REDUCING THE USE & MISUSE OF MARIJUANA

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A Literature Review

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A LITERATURE REVIEW

Introduction

Today, about 2.5 percent of the world population consumes cannabis - commonly called marijuana - compared to 0.2 percent for cocaine and 0.2 percent for opiates (WHO, 2017). Often linked to youth culture, cannabis abuse has grown rapidly in the past decade, while teens' perceptions of the risks of marijuana use have declined (NIH, 2017). In the United States specifically, marijuana is the most commonly used illicit drug and is often associated with cognitive and physical risks, as well as long-term addiction (SAMSHA, 2016). Thus, marijuana prevention programs may go a long way in reducing these risks.

Research from the National Institute of Health (NIH, 2017) has shown that substance abuse prevention programs implemented in schools and communities can effectively reduce illegal drug use by shaping individuals' perceptions about the risks of substance use. In addition, the Substance Abuse and Mental Health Services Administration (SAMSHA, 2014) has created prevention resources based on evidence that prevention programs can be efficient in reducing marijuana use. The summaries below illustrate various approaches to marijuana prevention.

For instance, Lemstra and colleagues (Lemstra, 2010) reviewed the effectiveness of school-based marijuana prevention programs for adolescents aged 10-15 years in the research published between 1980 and 2007. Through their analysis, they argued for comprehensive programs that include anti-drug information, refusal skills, self-management skills, and social-skills training. Similarly, Tobler et al. (1999) identified which programs were most effective in reducing, delaying or preventing marijuana use among 6th graders. They found that programs that emphasized social competencies had greater reductions in marijuana use, particularly when implemented in small groups, and that program delivery, more than content, can determine the success of a program.

In turn, Lee and colleagues (2013) assessed the impact of a brief in-person motivational intervention with college students on marijuana use reduction, and report preliminary results about the short-term effectiveness of a marijuana intervention with a college population in reduction marijuana use during an academic quarter. Alvaro et al. (2013) looked at mass media campaigns and the relationship between receivers' evaluation of marijuana prevention ads and their intentions to use marijuana. Their analysis helps understanding the success--or lack thereof--of media campaigns, and calls for an understanding of ad features that target individuals based on different usage, attitudes, and intentions of drug use.

For Freisthler, Kepple, Sims & Martin (2013), spatial analytic techniques can be used to review environmental interventions aiming to limit problems around medical marijuana dispensaries. They also examined which dispensary practices are related to crime at varying distances, and explained how

specific security measures can help reduce crime around these dispensaries. Finally, Quinlan and colleagues (2015) looked at the international literature on the effectiveness of environmental strategies for reducing non-medical use of marijuana, and highlighted the need for such research to better guide evidence-based practices and policies to make better choices about available environmental strategies for marijuana prevention programs.

Article 1: Review of School-Based Marijuana and Alcohol Prevention Programs

Past research has suggested that risky behaviors with drugs and alcohol start around age 10 and reach their height around 14-15 years old. Research also suggests that schools can help deliver drug and alcohol prevention programs and are typically efficient in doing so because of the large number of individuals they can target. Schools do so through two types of prevention programs. They can administer programs aimed at **knowledge dissemination** - that is, programs that provide students with knowledge of drug and alcohol effects, knowledge of media and social influence, and knowledge of drug and alcohol use by peers. Alternatively, they can offer another type called **comprehensive programs**, which provide anti-drug information combined with refusal skills (i.e., drug and alcohol related refusal skills, cognitive behavior skills and networking with non-drug using adolescents), self-management skills (i.e., skills to protect self in a drug-related situation, assertiveness skills, communication skills and problem-solving skills) and social skills (i.e., coping skills, goal setting, identifying alternatives, peer counseling, community wide collaboration and involvement).

Previous analyses showed that, historically, school-based prevention programs tend to take a **knowledge dissemination** approach. However, while previous researchers concluded that **these programs could help modify adolescents' attitudes towards drug and alcohol use, they do not necessarily impact actual behaviors**. In addition, school-based marijuana and alcohol prevention programs found in the literature showed inconsistent outcomes.

As a result, the authors conducted a review that examined the effectiveness of school-based marijuana and alcohol prevention programs for adolescents aged 10-15 years in the research published between 1980 and 2007. The purpose of the review was (i) to examine whether school-based marijuana and alcohol prevention programs helped 10-15 year olds reduce marijuana and alcohol use in the long term, and (ii) to examine the effectiveness of knowledge-based interventions vs. comprehensive type prevention programs. After setting specific selection criteria, the review focused on six studies: three focused on alcohol and marijuana usage as a dual set of outcome measures, and three used alcohol usage alone as the outcome. Three of these studies examined knowledge-based programs and three studies examined comprehensive-based programs; with an overall sample size of 11,926 adolescents. **Findings showed that long-term marijuana and alcohol prevention programs that used a comprehensive approach had a mean absolute reduction of 12 days of alcohol usage per month and a mean absolute reduction of 7 days of marijuana usage per month among adolescents aged 10–15 years**; while school-based marijuana and alcohol prevention programs that used a knowledge only approach had a mean absolute decrease of 2 days of alcohol usage per month among adolescents aged 10–15 years. Of the six programs evaluated in the review, most were short term and focused on changes in knowledge and attitudes instead of actual behavior. In other words,

comprehensive programs that were multi-factorial and combined knowledge with refusal skills, self-management skills, and social skills had long-term effectiveness in comparison to programs that focus on knowledge alone. In conclusion, the authors argued that comprehensive programs that included anti-drug information, refusal skills, self-management skills, and social-skills training were the most effective programs for reducing marijuana and alcohol use in the long-term among adolescents aged 10–15 years. Even though comprehensive multi-factorial interventions are more difficult to initiate, the authors called for these additional efforts for long-term effectiveness in actual behavioral change to be accomplished.

Article 2: School-Based Drug Prevention Programs for Marijuana Use

Research has shown that marijuana use among 6th graders is not uncommon, and that while interdiction initiatives can help decrease drug availability temporarily, drug trafficking cannot be contained unless a more enduring drug demand reduction solution is in place. This demand reduction is mainly based on attitudes and behaviors. One of the ways to tackle demand reduction at the community level is through school-based drug prevention programs. In this paper, **the authors sought to identify (i) which programs were most effective in reducing, delaying or preventing marijuana use**, (ii) whether programs that were successful depended on youth's characteristics, and (iii) what the relationship between implementation factors and program success were.

To conduct their analysis, the authors selected 37 programs that responded to their criteria (i.e., they were open to all ethnic groups in the U.S.; did not specifically target high risk youth; were implemented between grades 6 and 12; focused on primary or secondary prevention and/or early intervention) out of 595 studies related to adolescent prevention programs. The studies were synthesized quantitatively by coding program characteristics and by calculating weighted effect sizes (WES) for marijuana use. From the analysis of their content (i.e., knowledge, affect, refusal skills, generic skills, safety, skills, extracurricular activities, or others) and delivery method (i.e., from passive lectures to teachers facilitating interactions between the youth), selected programs were groups under two kinds: interactive and non-interactive. Using WES of marijuana use as the outcome, type of program as the predictor, and sample size as an additional covariate, the authors conducted a weighted least squares multiple regression analysis to determine the characteristics of programs that most effectively reduced, delayed or prevented marijuana use.

Their results showed that the kind of program (i.e., interactive vs. non-interactive) and sample size were significant predictors of program effectiveness. For instance, a non-interactive lecture-type prevention program built around knowledge about drugs had minimal effects on the decrease of marijuana use. **However, programs that emphasized social competencies had greater reductions in marijuana use, particularly when implemented in small groups.** Through their extensive research and analysis of such programs, the authors concluded that it is the delivery, and not the content, that can determine the success of a program. In this specific case, **it is the interactive cultivation of social skills among small groups that can help reduce marijuana use**. The authors also mentioned challenges contemporary to the time this study was conducted, namely that many programs were not available in marketable forms, and that extensive teacher training was required. They concluded a paradigm shift

was necessary for administrators to allow teachers to facilitate the help, guidance, and support of students in small group settings.

Article 3: College Student Marijuana Use Prevention

While illicit marijuana use is prevalent on college campuses, there is only a limited amount of intervention studies that address high-risk marijuana use on college campuses. Previous research reported that marijuana use can be linked to decrease in attendance and academic performance, cognitive impairments, attention and memory deficits, in addition to medical problems (e.g., respiratory, cardiac). The authors therefore assessed the impact of a brief in-person motivational intervention with college students on marijuana use reduction. **Motivational enhancement therapy (MET) in the shape of motivational interviews (MI) provides a non-confrontational strategy to enhance intrinsic motivation and change behavior through exploring individuals' ambivalence about change.** Research has shown positive results from this strategy--even among non-treatment-seeking individuals. For individuals seeking treatment, a combination of MET and cognitive behavioral therapy (CBT) is referred to as the gold standard. Nevertheless, there is limited research available on marijuana use interventions among college populations.

Only three published studies looked at a motivational framework to address student drug use; and although they showed positive results in reducing marijuana use, their effect size was small. **One study in particular, although it reported no overall intervention effect, showed promising results by using a web-based personalized feedback intervention that were effective even 6 months after its implementation.** In their own study, the authors aimed to evaluate the efficacy of personalized feedback in the context of a brief in-person motivational intervention to individuals who used marijuana frequently. Their hypothesis was that compared to a randomized assessment-only control group, participants who benefitted from the in-person intervention would reduce their marijuana use after 3 and 6 months. In total, 212 college students on 2 campuses who reported frequent marijuana use (i.e., at least 5 times in the past month) participated in the study. After completing a web-based baseline screening, they were randomly assigned to the in-person brief intervention group or to the control group. Participants scheduled the in-person intervention after completing the online assessment. Post-baseline assessments were conducted after 3 and 6 months, and both marijuana use and marijuana-related consequences were measured in terms of frequency. The intervention itself consisted of a one-hour in-person intervention adapted from Teen Marijuana Check-Up.

The intervention was tailored to each participant and contained personalized graphic feedback about the impact of marijuana use, patterns of use, family history risk, cost, related consequences, and information about participants' typical patterns of marijuana use for peer comparison. Other sections of feedback provided participants with an exploration of their social networks (i.e., how people in their surrounding felt about or used marijuana), along with goals for the upcoming year (i.e., a list of five goals accompanied by how marijuana use or reduction would affect attaining these goals). Participants were also given the opportunity to discuss these goals and ask questions. **Results of the study showed a significant effect of the intervention of the number of joints smoked by students in a typical week.** In addition, fewer marijuana-related consequences were reported after 3 months in comparison to the control group.

The authors mentioned some limitations. Indeed, the observed differences were no longer apparent after 6 months. The authors believe that long-lasting effects are difficult to expect from a brief intervention, suggesting the need for a multi-session approach and for an analysis of other factors (e.g., seasonal and situational factors, or the illicit aspect of the drug). In addition, the attrition rate for the study was low: only 55 percent attended the in-person feedback session. The authors proposed that future research should be replicated to look at variation between same-age college and non-college users. As such, this study reported preliminary results about the short-term effectiveness of a marijuana intervention with a college population in reduction marijuana use during an academic quarter.

Article 4: Adolescents' Attitudes Toward Marijuana

Mass media campaigns are often used to attempt to prevent or reduce substance use. However, these campaigns often demonstrate inconsistent results despite the amount of money spent in producing them. The authors shared the example of the National Youth Antidrug Media Campaign, which though it was extensive in exposure, did not produce the desired effects. The authors studied the reasons for its lack of success and examined how the role of persuasive-message design could lead to better results. Part of this analysis relies on observing receivers' reaction to ads and how it correlates to their drug use. Indeed, previous research showed that people who already knew they would resist marijuana usage (i.e., resolute nonusers) are typically less likely to start using it in comparison to abstinent receivers (i.e., vulnerable nonusers) who are sure they would stay abstinent. **For that reason, the authors looked at the relationship between (i) receivers' evaluation of marijuana prevention ads, (ii) their intentions to use marijuana, and iii) they use of marijuana use after being exposed to the campaign.** The authors put forth three hypotheses: 1) receivers evaluating anti-marijuana ads in a favorable way would be less likely to intend to use it and 2) less likely to start using it one year after; and 3) the same effect would be less apparent among resolute nonusers vs. vulnerable users and users.

The data used for this study was collected by the National Survey of Parents and Youth, which was a 4-year panel conducted during the National Youth Antidrug Media Campaign. A total of 5,340 ad evaluations and attitudes toward marijuana were analyzed during the campaign (T1), and actual marijuana intention to use and actual use were measured one year later (T2). The ads themselves varied from celebrity testimonials and alternatives to drugs, to refusal skills. Participants responded to items using headphones and touch-sensitive screens, and were interviewed four times from 1999 to 2004. The interviewed focused on beliefs, attitudes, behaviors, and intentions. Cued ad recall and ad evaluations were also collected. I**n their analysis, the authors showed that the more ads the participants viewed, the more positive their evaluation;** that women evaluated ads more positively than men; that positive marijuana attitudes were associated with less positive ad evaluations; that resolute nonusers evaluated ads more positively than vulnerable nonusers; and evaluation did not differ significantly between users and vulnerable nonusers. **The researchers also found that attitude toward the ads was predictive of marijuana usage intentions and actual use after one year.** For those who were already using marijuana at T1, positive ad evaluations resulted in reduced intention and actual use of marijuana one year later. Altogether, this study helps understanding how to develop more effective drug prevention campaigns based on receivers' appraisal of its persuasive messages. It also helps understanding the success--or lack thereof--of media campaigns, and calls for an understanding of ad features that target individuals based on different usage, attitudes, and intentions.

Article 5: Marijuana Dispensary Policies

In this article, the authors used advanced spatial analytic techniques to review policies and land use environmental interventions aiming to limiting problems around medical marijuana dispensaries in California. **They also examined which dispensary practices are related to crime at varying distances, and explain how security measures like cameras or guards can help reduce crime around these dispensaries.** The authors explained that environmental interventions intend to reduce negative outcomes in locations where social problems happen. Using spatial methods to study a specific location is therefore key to evaluate the effectiveness of these interventions. And because there is a perceived relationship between increase of crime, youth access, and recreational use of marijuana and the presence of medical marijuana dispensaries, such spatial methods can help examine the effectiveness of policies regulating these dispensaries.

California specifically, was the first state to pass the Compassionate Use Act in 1996 to legalize the use of medical marijuana. However, there are still controversies around the perception that medical marijuana dispensaries increase social problems in the neighborhoods around them. Many state and local regulations have been placed to limit the density of dispensaries based on codes and permits, population, land ordinances, zoning restrictions, hours of operation, or distance buffers between establishments. **The authors argued, however, that no empirical studies have looked at how the environmental context of these dispensaries related to increased crime;** a task that is particularly difficult because the implementation of state and local regulatory efforts is often unknown.

To address these issues, the authors look at interventions based on Crime Prevention through Environmental Design (CPTED), an approach that targets operational aspects of businesses through security measures ranging from barriers, video cameras or mirrors to security hardware and guards. Using such spatial methods--through assessments of correlations across space or spatial regression and Bayesian space-time models for instance--is one way to create statistical modeling to explain how some places react to environmental interventions and reduce social problems. In other words, these methods look at how and why places are connected to each other, and how researchers can model this relationship through an analytic strategy. More specifically in this article, the authors presented a case study looking at violent crimes around dispensaries before and after Sacramento limited the density of dispensaries and regulated their location in 2010.

The authors conducted a premise survey in 31 medical marijuana dispensaries within the city limits of Sacramento to understand how specific dispensary practices could reduce crimes or violence associated with them in their vicinity. The authors collected data on violent crimes within 1,000 feet of the medical marijuana dispensary through police archives; and security measures through observations during the premise survey. They compared the average of violent crimes based on each type of security measure at 100, 250, 500 and 1,000 feet buffers around the dispensaries. **Their results showed that certain security measures (e.g., security cameras, door man, prescription card requirement signs) might reduce crime within the immediate surrounding of the dispensaries.** Nevertheless, they found that locked metal doors linked with higher crimes with the 500 feet radius--a finding that the authors associate with the high-crime area itself more than the dispensary. The authors acknowledge that their results are limited by a small sample size and the cross-sectional nature of their data in one location. Overall, their findings do, however, yield interesting implications for environmental change strategies: they suggest that some security measures are likely to reduce crime rates.

Article 6: Community-Based Environmental Strategies for Non-Medical Marijuana Use

This article is an international literature review of the effectiveness of environmental strategies on reducing non-medical use of marijuana (NMUM). Community leaders have been interested in preventing NMUM for youth due to psychiatric reactions, accidents, long-term consequences like respiratory issues, or dependence. **Environmental strategies are used to prevent substance abuse prevention by changing contextual factors to change individual behaviors.** This can be done at the community, regional, or national level through community mobilization, changes in neighborhoods, policy changes, enforcement, or campaigns. However, there is a need for research on this topic to better guide evidence-based practices (i.e., "lessons learned") and policies and to make better choices about available environmental strategies, especially with specific substances. In this case, evidence about the impact of community-level norms on NMUM for youth is inconsistent; and **it is therefore essential to identify the environmental-level factors (e.g., availability, norms favoring use, neighborhood disorganization, price, etc.) that influence NMUM.**

The authors reviewed twenty peer-reviewed articles between 2003 and 2013 that met their inclusion criteria. The articles included two main types of environmental prevention strategies: (i) evaluations of media strategies to prevent marijuana use at the national and local level, and (ii) impact of policy, price and availability on marijuana demand and use. The review of media campaigns showed "what works" in media messaging related to NMUM: they must be well-directed, well-liked media messages supported at the community level. The authors suggested that it is critical to understand the history of media campaigns in NMUM to avoid the negative effects of past unsuccessful campaigns. **The review of price and availability impact showed that marijuana is, among U.S. adolescents particularly, a socially transferred substance that is quite insensitive to price fluctuations.**

Altogether, results from the review of these environmental strategies showed that existing state characteristics impact policy, and that supply/demand policies through enforcement can also impact use. The authors concluded **that best practices for NMUM prevention is a combination of environmental level prevention strategies.** They however caution that there might be cultural and political differences in cross-country findings that might limit the study and make findings non-transferable. They advise future research to use alternative data sources to gain additional perspective, while reinforcing the idea that their research offers community-based guidelines to practitioners and guides future directions for research in that field.

Conclusion

This literature review aimed to provide a state of the field of marijuana prevention, currently one of the most widely used drugs among young people. This review looked across a number of different environmental strategies aimed at reducing the use (and abuse) of marijuana by young people, from

prevention programs delivered in secondary schools to public policies limiting marijuana dispensary access to young people's perception of marijuana use.

Lemstra et al (2010) compared knowledge dissemination programs in secondary schools with comprehensive programs, finding that comprehensive programs achieved a much higher rate of success in changing actual user behavior. For example, the authors found that comprehensive programs (which include drug and alcohol refusal skills, cognitive behavioral skills, communication, problem-solving, assertiveness training, with social skills) were much more effective, with a mean reduction of 7 days per month of marijuana use.

Tobler et al (1999) used quantitative analyses to evaluate the effectiveness of marijuana programs currently used in the U.S., aiming to find which were most successful at reducing, delaying, or preventing marijuana use. Like Lemstra et al (2010), Tobler et al (1999) found that programs that emphasized social competencies had greater reductions in marijuana use, particularly when implemented in small groups. Tobler noted that it is the interactive component of social-skills programs, especially in small groups, that can help reduce marijuana use.

Lee et al (2013) investigated the effectiveness of motivational enhancement therapy, or MET (e.g., also called motivational interviewing, MI), which provides a non-confrontational strategy to enhance intrinsic motivation and change behavior through exploring individuals' ambivalence about change. Lee found that by providing individuals with personalized information about their marijuana use, cost, and related consequences, many users reduced the amount of marijuana used.

Alvaro et al (2013) looked at how adolescents view marijuana, and whether anti-drug campaigns, such as those produced by the National Youth Antidrug Media campaign, were effective. Through interviews with people who were exposed to the campaign's anti-drug ads (e.g., celebrity testimonials advocating non-use of marijuana and ads touting refusal skills), the authors found that that the more ads these young people viewed, the less positively they viewed marijuana use. Further, this effect remained for one year afterward.

Freisthler et al (2013) examined the relationship between medical marijuana dispensaries and crime within the vicinity of the dispensary. After arguing that there have not been any studies looking at the environmental context around marijuana dispensaries, Freisthler et al (2013) found that certain security measures, such as security cameras, door security guards, and prescription card requirements, might reduce crime within the immediate surrounding context.

Quinlan et al (2015) investigated the efficacy of community-based environmental strategies to reduce non-medical use of marijuana, focusing specifically on availability, norms favoring use, neighborhood disorganization, price, and others. Regarding the impact of price and availability, the authors found that use is quite insensitive to price fluctuations. In addition, the researchers suggested that the best practices for reducing non-medical use of marijuana is a combination of environmental prevention strategies.

Each article investigated a different element around reducing the use and abuse of marijuana, and overall, suggested that a range of different strategies, including comprehensive school-based programs, environmental strategies, and anti-drug advertisements work well to reduce use.

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