



The Effectiveness of Universal Educational Interventions for Prevention of Illicit Drug Use among University Students: A Systematic Review

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(Received 23 Apr 2023; accepted 19 Jul 2023)

Abstract

Background: The extent of illicit drug use among university students necessitates effective preventive programs. To identify and assess the effectiveness of university-based interventions in preventing or reducing illicit drug use.

Methods: The MEDLINE (PubMed), SCOPUS, ISI (Web of Science), and other sources were searched according to the Cochrane Collaboration method. RCTs, CRTs and non- RCTs evaluating university-based interventions designed to prevent illicit drug use were reviewed. Data were extracted independently by two reviewers. The quality of the publications was assessed. Interventions were classified by type, provider, duration, and theoretical background.

Results: Of 6652 papers, 11 studies met the eligibility criteria that were conducted between 1987 and 2020. The effectiveness of interventions was different. Substantial heterogeneity among the studies prevented the integration of results for estimating summaries.

Conclusion: Despite the importance of the subject, there is a paucity of studies about specific educational programs for illicit drug use, indicating the necessity of further research in other countries.

Keywords: Prevention; University-based programs; Illicit drug use; Systematic review; Effectiveness

Introduction

The global problem of illicit drugs encompasses various dimensions (1) and drug use disorders are considered a serious threat to health with a signif-

icant burden (2). About 275 million people worldwide have used drugs in the past year (3) only in the Eastern Mediterranean Region estimated about 6.7% (about 30 million) of the population



between 15 and 64 yr old have used any illicit drug in the past year (4).

Drug use causes 2% of the global disability-adjusted life yr in the age group 15-24 yr old age (5). The university setting is a high-risk environment for drug use because of the opportunity to use (6). Starting college can be a stressful time for many young people, especially those who live away from their families for the first time, which may increase the prevalence of high-risk behaviors in this group (7).

The use of any illegal drug among students is variety, for example a lifetime prevalence of 22.2% for marijuana, 2.4% for cocaine, 0.2% for heroine, 2.2% for LSD, 1.9% for amphetamines among Greek medical students (8), 1% to 3% for hashish, 1.1% to 2.6% for opioid drugs, 1.3% to 2.6% for amphetamine-type stimulants (9), the prevalence of methylphenidate use in the last year was 2.7%, and the prevalence of sedative use (at least three times a week for the last month) was 0.4% in Iranian medical sciences students (10) and 43% for marijuana in college students in USA (11).

Preventing drug use among university students is important to avoid future and long-term side effects (12). Although youth-focused prevention programs are implemented, they have little impact on older ages, as there are no mandatory and appropriate programs for the age group 16-19 yr (13).

Preventive interventions can be divided into three categories, including universal, selective, and indicated. Universal interventions target all communities or the whole population within specific settings without prior assessment of risk factors (14). Considering the prevalence of illegal drug use among students and the lack of a reliable and effective program for universal prevention in this group, this systematic review was conducted to review the evidence related to the effectiveness of universal educative interventions to prevent or delay the use of illicit substances in the university or college students worldwide.

Methods

This systematic review was conducted to review the existing peer-reviewed publications on studies conducted on university students (population) to evaluate the effect of universal educational/interventions (intervention) compared to other interventions (comparison) in preventing illicit drug use (outcome). The international databases of MEDLINE (through PubMed), SCOPUS, and ISI (Web of Science) were searched systematically to retrieve relevant articles.

The databases were searched in Mar 2021 using the four types of keywords, including the name of various illicit drugs or drug use disorders (e.g., marijuana, opioid, cocaine, ...), study setting (e.g., university, campus, ...), type of intervention (e.g., train, prevent, ...), and study design (e.g., random, trial, ...).

No time or language restrictions were applied. The details of the search strategy are presented in Appendix Table 1. The reference lists of the included studies and all the papers that cited the included studies (backward and forward citation tracking) as well as the study protocols in the International Clinical Trial Registry Platform (ICTRP) and ClinicalTrials.gov were also searched to track relevant articles.

Primary studies were included in the systematic review if they met the following eligibility criteria that align with the PICO items: 1) the participants were university students, 2) the study evaluated the effect of any universal educational intervention with a universal approach including face-to-face, web-based, or mobile-based training, or any other education method for prevention of illicit drug use; 3) the study had a comparison group that received any type of intervention or no intervention, or did not have a comparison group, 4) the study reported at least one of the outcome measures, including attitude toward illicit drugs, or intention to use or use of illicit drugs, and 5) the study was a randomized controlled trial or quasi-experimental study (non-randomized studies and before-after studies). Studies investigating high-risk students (e.g., relapse prevention interventions on previous

drug users), selective educational preventive intervention studies and studies investigating smoking and/or alcohol use as the only study objectives were excluded from the review.

The retrieved publications were assessed in three steps. The titles and abstracts of the publications were initially screened for eligibility criteria. In the next step, the full texts of studies were evaluated and all the required data were extracted. Screening and data extraction were performed by two reviewers independently (KG, and GM) and disagreements were resolved through discussion. If a consensus could not be reached, disagreement was resolved by two other team members who were experts in this regard (AR, and JG).

A data extraction sheet was created in the Microsoft Excel to record the following data:

- Bibliographic data
- Study characteristics
- Study findings

For each included study, the risk of bias was evaluated according to the type of study and using the instructions provided by the Cochrane collaboration (15-17).

Results

Overall, 6,645 records were identified through searching the electronic databases, and seven articles were found through other sources (International Clinical Trial Registry Platform, ClinicalTrials.gov, backward and forward citations tracking, and opportunistic paper finding). After eliminating duplicates and screening process finally, 11 publications including 9 research studies were reviewed (Fig. 1). The excluded studies and the reasons for exclusion are presented in Appendix table 2. Two articles were derived from one project, their data were considered as a single study (18, 19), and another study was a study protocol (20) whose findings were published in a separate article (21).

Study characteristics

The studies were conducted between 1987 and 2020. Six studies were randomized controlled trials (RCTs) with a parallel design, one study was a cluster randomized trial (CRT), one study was a single group pre-test & post-test study, and one study had a quasi-experimental design with repeated anonymous random sample surveys. The sample sizes of included studies ranged from 60 (22) to 4775 (21) students. Six studies (23, 19, 24, 25, 26, 27) were conducted in the USA and three studies were performed in Germany (21), India (28) and Jordan (22). The Appendix Table 3, 4 and 5 provided the characteristics and the intervention, comparisons, outcome details and statistical information extracted from each study, respectively.

Study findings

Detailed findings of the included studies are summarized in Table 1.

Three studies that were conducted based on the *behavior Image Model (BIM)* had different implementation methods and follow-up times. In brief, the study of the effect of the consultation and contract with calendar log compared to consultation or contract with calendar log, no difference was observed in the consumption of marijuana between intervention and comparison groups after one month (23). The second study (19) had two follow-up assessment times at 3 and 12 months after the enrollment. No significant difference was reported in marijuana consumption measures between baseline measurement and 3-month and 12-month follow-ups (18, 19). In the third study (24), found that the intervention had no effect on the intentions to use marijuana in the next 6 month; however, the intervention group had a significantly better knowledge and attitude towards negative effects of marijuana use on health-related behaviors compared to the control group after the intervention.

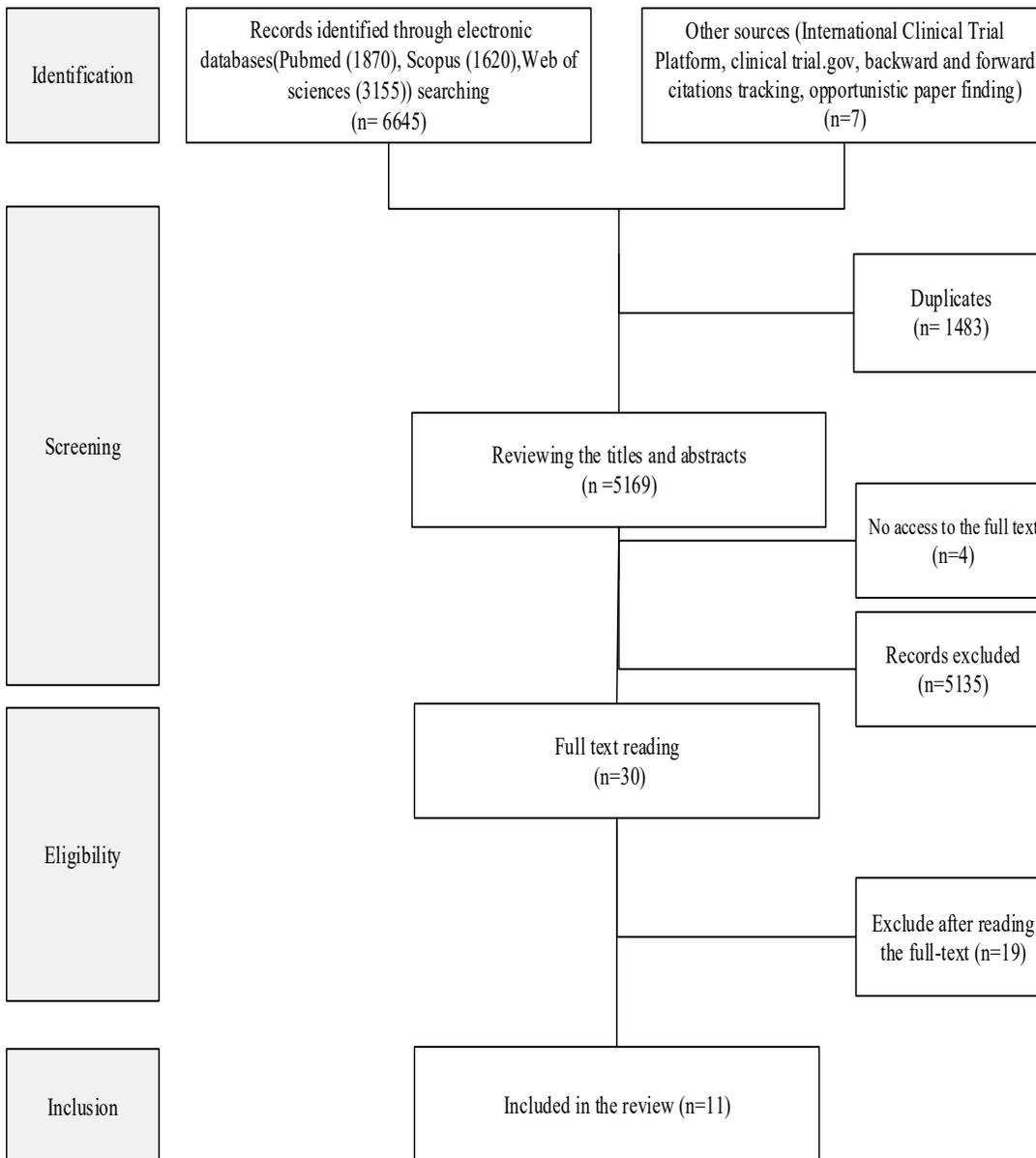


Fig. 1: Flow diagram of study selection

A study with a 17-month follow-up period based on the *self-regulation theory*. The level of risk perception for marijuana and cocaine was higher in the intervention group compared to the control group at the follow-up. Furthermore, the percentage of

marijuana and cocaine use in the last 30 days decreased in the intervention group compared to the control group (25).

One of the studies was based on *gain-framed and loss-framed theory*. Zimmerman et al. used an intervention in the form of showing public service announcements with messages regarding marijuana

use and its threat, loss and gain. The results showed a decrease in positive attitude about marijuana use and an increase in the perceived seriousness of consequences in the intervention group (26).

Pischke performed a study with a 5-month follow-up based on the *theory of social norms*, which showed that the intervention group had greater odds of cannabis consumption (21). Similarly, Elliot et al investigated descriptive and injunctive norms and found that no significant difference for consumption between the intervention and control group after a one-month follow-up (27).

Singh et al. conducted a pre-test and post-test study with no control group to measure the knowledge, attitude and behavior toward substance use. They found a significant difference in the mean scores of the students' knowledge, attitude and performance after the intervention (28). In another study, a cognitive behavioral intervention was applied to prevent substance use in intervention and control groups. The results of the post-test immediately after the intervention and 3 months later showed significant favorable changes in the attitude towards drug use in the intervention group (22).

Table 1: Summary of findings from included studies

No	First author, Publication Year	Study year	Country	Sample size (Female, Male)	Study objectives related to drug use	Age: mean (SD), min-max	Primary outcomes and measurement time point	Summary results
1	Werch, 2007 (23)	2005-2006	USA	155 (102, 53)	Marijuana use	19 (1.12), NR	<ul style="list-style-type: none"> - Length of marijuana use - 30- day marijuana frequency - 30- day marijuana quantity (1 month follow up) 	No differences were seen after one month on marijuana consumption measures
2	Werch, 2008 & 2010 (18, 19)	2006-2007	USA	299 (178, 121)	Marijuana consumption and problems	19.2 (1.12), 18- 21	<ul style="list-style-type: none"> - Length of marijuana use - 30- day marijuana frequency - 30- day marijuana quantity - 30- day heavy use of marijuana (3 months & 12 months follow up) 	<ul style="list-style-type: none"> - The intervention group after 3 months was less likely to initiate marijuana use, used less quantity of marijuana, and used marijuana heavily less frequently. - No significant effect for marijuana use at baseline to 12-month follow up.
3	Moore, 2012 (24)	2007	USA	200 (102, 98)	Marijuana use	19.44 (1.06), 18-21	<ul style="list-style-type: none"> - Intentions of marijuana use in the next 6 months - Social norms (How many of your friends Use marijuana) (Immediately after intervention) 	The effect of the intervention on intention of marijuana use in the next 6 month was not significant.
4	Miller, 2000 (25)	1987-1989	USA	Baseline survey, distributed questionnaires: 2480	Risk perceptions and the use of drugs	Intervention group and control groups:	<ul style="list-style-type: none"> - Marijuana use in past 30 days - Cocaine use in past 30 days 	-At follow-up, intervention campus which had higher rates of drug use and drug-related problems and a higher risk

Table 1: Continued ...

				Follow up survey, distributed questionnaires: 3666 (NR)		25.7 to 28.5	<ul style="list-style-type: none"> - Total drug use in the past month - Tranquilizers use in past 30 days - LSD use in past 30 days (17 months follow up) 	<p>perception at baseline, continued to report a higher overall rate of total drug use (by only two specific drug classes).</p> <ul style="list-style-type: none"> - The higher rate of drug-related problems on the intervention campus at baseline was no longer significant different from the control campus at follow-up.
5	Zimmerman, 2014 (26)	NR	USA	Completed a pre-test: 525 Created an ID number: 406 Registered for a session in the media lab: 307 Attended a media lab session: 243 (NR)	Attitudes, beliefs, and intentions related to marijuana	18-21 (NR), NR	<ul style="list-style-type: none"> - Positive attitudes about marijuana use - Negative attitudes about marijuana use - Peer norms about marijuana use Post Behavioral intentions - Perceived severity of marijuana use (Immediately after intervention) 	<ul style="list-style-type: none"> - The public service announcements were generally successful (as compared to the control messages) at reduction of positive attitudes toward marijuana use, and increased perceived seriousness of consequences.
6	Pischke, 2021 (21)	2014	Germany	4775 (NR)	cannabis consumption	NR	<ul style="list-style-type: none"> - Cannabis consumption decreased 5 months post-intervention - Decreased consumption - Not increased cannabis consumption (5 months follow up) 	<ul style="list-style-type: none"> - Intervention group showed significant higher odds for not increased cannabis use (among females and total).
7	Singh, 2018 (28)	NR	India	200 (200, 0)	Knowledge, attitude and practice on Substance abuse	NR	<ul style="list-style-type: none"> - Knowledge towards substance abuse - Attitude towards substance abuse - Practice regarding substance use (10 days follow up) 	<p>The mean post-test knowledge, attitude and practice score were higher than the mean pre-test and were found to be statistically significant.</p>
8	Elliott, 2012 (27)	2011	USA	245 (179, 66)	Values and views regarding marijuana	20.5 (SD = 2.7), NR	<p>Descriptive norms:</p> <ul style="list-style-type: none"> - The percentage of college students do not use marijuana at all - The percentage of college students 	<p>Rates of use/initiation did not differ between the two conditions.</p>

Table 1: Continued ...

							used marijuana in last month	
							- The percentage of college students used marijuana ever in lifetime	
							Injunctive norms:	
							- Percentage stating that friends would:	
							- approve if they abstained from marijuana	
							- not care if they abstained from marijuana	
							- disapprove if they abstained from marijuana	
							Marijuana use/initiation:	
							- Percentage who used in past month (1 month follow up)	
9	Hamdan Mansour, 2020 (22)	NR	Jordan	60 (38, 22)	Attitudes toward substance use	18.8 (SD = 1.67), 17-24	- Attitudes toward substance use (Immediately & 3 months follow up)	Participants' negative attitudes toward substance use in the intervention group was increased post intervention.

¹Not Significant, ²Maximum possible score was 24, ³Maximum possible score was 75, ⁴Maximum possible score was 33

Risk of bias evaluation

The included studies were assessed for risk of bias according to the study design:

For RCTs and CRTs, the risk of bias was evaluated for 5 domains. All six RCTs had a high risk of bias due to deviations from the intended interventions (effect of assignment to intervention and/or effect of adhering to intervention) while they had a low risk of bias in terms of availability of outcome data for participants (19, 22-24, 26, 27).

Only one study was a CRT (21) in which the randomization process was not clearly defined either.

It had a high risk of bias for deviations

Two studies were non-randomized trials conducted by Miller et al (25) had a critical risk of bias and the study by Singh et al (28) had a serious risk of bias. Overall, the risk of bias was high in seven studies and critical in two studies. The details of

risk of bias domains for each study provided in Appendix Table 6.

Discussion

This systematic review identified nine studies (11 articles) published from 2000 onward that focused on a universal preventive education on illicit drug use in university and college students around the world. We were not able to perform a meta-analysis due to the heterogeneity of the educational interventions and the measured indicators. Most of these interventions were mixed and focused on nutrition, exercise, other behaviors and life skills in addition to preventing the use of illegal drugs. Most of the universal educational prevention programs included in this review focused on tobacco, alcohol, marijuana, and other health-related items;

however, according to the purpose of our study, which was illegal drugs, we removed other outcomes. The main focus of all included studies was on measuring the attitude, knowledge, perceptions, beliefs, frequency/amount, and duration of use, as well as reducing the use of such drugs. The included studies had some drawbacks, including failure to report the outcome measures clearly (e.g. length of marijuana use (18, 19, 23)), failure to explain the content of the educational intervention programs properly (28), failure to report the sample sizes (21, 26) or the number of male and female subject (21, 24-27). Moreover, all of the studies were rated as high risk in the risk of bias assessments.

Each intervention was based on a theory. The *Behavior-Image Model* (BIM) argues that multiple health-related behaviors can be connected and affected by the portrayal of other self-images for the target audience, which in turn activates prototypes and future self-images, and leads to improvements in risk and protective factors (23). Social norms (SN) interventions involve Personalized Normative Feedback (PNF). Data on perceived attitudes and use as well as actual attitudes and use are evaluated. PNF is composed of three components. Participation in PNF lead to a reduction in the social pressure on the individual and may reduces personal substance use (21). Self-regulation theory is about understanding how people do (or do not) control and change their behavior in adjusting to changes in the social environment (25). In Extended Parallel Processing Model (EPPM), high-threat messages are more effective than low-threat messages, but only for individuals who have high levels of results (self-efficacy plus response efficacy). According to the theory, these individuals will cope with the threat by “danger control” (26). The effectiveness of universal prevention educations varied. The studies showed different results based on content and follow-up time. The most effective program on marijuana use in the medium-term evaluation (with a 3-month follow-up) was an educational intervention based on the BIM. Most of the universal educational prevention programs in this review were brief (19, 23, 24, 26-28),

and the longest program (25) included in this review did not specify how much the students benefited from program. The programs were based on various models and some of them had significant effects on some measures in the short term (22, 26-28) and on some measures in the medium term (19, 21, 22). In the long term, none of the indices improved significantly (19, 25).

As for the platform, only 2 studies used a computer-based delivery method (21, 24) and one of them used media (26). Other studies used a combination of methods (such as face-to-face consultation, scripted messages, etc.) Therefore, it is difficult to compare the methods and determine the best scenario for training.

Only one study had two follow-ups at 3 and 12 months (19). The rate of changes before and after the intervention was significant only in the 3-month follow-up. Therefore, more studies with longer follow-up durations are necessary to assess the long-term effect of interventions. In the study by Miller et al (25), the follow-up time was 17 months. In this study, the intervention group had higher scores in marijuana/cocaine consumption in the last 30 days compared to the control group at the baseline. After 17 months, this group showed a greater reduction compared to the control group; however, only the percentages were provided.

Considering the the above limitations, educational interventions for alcohol were used for comparison with other studies. One of the studies (21), based on the theory of social norms, concluded that the intervention group had a lower chance of an increase in cannabis use (among women and overall). The above finding, in line with studies by Dotsons (29) that conducted an intervention based on PNF delivered using computer and by Reavleys (30) that conducted an intervention based on PNF delivered using computers or individual face-to-face sessions for BMIs, suggest that educational interventions are effective in reducing alcohol consumption among students. A meta-analysis of randomized controlled trials conducted on first-year students (31) showed that behavioral interventions could reduce alcohol use and related

problems, such as quantity and frequency of drinking. Plotnikoffs reviewed randomized controlled trials to evaluate the efficacy of interventions targeting alcohol, drug, and smoking behaviors in university and college students and education-based interventions were effective in reducing alcohol consumption and the negative consequences of its consumption. However, the results of drug use and smoking were contradictory (7). Lavilla-Garcia et al (32) conducted a scoping review to evaluate peer-to-peer interventions to reduce alcohol consumption among college students and found that such interventions could prevent consumption. However, the findings of this study were inconsistent with the results of a study by Moreira (33) that assessed social norms interventions to reduce alcohol consumption in university students and found non-significant results.

One of the reasons for the lack of studies on universal educational interventions for prevention of illicit drug use among university students, only carried out in developed western countries, especially the United States, may be their complexity and high costs. Other reasons could be the low age of initiating drug use in these countries. For this reason, these countries start preventive studies at a lower age and from school. However, in many other countries, most of the students have not received any preventive services and have not consumed illicit drugs when they enter the university, and the university setting can provide a suitable opportunity for preventive interventions.

Research into substance abuse prevention packages among university students is so limited that it is not possible to comment on their effectiveness with certainty. Considering the lack of preventive studies in students, it may be possible to use the older adolescents' preventive knowledge for university students. However, a successful application of these suggestions requires proof of their effectiveness.

To the best of our knowledge, this is the only systematic review of universal educational interventions for prevention of illicit drug use among university students. A limited number of studies have evaluated universal educational interventions for prevention of illicit drug use in university students.

On the other hand, due to inconsistencies between the measured indicators and the type of interventions, it was not possible to perform a meta-analysis.

Conclusion

A limited number of studies have evaluated universal educational interventions for prevention of illicit drug use in the university students; however, the results of individual studies are promising. More studies with longer follow-ups are needed.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Conflict of interest

The authors declare that there is no conflict of interests.

Availability of data

For supplementary tables, readers can contact the corresponding authors, if needed.

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