonymity and confidentiality were assured. Demographic data was obtained and student responses were linked over time using a unique identification code.

The alcohol knowledge questionnaire was adapted from the School Health and Alcohol Harm Reduction Project (SHAHRP) 16 item 'Knowledge of Alcohol' index (reliability: alpha = 0.73) (McBride et al., 2006). The *Cannabis knowledge* questionnaire was adapted from the Cannabis Quiz and also included 16 items (Bleeker and Malcolm, 2001).

The alcohol consumption questionnaire was adapted from the SHAHRP 'Patterns of Alcohol' index (test–retest reliability, $r = 0.84$) (McBride et al., 2006). This measured frequency and quantity of consumption in standard drinks and frequency of drinking to excess, defined by females having more than four, and males having more than six standard drinks on a single occasion (National Health and Medical Research Council, 2001). *Cannabis use* was assessed from a questionnaire in the 2007 NDSHS that identified the frequency of use of cannabis (Australian Institute of Health and Welfare, 2008).

Alcohol related harms were measured using 12 items from the SHAHRP survey instrument (internal consistency, alpha = 0.90); (test–retest reliability, $r = 0.89$) (McBride et al., 2004). *Cannabis harms* were assessed with six questions derived from the SHAHRP survey instrument for alcohol harms and from the Adolescent Cannabis Problems Questionnaire (test–retest reliability, $r = 0.91$) (Martin et al., 2006).

Alcohol related expectancies were measured using Scale 2 'alcohol can enhance or impede social behaviour' from the Alcohol Expectancy Questionnaire Adolescent form (AEQ-A). This scale has shown to have the best concurrent and predictive validity of the seven scales that make up the AEQ-A (Christiansen et al., 1989). Attitudes towards cannabis were measured by four items from the Life Skills Training Questionnaire (National Health Promotion Associates Incorporated, 2004).

Upon completion of the course students and teachers were asked to evaluate the program indicating how acceptable, appropriate and enjoyable they found it as a means of teaching drug education. Teachers were asked if they would recommend the program to others, and students were asked if they would use the information in their own lives.

Statistical analyses

Baseline equivalence and attrition between groups were examined using single-level analyses. A series of one-way Analysis of Variance for normally distributed data, Chi-square for binominal data, and Mann–Whitney *U* for non-normally distributed data.

Hierarchical linear modelling (HLM) using the program HLM 6 (Raudenbush et al., 2004) was used as the primary statistical method of analyses to account for intracluster correlations between schools. If the unconditional hierarchical linear model revealed that less than 10% of systematic variance existed at the between school level, HLM was abandoned and single-level analyses were used (Lee, 2000). If outcome variables were not normally distributed, change scores were used in the analyses as they better represented normal distributions. For these variables ANOVAs utilising SPSS GLM procedure were conducted on change scores from baseline to each follow-up occasion. Bonferroni adjustments were made for multiple comparisons.

Results

Baseline equivalence, attrition and differential attrition

764 students completed baseline questionnaires, 444 students provided data immediately post the course (after the intervention schools had completed both the alcohol and cannabis modules), and 630 students provided data six months after the intervention. Fig. 1 represents the number and percentage of students in each group over time.

There were some differences at baseline between intervention and control schools: the proportion of males and females in the intervention and control groups ($p<0.05$): intervention schools 54% male, control schools 65% male; the intervention group had significantly higher alcohol related knowledge ($p<0.05$), higher average weekly consumption of alcohol ($p<0.05$), higher frequency of bingeing in the past 3 months ($p<0.01$). At baseline the students in the intervention group had significantly higher cannabis related knowledge ($p<0.05$).

Table 3 provides the mean scores and standard deviations for all outcome measures at baseline, for the intervention and control groups. Alcohol consumption and frequency of cannabis use at baseline where comparable to larger population based studies (Australian Institute of Health and Welfare, 2008).

Attrition analyses were conducted to assess comparability of students who were present only at baseline versus students who completed a follow-up assessment. Attrition resulted from students being absent on the day of the survey, failing to use their unique identifying code, or answering less than 80% of the items on any scale. Students present only at baseline had significantly higher levels of

Table 1
Control and Intervention group assessment times (Sydney, Australia; March 2007–April 2008).

	Pre intervention survey	Climate Schools: Alcohol module	Climate Schools: Alcohol and Cannabis module	Post intervention surveyIntervention survey	Six month follow-up survey
Timing	Semester 1, 2007	Semester 1, 2007	Semester 2, 2007	Semester 2, 2007	Semester 1, 2008
Control	X			X	X
Intervention	X	X	X	X	X

Table 2
Lesson content of Climate Schools: Alcohol and Cannabis course (Sydney, Australia; March 2007–April 2008).

Lesson	Content
Alcohol 1	•Alcohol, the law and underage drinking Standard drinks •Australian alcohol guidelines for low risk drinking limits •Gender and age difference in the low risk drinking limits •Identifying the number of drinks in alcohol beverages •Societal pressures and expectations to drink
Alcohol 2	•Prevalence and patterns of alcohol consumption among 14–15 year olds •Alcohol-free social activities •Identifying sources of pressure to drink too much alcohol •Identifying the reasons teenagers choose to or not to drink alcohol •Dispelling myths about alcohol
Alcohol 3	•Short- and long-term consequences of drinking too much alcohol •Identifying the potential for risk and harm in common teenage drinking scenarios •Exploring ways to prevent alcohol related harm in common teenage drinking scenarios •Identifying sources of help for teenagers
Alcohol 4	•Myths and facts about alcohol •Advertising tactics •Alcohol advertising laws •Alcohol advertising and youth
Alcohol 5	•Alcohol refusal skills •Ways to minimise alcohol consumption •Tips to keep people safe who are drinking too much alcohol •Decision-making about whether to consume alcohol and the purpose of getting drunk •Examining different views on the consumption of alcohol
Alcohol 6	•Ways to prevent an alcohol related medical emergency •Recognising the signs of an alcohol related medical emergency •What to do if there is a medical emergency •Who to contact if there is a medical emergency •Calling the emergency number '000' •The recovery position
Cannabis 1	•Alcohol, the law and underage drinking •Standard drinks •Australian Guidelines for low risk drinking limits •Identifying the number of standard drinks in alcohol beverages •Prevalence and patterns of alcohol use among 14–15 year olds •Acute harms/consequences associated with alcohol use
Cannabis 2	•Alcohol, the law and underage drinking •Identifying reasons why teenagers choose to or not to drink •Alcohol-free activities •Acute and chronic harms/consequences of drinking alcohol •Identifying the potential for risk and harm in common teenage drinking scenarios •Exploring ways to prevent alcohol related harm in common teenage drinking scenarios e.g. Tips to keep people safe who were drinking too much alcohol and ways to minimise alcohol consumption •Drug refusal skills
Cannabis 3	•Australian guidelines for low risk drinking limits •Acute and chronic harms/consequences of drinking alcohol •What is cannabis •Prevalence and patterns of cannabis use among 14–16 year olds •Identifying reasons why teens choose to or not to use cannabis •Acute harms/consequences of using cannabis on health and well-being •Varying effects of cannabis from person to person
Cannabis 4	•Cannabis and the law •Economic consequences of using cannabis •Acute and chronic harms/consequences of using cannabis on health and well-being •Varying effects of cannabis from person to person •Recognizing problems associated with cannabis use •Teaching and responding to risk and harm in common teenage scenarios •Tips to keep people safe who are using cannabis
Cannabis 5	•Acute and chronic harms/consequences of cannabis on health and well-being •Relationship between cannabis use and mental illness •Identifying reasons why people choose to or not to use cannabis •Recognizing problems associated with cannabis use •Seeking help
Cannabis 6	•Dealing and coping with challenging situations •Effects of other people's drug use •Recognizing and responding to risk and harms of cannabis •Tips to help friends reduce or cease using cannabis •Alternatives to using cannabis •Identifying when to seek help •Identifying where to seek help e.g. resources and support agencies for teenagers using cannabis (both at school and in the community)

drinking to excess in the past three months (1.42 versus 0.55 episodes; $p<0.05$). There were no significant differences on any other alcohol or cannabis outcome measures. There was no differential attrition between the intervention and control conditions.

Intervention effects

The outcome variables with intraclass correlations (ICC) higher than 10% included alcohol and cannabis related knowledge, alcohol related expectancies, and harms caused by one's own use of alcohol. These outcomes were then analysed using HLM as suggested by Lee (2000). The outcome variables with ICCs under 10% included average weekly alcohol consumption, frequency of drinking to excess on a single occasion in the past three months, cannabis attitudes, frequency of cannabis use in the past three months, and harms caused by one's own use of cannabis. Table 3 provides the mean scores and standard deviations for the change in scores on all outcome measures from baseline to each follow-up occasion, for the intervention and control groups.

Alcohol related outcomes

Alcohol related knowledge

The unconditional hierarchical linear model had knowledge scores centred at post-test. A linear growth term was utilised to characterise the pattern of change in knowledge over time. The variation between schools accounted for 24% of total explainable variance in knowledge scores. Intervention condition was added to the model as a school-level predictor and was found to significantly improve model fit ($p<0.05$). The population mean across all schools was 7.62 with the intervention group scoring significantly higher (1.44 U) on the alcohol knowledge scale than students in the control group at post intervention ($p<0.001$). The average growth in knowledge scores across all schools was 0.25 U/occasion with the intervention group demonstrating a further 0.99 U/occasion ($p<0.01$). The inclusion of intervention effects explained 99% of the variance in post-test knowledge scores.

Alcohol related expectancies

The unconditional hierarchical linear model had alcohol related expectancy scores centred at post-test. A linear growth term was utilised to characterise the pattern of change in expectancy scores over time. The variation between schools accounted for 16% of total explainable variance in expectancy scores. Intervention condition was added to the model as a school-level predictor, but was not found to be a significant predictor of alcohol related expectancies ($p=0.78$ (intercept); $p=0.46$ (slope)).

Average weekly alcohol consumption

Baseline to immediate follow-up demonstrated no significant difference between groups in average weekly alcohol consumption ($p=0.72$). At the 6 month follow-up there was a significant difference with the control group increasing their average consumption (mean difference = 2.67 standard drinks) significantly more than the intervention group (mean difference = −0.88 standard drinks) ($p<0.05$).

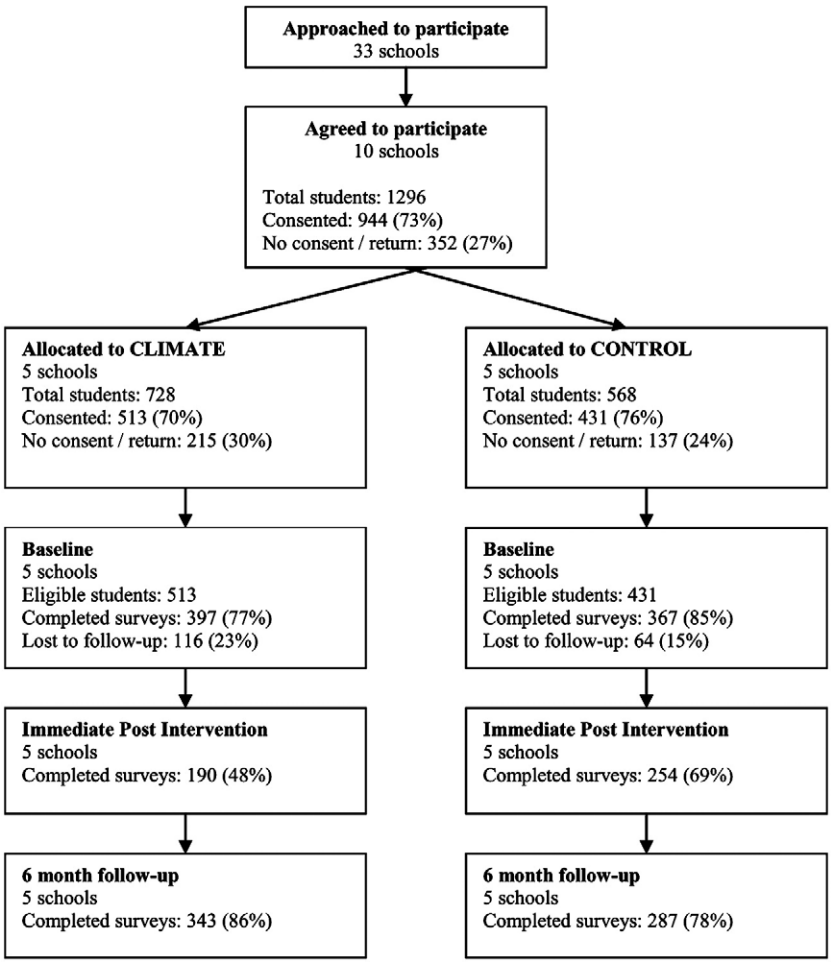

Fig. 1. Flow chart of recruitment and participation of schools.

Frequency of drinking to excess on a single occasion in the past 3 months

Baseline to immediate follow-up demonstrated no significant difference between groups, in their frequency of drinking to excess ($p = 0.93$). At the six month follow-up, again there was no significant difference between groups on frequency of drinking to excess ($p = 0.69$).

Harms associated with own use of alcohol

The unconditional hierarchical linear model had alcohol related harms centred at post-test. A linear growth term was utilised to characterise the pattern of change in alcohol related harms over time. The variation between schools accounted for 11% of total explainable variance in harm scores. Intervention condition was added to the model as a school-level predictor, but was not found to be a significant predictor of alcohol related harms ($p = 0.18$ (intercept); $p = 0.90$ (slope)).

Cannabis related outcomes

Cannabis related knowledge

The unconditional hierarchical linear model had cannabis knowledge scores centred at post-test. A linear growth term was utilised to characterise the pattern of change in knowledge over time. The variation between schools accounted for 16% of total explainable variance in cannabis knowledge scores. Intervention condition was added to the model as a school-level predictor and was found to significantly improve model fit ($p < 0.05$). The population mean across all schools was 9.34 with the intervention group scoring significantly higher (1.33 U) on the cannabis knowledge scale than students in the control group at post intervention ($p < 0.001$). The average growth in knowledge scores across all schools was 0.18 U/occasion with the intervention group demonstrating a further 0.76 U/occasion ($p < 0.05$). The inclusion of intervention effects explained 92% of the variance in post-test knowledge scores.

Cannabis attitudes

There was no significant difference between intervention and control groups in change of cannabis attitudes from baseline to immediate follow-up ($p = 0.32$). At the six month follow-up, again there was no significant difference between groups in attitudes to cannabis ($p = 0.94$).

Frequency of cannabis use in the past 3 months

From baseline to immediate follow-up there was no significant difference between groups in frequency of cannabis use ($p = 0.33$). From baseline to the six month follow-up there was a significant difference between groups, with the intervention group decreasing their frequency of cannabis use (mean difference = −0.06 times/week) compared to the control group (mean difference = 0.20 times/week) ($p < 0.05$).

Cannabis harms

There was no significant difference between intervention and control groups in change of cannabis harms scores from baseline to immediate follow-up ($p = 0.33$). At the six month follow-up, again there was no significant difference between groups in attitudes to cannabis ($p = 0.96$).

Table 3
Baseline means (standard deviations) and mean change scores (standard errors) for each follow-up occasion for student alcohol and cannabis outcome data (Sydney, Australia; March 2007–April 2008).

Outcome measures	Group[a]	Baseline	Baseline—post	Baseline—six month follow-up
Alcohol knowledge[b]	INT	7.75	2.41**	2.37**
		(2.91)	(0.40)	(0.26)
	CON	7.26	0.54	0.74
		(2.53)	(0.29)	(0.29)
Average weekly alcohol consumption[c]	INT	3.55	0.86	−0.88*
		(15.69)	(1.68)	(0.91)
	CON	0.84	0.24	2.67
		(5.39)	(0.75)	(1.09)
Frequency drinking to excess on a single occasion[c]	INT	0.62	−0.08	0.32
		(2.96)	(0.28)	(0.18)
	CON	0.23	−0.11	0.23
		(1.90)	(0.21)	(0.11)
Alcohol harms[c]	INT	6.86	3.07	0.34
		(26.72)	(3.15)	(1.63)
	CON	2.87	−1.19	2.73
		(12.15)	(1.51)	(1.47)
Positive alcohol related expectancies[b]	INT	5.87	0.03	0.48
		(3.90)	(0.46)	(0.34)
	CON	5.90	0.49	1.20
		(3.73)	(0.39)	(0.38)
Cannabis knowledge[b]	INT	9.52	2.88**	1.83**
		(3.37)	(0.43)	(0.31)
	CON	9.08	0.54	0.33
		(3.05)	(0.37)	(0.35)
Frequency of cannabis use[c]	INT	0.13	0.08	−0.06*
		(0.92)	(0.11)	(0.07)
	CON	0.04	−0.04	0.20
		(0.54)	(0.07)	(0.09)
Cannabis harms[c]	INT	0.28	0.00	−0.04
		(1.02)	(0.13)	(0.08)
	CON	0.19	−0.16	−0.03
		(0.87)	(0.10)	(0.09)
Positive attitudes towards cannabis[c]	INT	2.22	0.33	0.20
		(3.58)	(0.46)	(0.32)
	CON	2.04	−0.26	0.16
		(3.19)	(0.37)	(0.41)

[a] INT: Intervention (Climate Schools) group and CON: Control group.
[b] Baseline equivalence between groups was determined using one-way ANOVAs and differences between groups in change scores from baseline to each follow-up occasion was determined using HLM analyses.
[c] Baseline equivalence between groups was determined using Mann–Whitney *U* and differences between groups in change scores from baseline to each follow-up occasion was determined using ANOVAs on change scores.
* Indicates a significant difference in change scores between groups at $p<0.05$.
** Indicates a significant difference in change scores between groups at $p<0.01$.

Evaluation of the course

Teachers who delivered the course ($n=12$), and students from one class from each school who completed the course ($n=98$), were randomly selected to evaluate the program. The course was found to be acceptable to students and teachers. Ninety three percent of students surveyed found the cartoon delivery appropriate and enjoyable and 85% said they would use the information in their own lives. Teachers were similarly positive; with 91% reporting the course met the outcomes of the syllabus well, 92% indicating that student's liked the program, and 72% endorsing the program as better than other education programs. Three quarters (75%) of teachers surveyed indicated they would use the course in the future and would recommend the course to others.

Discussion

Schools in the present study were randomly allocated to alcohol and drug education as usual or to an internet based course that spanned six months (lessons on alcohol misuse followed six months later in the school year with lessons that reprised the alcohol information and then taught about cannabis misuse). Students were surveyed by an online self report questionnaire at baseline, immediately after the course had been completed, and again six months later.

The integrated Climate Schools: Alcohol and Cannabis course was related to increases in alcohol and cannabis knowledge both immediately post the intervention and at the six month follow-up. In terms of behavioural change, the course was related decreases in average alcohol consumption and decreases in frequency of cannabis use in the intervention schools compared to the control schools six month following the intervention. These positive findings are consistent with other studies which have focused on harm reduction messages as opposed to abstinence based messages for change in alcohol and cannabis use (McBride et al., 2004; Newton et al., 2009; Vogl et al., 2009).

Study strengths

The strength of this study is that the course is delivered over the internet therefore it is infinitely scalability, and costs and other barriers to implementation are low. Further, fidelity is assured as computers guarantee that the course material is delivered in its entirety and is unable to be changed. This offers the advantage over traditional methods where teachers are able to adapt prevention programs to their own teaching style preference or to the specific needs of their classroom. This adaptation which so commonly occurs (Ennett et al., 2003), is extremely detrimental to a program as not only can it inadvertently remove the essential components of a program, it may even add components which can detract from the efficacy of the program (Ringwalt et al., 2004). A further strength of this study is that the program is contemporary and novel in its design, and students and teachers found it to be both an appealing and acceptable way to teach drug education.

Study limitations

The principal threat to validity is that it relied solely on student self report. While the demand characteristics would have been operative at the end of the course, it is hard to think that the demands of an anonymous web based survey would have distorted the results after 6 months. This concern may not be important as studies have found that self reports of transgressive behaviours such as substance use correlate with alternative assessment methods such as behavioural observations (Bandura et al., 1996). In addition, online questionnaires have been found to be at least comparable, if not superior to the traditional pen and paper questionnaires in terms of reliability and validity (Bonevski et al., 1997).

A further limitation concerns the generalisability of results given that all schools in the study were Independent (private) schools. This was a result of the convenience sampling that was used to recruit schools in the trial. The consumption and frequency of cannabis use at baseline are comparable to larger population based studies, suggesting they are comparable to other students their age from a range of school types (Australian Institute of Health and Welfare, 2008). Future studies would benefit from recruiting a larger number of schools to provide the power to examine other important individual level (e.g. gender), and school level (e.g. average teaching experience) predictors in the HLM models.

The implications for further research are that replication is needed. The beginning phase of this study served to replicate the alcohol module but replication of the finding in respect to cannabis is needed. This study was conducted in metropolitan independent schools. Rural schools and non-independent or state schools now need to be involved. Fortunately the state has embarked on a program to equip all students with computers that will make the next step possible.

Conclusions

The innovative design and delivery of the Climate Schools: Alcohol and Cannabis course which overcomes the more traditional obstacles

to implementation of prevention programs were effective in increasing alcohol and cannabis related knowledge, decreasing frequency of alcohol and cannabis use and decreasing average alcohol consumption, thus providing a promising framework for the provision of prevention programs in the future.

Conflict of interest statement

I, Nicola Newton confirm that I had full access to all the data in the study and had final responsibility for the decision to submit this paper for publication. The authors declare that there are no conflicts of interest.

Acknowledgments

The development of the Climate Schools: Alcohol and Cannabis program was funded by the Australian Government Department of Health and Ageing, as well as the Alcohol Education and Rehabilitation Foundation. Laura Vogl was funded by the Australian Research Council and Maree Teesson was funded by the National Health and Medical Research Council. Climate Schools is operated on a not-for-profit basis. Many thanks to Wendy Swift, Greg Martin, and the many schools, students, teachers, and health professionals who were involved in this research.

References

Australian Institute of Health and Welfare, 2008. 2007 National Drug Strategy Household Survey: First Results. AIHW, Canberra.

Bandura, A., Barbaranelli, C., Caprara, G.V., Pastorelli, C., 1996. Multifaceted impact of self-efficacy beliefs on academic functioning. Child Dev. 67, 1206–1222.

Bleeker, A., Malcolm, A., 2001. The Cannabis Quiz. Sydney: Manly Drug Education and Counselling Centre.

Bonevski, B., Sanson-Fisher, R.W., Campbell, E.M., Ireland, M.C., 1997. Do general practice patients find computer health risk surveys acceptable? A comparison with pen and paper method. Health Promot. J. Aust. 7, 100–106.

Botvin, G.J., Griffin, K.W., Diaz, T., Ifill-Williams, M., 2001a. Drug abuse prevention among minority adolescents: one-year follow-up of a school-based preventive intervention. Prevention Sci. 2, 1–13.

Botvin, G.J., Griffin, K.W., Diaz, T., Ifill-Williams, M., 2001b. Preventing binge drinking during early adolescence: one- and two-year follow-up of a school-based preventive intervention. Psychol. Addict. Behav. 15, 360–365.

Christiansen, B.A., Smith, G.T., Roehling, P.V., Goldman, M.S., 1989. Using alcohol expectancies to predict drinking behavior after 1 year. J. Consult. Clin. Psychol. 57, 93–99.

Collins, D.J., Lapsley, H.M., 2008. The Costs of Tobacco, Alcohol and Illicit Drug Abuse to Australian Society in 2004/05. Commonwealth of Australia 2008, Canberra.

Cuijpers, P., 2003. Three decades of drug prevention research. Drugs Educ. Prev. Policy 10, 6–20.

Ennett, S.T., Ringwalt, C.L., Thorne, J., Rochrbach, L.A., Vincus, A., Simons-Rudolph, A., et al., 2003. A comparison of current practice in school based substance use programs with meta-analysis findings. Prevent. Sci. 4, 1–14.

Faggiano, F., Vigna-Taglianti, F.D., Versino, E., Zambon, A., Borraccino, A., Lemma, P., 2008. School-based prevention for illicit drugs use: a systematic review. Prevent. Med. 46, 385–396.

Gorman, D.M., 2003. The best of practices, the worst of practices: the making of science-based primary prevention programs. Alcohol. Drug Abuse 54, 1087–1089.

Lee, V.E., 2000. Using hierarchical linear modelling to study social contexts: the case of school effects. Educ. Psychologist 35, 125–141.

Martin, G., Copeland, J., Gilmour, S., Gates, P., Swift, W., 2006. The adolescent cannabis problems questionnaire (CPQ-A): psychometric properties. Addict. Behav. 31, 2238–2248.

Mathers, C., Vos, T., Stevenson, C., 1999. The Burden of Disease and Injury in Australia. Australian Institute of Health and Welfare, Canberra.

Mukherjee, D., 1999. Socio-economic Status and School System Enrolments. Australian Centre for Equity through Education, Sydney.

McBride, N., Farringdon, F., Midford, R., Meuleners, L., Phillips, M., 2004. Harm minimisation in school drug education: final results of the School Health and Alcohol Harm Reduction Project (SHAHRP). Addiction 99, 278–291.

McBride, N., Farringdon, F., Muleners, L., Midford, R., 2006. School Health and Alcohol Harm Reduction Project: Details of Intervention Development and Research Procedures. National Drug Research Institute, Curtin University of Technology, Perth, W.A.

National Health and Medical Research Council, 2001. Australian Alcohol Guidelines: Health Risks and Benefits. NHMRC, Canberra.

National Health Promotion Associates Incorporated, 2004. Life Skills Training Questionnaire-Middle School. NHPA.

Newton, N., Vogl, L., Teesson, M., Andrews, G., 2009. Climate Schools: Alcohol module—a cross-validation of a school based prevention program for alcohol misuse. Aust. New Zealand J. Psychiatry 43, 201–207.

Office of National Drug Control Policy, 2008. Marijuana: The Greatest Cause of Illegal Drug Abuse. Washington DC.

Raudenbush, S.W., Bryk, A.S., Congdon, R.T., 2004. HLM 6: Hierarchical Linear Modelling and Non Linear Modelling. Scientific Softwarre International, Inc., Lincolnwood, IL.

Ringwalt, C., Ennett, S.T., Vincus, A., Simons-Rudolph, A., 2004. Students' special needs and problems as reasons for the adaptation of substance abuse prevention curricula in the nation's middle schools. Prevent. Sci. 5, 197–206.

Schinke, S., Schwinn, T.M., Noia, J.D., Cole, K.C., 2004. Reducing the risks of alcohol use among urban youth: three-year effects of a computer-based intervention with and without parent involvement. J. Stud. Alcohol 65, 443–449.

Shope, J.T., Copeland, L.A., Marcoux, B.C., Kamp, M.E., 1996. Effectiveness of a school-based substance abuse prevention program. J. Drug Educ. 26, 323–337.

Soole, D.W., Mazerolle, L., Rombouts, S., 2005. School based drug prevention: a systematic review of the effectiveness on illicit drug use. Drug Policy Model. Project, Monograph 07 Griffith University.

Tobler, N.S., 2000. Lessons learned. J. Primary Prevent. 20, 261–274.

Tobler, N.S., Stratton, H.H., 1997. Effectiveness of school-based drug prevention programs: a meta-analysis of the research. J. Prim. Prevent. 18, 71–128.

Tobler, N.S., Lassard, T., Marshall, D., Ochshorn, P., Roona, M., 1999. Effectiveness of school-based drug prevention programs for marijuana use. Sch. Psychol. Int. 20, 105–137.

Tobler, N.S., Roona, M.R., Ochshorn, P., Marshall, D.G., Streke, A.V., Stackpole, K.M., 2000. School-based adolescent drug prevention programs: 1998 meta-analysis. J. Prim. Prevent. 20, 275–336.

Van Vliet, H., Andrews, G., 2009. An internet based course for the management of stress for junior high schools. Australian and New Zealand Journal of Psychiatry 43, 305–309.

Vogl, L., Teesson, M., Andrews, G., Bird, K., Steadman, B., Dillon, P., 2009. A computerised harm minimisation prevention program for alcohol misuse and related harms: randomised controlled trial. Australian and Addiction 104, 564–575.