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School-based programmes to prevent alcohol, tobacco and other drug use

GILBERT J. BOTVIN & KENNETH W. GRIFFIN

Institute for Prevention Research, Weill Medical College of Cornell University, New York, USA

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Abstract
Substance use and abuse are important public health problems in the USA and throughout the world. In many developed countries, the initial stages of substance use typically include experimentation with alcohol, tobacco, or marijuana with one's peer group during adolescence. While there have been gradual decreases in the use of these substances in recent years among youth in the USA and other countries, increases have been observed in the use and misuse of other substances, such as the misuse of prescription drugs and over-the-counter cough medications in the USA. From a developmental perspective, data shows that rates of alcohol, tobacco, marijuana, and other illicit drug use typically escalate during adolescence and peak during young adulthood, corresponding with the increased freedom and independence of this time of life. Substance use decreases for most young people as they take on adult responsibilities, although a proportion will continue or increase their use and develop substance use problems. Given what we know about the onset and progression of substance use, implementing preventive interventions during early adolescence is critical. Most drug prevention or education programmes take place in school settings. A variety of theory-based school-based drug prevention programmes have been developed and tested. The most effective programmes are delivered interactively and teach skills to help young people refuse drug offers, resist pro-drug influences, correct misperceptions that drug use is normative, and enhance social and personal competence skills. A key challenge is to identify mechanisms for the wide dissemination of evidence-based drug preventive interventions and ways to train providers to implement programmes effectively and thoroughly.

Introduction

Substance use and abuse are important public health problems in the USA and throughout the world. Our goals in the current review are to summarize the scope of the problem in the USA and globally; describe the typical course of substance use onset and progression; review the implications for prevention in terms of intervention goals, content, and delivery; discuss research-based drug prevention programmes for adolescents currently being used in school settings; and identify some of the primary challenges that remain in attempts to prevent substance use and abuse.

Prevalence rates of substance use in the USA and internationally

Prevalence rates in the USA. Substance use and abuse remain significant problems in the USA and throughout the world, with alcohol and tobacco use having by far the greatest negative impact on public health. In the latest USA national household survey, about 23% of Americans reported binge drinking (defined as five or more drinks on the same occasion) in the past month, and 6.6% reported heavy binge drinking, defined as five or more episodes of binge drinking in the past month (SAMHSA, 2006). While rates of tobacco use have decreased over the past several years in the USA, cigarette smoking remains a major public health problem. One in four of those 12 and older were current cigarette smokers in 2005, with an additional 5.5% reporting the use of cigars, smokeless tobacco, or chewing tobacco in the past month. Rates of illicit substance use, while lower than those of alcohol and tobacco, are also problematic. In the USA, an estimated 8.1% of people aged 12 or older were current (past month) illicit drug users in 2005 (SAMHSA, 2006). Marijuana is the most commonly used illicit drug in the USA, reported by 6% of those 12 and over in the past month, followed by nonmedical use of prescription medications (2.6%), and cocaine use (1%) (SAMHSA, 2006).

Correspondence: Gilbert J. Botvin, Ph.D., Institute for Prevention Research, Department of Public Health, Weill Medical College of Cornell University, 411 East 69th Street, New York, NY 10021. E-mail: gjbotvin@med.cornell.edu

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Estimates of the prevalence rates of dependence or abuse of alcohol or illicit drugs were 9.1% of Americans aged 12 or older in 2005.

Adolescence is a key period for developing patterns of substance use and abuse that can continue into adulthood. Data from the latest USA national school survey (Monitoring the Future, Johnston, O'Malley, Bachman, & Schulenberg, 2006) show that in 2005 more than half (58%) of those about to graduate high school reported having been drunk at least once in their life, almost a quarter (23%) were current smokers, and about 1 in 3 had used marijuana in the past year. Fortunately, there has been a gradual year-to-year decline in the use of a number of substances among secondary school students over the past several years. About half (50.4%) of high school seniors in 2005 reported using any illicit drug in their lifetime, down from about 55% in the late 1990s. Conversely, there have been recent increases in the prevalence of nonmedical pill use, or the use of prescription medications for purposes other than prescribed. The nonmedical use of oxycodone (i.e., OxyContin), a potent and addictive opiate prescribed for chronic pain, was reported by 5.5% of students in 2005, and the nonmedical use of sedatives rose to 7.2%, up from 2.8% in 2002 (Johnston et al., 2006). There is some evidence of an increase in the misuse of over-the-counter cough and cold preparations that include dextromethorphan, which in high doses can produce dissociative hallucinations. A review of poison control records in California showed a 14-fold increase in the use of such preparations from 1999 to 2004 (Bryner et al., 2006), reflecting national data. In summary, while alcohol, tobacco, and marijuana are the most commonly used substances among adolescents, the nonmedical use of prescription medications, along with the misuse of over-the-counter medications, is also a growing problem among adolescents in the USA.

Global prevalence rates. As in the USA, alcohol and tobacco use have by far the greatest public health impact worldwide. It has been estimated that 48% of the world's adult population are current (past month) users of alcohol, 29% are current cigarette smokers and 4.5% are current users of illicit drugs (Anderson, 2006). Other estimates suggest that 4.9% of adults worldwide (age 15 to 64) have used illicit drugs in the past year, with 2.7% reporting monthly use and 0.6% with signs of drug dependence (UN, 2006). There are often significant methodological differences across countries in survey-based prevalence studies and other surveillance methods, making cross-national comparisons of substance use prevalence rates difficult to interpret (Pirkis, Irwin, Brindis, Patton, & Sawyer, 2003). Nevertheless, it appears that at the global level, the use of amphetamine-type stimulants (e.g., methamphetamine and amphetamine), cocaine, and opiates has remained stable for the past several years. Cannabis (i.e., marijuana and hashish) remains by far the most widely used illicit drug in the world, and consumption continues to increase at the global level. An estimated 4% of the global population aged 15 to 64 used cannabis in 2004 (UN, 2006).

Developmental aspects of substance use and abuse

While no single pattern of substance use initiation and escalation can describe the experience of all substance users, there is a general pattern that describes the experiences of many people. From a population perspective, this general pattern of substance use onset and change over time appears to be linked to developmental transitions that occur from early adolescence to young adulthood.

Onset in early adolescence. In the USA and many other countries, the initial stages of substance use typically include experimentation with alcohol and tobacco during the early and middle years of adolescence. The use of these substances is legal for adults, thus they are readily available and their use is ubiquitous in popular culture. Positive messages about smoking and drinking in the media often contribute to early experimentation. Inhalants are also commonly used early in the progression of use, in large part because they are readily available. Generally, the early phases of experimentation with substance use during adolescence occur within the context of social situations involving same age or slightly older peers. Substance use is one of many behaviours and roles that adolescents experiment with as a way of establishing a personal identity that is increasingly autonomous and independent from parents. During early adolescence, youths start to become more closely affiliated with their peers and there is a general developmental trend toward increased conformity and greater concerns about peer acceptance. Some adolescents may smoke, drink, or use drugs to fit in with peers or conform to peer pressure. Finally, adolescents often minimize the risks associated with substance use and overestimate their ability to avoid personally destructive patterns of use, which is characteristic of beliefs about personal invulnerability and immortality that many adolescents experience.

Progression of use. Experimentation is the initial stage in a well-defined sequence of substance use progression that is frequently observed during adolescence (Kandel, 2002). A subset of young people who experiment with alcohol, tobacco, or marijuana will later become regular users of these

substances, and some will eventually progress to experimentation and regular use of other more serious drugs, including opiates, hallucinogens, methamphetamines, and 'club drugs' such as MDMA ('ecstasy'), GHB, and ketamine. This typical pattern of drug use progression can best be understood in terms of probabilities, with an individual's risk of moving to greater involvement with drugs increasing at each step in the developmental progression. A subset of those who experiment with substances and progress to using greater amounts or move to more serious drug involvement will ultimately develop problematic patterns of use characterized by psychological and physiological dependence. What typically begins as experimental use in social situations can in some cases ultimately lead to heavier levels of substance use and abuse driven by psychological motivations and pharmacological factors (Hartel & Glantz, 1997). Fortunately, many individuals discontinue use after a short period of experimentation and/or fail to progress to more serious types of drugs.

Peak in late adolescence. Rates of substance use and abuse typically peak during late adolescence and early adulthood. This can be explained in part by developmental changes and related new freedoms that usually come with entry into late adolescence and young adulthood, such as living independently from parents and college attendance. Research has shown that being a full-time student living in a dormitory is associated with greater substance use, particularly heavy drinking, in part because students spent more evenings out with friends and share similar norms regarding low perceived risk and high approval of substance use (Bachman et al., 2002).

Decline in young adulthood. Similarly, developmental factors explain a general decline in substance use and abuse as young adults adopt new roles and responsibilities. Most young adults who begin full-time employment, enter into committed relationships, or start a family decrease their substance use as these responsibilities become central to their lives and identities. Bachman and colleagues (2002) found that a decrease in substance use after role transitions can be predicted by a variety of social and attitudinal factors among young adults; e.g., a decrease in substance use is most likely to occur among young adults who have few friends that use drugs and those who are religious.

Prevention programmes address various stages of use

Knowledge regarding the developmental progression of substance use during adolescence and early adulthood is important because it can guide the focus and timing of preventive interventions. Interventions targeted at the use of substances occurring towards the beginning of this progression have the potential of preventing the use or escalation in use of those substances as well as the potential for reducing or eliminating the use of other substances further along the progression.

For many years, prevention was discussed in terms of primary, secondary, and tertiary prevention. The most commonly used phrase – *primary prevention* – refers to efforts to decrease the incidence of disease by preventing the onset of a condition. *Secondary prevention* refers to efforts that lower the prevalence of disease through early identification (e.g., screening) of persons with relevant risk factors or early stages of disorder. The less frequently used *tertiary prevention* refers to reducing disability associated with an existing condition. Because it is difficult to distinguish between tertiary prevention and treatment, these terms have been used less over time and replaced with more descriptive terms. A 1994 Institute of Medicine (IOM, 1994) report on preventive intervention research proposed new terminology for classifying intervention programmes as part of a continuum of care that includes prevention, treatment, and maintenance. Within this framework, *prevention* is reserved only for interventions that occur prior to the initial onset of a disorder, and preventive interventions are categorized as universal, selective or indicated. *Universal* prevention programmes focus on the general population and aim to deter or delay the onset of a condition or behaviour; *selective* prevention programmes target subsets of the population believed to be at high risk due to membership in a particular risk group; and *indicated* prevention programmes are for those already showing early danger signs or engaging in related high risk behaviours. Thus, where recruitment and participation in a selective intervention is based on *subgroup membership*, recruitment and participation in an indicated intervention is based on early warning signs demonstrated by an *individual.*

A drug prevention programme for all students in a middle or elementary school health class is considered a universal intervention because it targets young people in an effort to prevent or at least delay the onset of substance use. A drug prevention programme for children of drug users or children of alcoholics is considered a selected intervention because it targets those who are at high risk for developing substance abuse problems. This type of programme may be most appropriate for older adolescents and might include monitoring and counselling. A prevention intervention designed to reduce drug abuse problems among individuals who have initiated drug use is considered an indicated programme. As reviewed in the following sections,

universal, selected, and indicated prevention programmes are delivered in a variety of settings – the most common of which are universal prevention programmes delivered in schools.

School-based prevention approaches

Drug prevention programmes are most often delivered in school settings. Schools provide a natural setting for conducting prevention efforts. Because many drugs impair memory and brain functioning, use by students creates a major obstacle to learning and academic achievement. Many school districts are mandated to provide drug education to students. The majority of school-based drug prevention programmes are universal interventions designed to reach all students in a particular school or classroom before they have begun using tobacco, alcohol, or other drugs. These substances are targeted because they are the most widely used substances among both teens and adults and they are typically the first substances that youth experiment with.

Historically, school-based prevention has focused on the dissemination of information about the dangers of drug use and abuse. Many of these approaches provide information in ways that dramatize the dangers associated with substance use in an attempt to evoke fear. However, one of the earliest findings from school-based prevention research was that information dissemination interventions (with or without fear appeals) do not change tobacco, alcohol, or drug use behaviour or intentions to use substances in the future (Botvin & Botvin, 1992). Information may help to change knowledge or attitudes, but it is not sufficient to change behaviour. The most effective contemporary approaches are derived from psychosocial theories and focus primary attention on the risk and protective factors that promote the initiation and early stages of substance use (Hawkins, Catalano, & Miller, 1992; Petraitis, Flay, & Miller, 1995). Contemporary prevention programmes focus on teaching drug refusal skills, correcting normative expectations regarding the prevalence of substance use, and enhancing general social and personal competence skills.

Social resistance skills. Social factors play a primary and fundamental role in promoting the initiation of substance use among adolescents. Social influences can come from a variety of sources, including peers, family (parents and older siblings), and the mass media. Young people who have friends who smoke, drink, or use drugs are more likely to become substance users themselves due to factors such as the need for peer acceptance, modelling of behaviour, and increased availability of substances. Similarly, parents or older siblings may model substance use behaviour and transmit positive messages and attitudes regarding substance use. Finally, on the larger societal level, high-status role models in the mass media may promote substance use, supported by the perception of positive norms and expectations with respect to substance use. Prevention programmes that focus on social resistance skills training teach students how to identify social situations in which they are likely to experience peer pressure to smoke, drink, or use drugs and how to avoid these high-risk situations. Students are taught techniques to handle these situations when they are unavoidable, including what to say (i.e., the specific content of a refusal message) and how to communicate it in the most effective way possible. Finally, these programmes often make students aware of the techniques used by advertisers to promote tobacco products or alcoholic beverages along with ways to formulate counter-arguments to such messages.

Several studies have examined the effectiveness of social resistance skills prevention programmes for adolescent substance use, with many of these focusing on preventing the onset of cigarette smoking. Findings indicate that social resistance skills interventions can reduce the proportion of young people beginning to smoke by about one-third compared to a control group not receiving the intervention and reduce regular smoking (one or more cigarettes per week) by about 45% compared to controls (Botvin & Griffin, 2003). Similar reductions in alcohol and marijuana use have been observed for social resistance skills programmes (Ellickson & Bell, 1990; Shope et al., 1992). Follow-up studies have shown that the positive behavioural effects of school-based social resistance skills prevention programmes are evident for up to three years after the conclusion of these programmes for cigarette smoking (Leupker, Johnson, Murray, & Pechacek, 1983; Sussman, Dent, Stacy, & Sun, 1993) but these effects are not maintained beyond this period (Bell, Ellickson, & Harrison, 1993; Ellickson, Bell, & McGuigan 1993; Flay et al., 1989; Murray, Davis-Hearn, Goldman, Pirie, & Luepker, 1988; Shope, Copeland, Kamp, & Lang, 1998).

Normative education. Many contemporary prevention programmes include material to combat the perception that substance use is widespread (i.e., 'everybody's doing it') among peers and adults. This approach is based on research demonstrating that adolescents typically overestimate the prevalence of smoking, drinking, and the use of certain drugs (Fishbein, 1977). Changing these normative beliefs can be accomplished by educating about the actual prevalence rates of substance use among their peers either in terms of national survey

data or by conducting classroom or school-wide surveys, which are organized and directed by students participating in the programme.

Competence enhancement. According to problem behaviour theory (PBT; Jessor & Jessor, 1977), substance use and abuse and other problem behaviours are socially learned, purposeful, and functional from the adolescent's point of view. Young people without the skills and abilities needed to achieve developmental goals (e.g., peer approval, positive self-image) will engage in substance use because doing so is seen as a viable way of achieving these outcomes. Furthermore, youths with poor social and personal competence skills may be more vulnerable to the various social, environmental, and motivational forces that promote substance use. Poorly competent youths may not invoke appropriate decision-making or social skills in order to handle negative peer pressure effectively (e.g., Scheier, Botvin, Griffin, & Diaz, 1999), or may turn to drugs in an effort to regulate negative affect or alleviate feelings of meaninglessness or perceived powerlessness (Labouvie, 1986; Mainous, Martin, Oler, Richardson, & Haney, 1996).

The competence-enhancement approach to prevention acknowledges that youths with poor personal and social skills are more susceptible to the social influences that promote drug use and may be motivated to use drugs as an alternative to more adaptive coping strategies (Botvin, 2000). Competence enhancement prevention programmes teach generic social and personal skills such as decision-making skills, interpersonal communication skills, assertiveness skills, and skills for coping with anxiety and anger. Meta-analytic studies have found that prevention programmes that combine social resistance skills and competence enhancement approaches are among the most effective approaches (Bangert-Drowns, 1988; Tobler, 1992; Tobler & Stratton, 1997) and some of these programmes have had long-term behavioural effects until the end of high school (Botvin et al., 1995).

International initiatives

In a study of drug prevention activity at the global level, the UN Office for Drug Control and Crime Prevention (2002) surveyed governments around the globe and found that most drug prevention activity is occurring in schools. Of the governments that responded ($N = 106$), overall 68% reported relatively extensive school-based drug education programmes; including 86% of European countries, 68% of Asian countries, 56% of countries in the Americas, and 48% of those in Africa. Unfortunately, the majority of the existing school-based programmes around the globe focus on providing information about drugs and drug abuse. Governmental agencies in a number of countries have also promoted school-based prevention initiatives. For example, Health Canada (2001) lists 39 'exemplary' drug prevention programmes developed for Canadian youths, although none have been tested rigorously and no peer-reviewed scientific publications have been produced to support the programmes.

In fact, the vast majority of rigorously designed randomized controlled trials of school-based drug prevention interventions have taken place in the USA. However, in recent years there has been an increase in the number of studies in the prevention literature testing school-based prevention programmes outside of the USA. School-based drug preventive interventions have been designed, implemented, and evaluated in countries such as Greece (Koumi & Tsiantis, 2001), the Netherlands (Cuijpers et al., 2002), and Norway (Jøsendal, Aarø, Torsheim, & Rasbash, 2005). Other published reports consist of replications of interventions first developed in the USA, such as tests of smoking prevention programmes in China including 'Project EX' (Zheng et al. 2004) and 'Project SMART' (Chou et al., 2006). Generally, when the school systems are similar to those in the USA and the interventions have been culturally adapted in an appropriate way, behavioural effects have been observed in the new settings.

School-based prevention for different age groups

Most of the research on school-based prevention has focused on interventions targeting middle or junior high school students, when children are between 11 and 13 years of age. There has been research on the effectiveness of drug education and prevention with other age groups as well, including elementary, high school, and college age youth.

Elementary school programmes. Epidemiologic studies show that a relatively small number of elementary school students experiment with tobacco or alcohol. One large study found that about 5% of fifth graders reported having smoked cigarettes (Elder et al., 1996). Few studies have evaluated drug prevention programmes for elementary students because it is difficult to demonstrate behavioural effects of an intervention when base rates of use are very low. However, experimentation with alcohol and drugs during elementary school significantly increases the risk for more serious drug involvement in secondary school and beyond (Anthony & Petronis, 1995; Fergusson & Harwood 1997; Wilson, Battistich, Syme, & Boyce, 2002). Because some children experiment with alcohol and

drugs at earlier ages, well before most middle school-based prevention efforts, there is a need for preventive intervention programmes and materials for elementary schools (Lloyd, Joyce, Hurry, & Ashton, 2000). Indeed, some prevention research suggests that intervening before middle school can produce stronger and more durable prevention effects (Sarvela et al., 1999). Even if it is difficult to demonstrate reduced rates of use for alcohol, tobacco, or other drugs, elementary school youths may benefit from prevention programmes that help them develop strong anti-drug attitudes and establish anti-drug use norms prior to the years of experimentation.

Several programmes and curricula have been developed and tested for younger children, even preschoolers (Hall & Zigler, 1997). However, most drug prevention programmes for elementary school students target children age 8 or above (Botvin, Griffin, Paul, & Macaulay, 2003; Campanelli, Dielman, Shope, Butchart, & Renner, 1989; O'Donnell, Hawkins, Catalano, & Abbott, 1995; Shope, Dielman, Butchart, Campanelli, & Kloska, 1992). Many of the theory-based programmes can change attitudes and beliefs about drug use in a positive direction, and some interventions for elementary school students have been shown to reduce alcohol and tobacco use behaviour (Botvin, Griffin, Paul, & Macaulay, 2003).

High school programmes. Data from national school surveys in the USA show that the majority of students in the tenth grade and below have never used any illicit drug and that many students become involved in substance use for the first time during high school. Furthermore, among those high school-age students who do engage in substance use, it is more likely to occur in the context of other risk behaviours such as risky driving or sexual activity, the latter raising the risk for sexually transmitted diseases, HIV infection, and unwanted pregnancy. Substance use may also occur among extended friendship groups and acquaintances, and students may be more likely to observe dependence or addiction among their peers. Thus, many high school students can benefit from drug prevention, but such interventions must address the contexts in which drug use occurs and the developmental needs of students during the high school years.

Most existing high school drug prevention programmes are targeted or indicated interventions designed for high-risk youths who are at risk for school drop-out or other behaviour problems (Eggert, Thompson, Herting, Nicholas & Dicker, 2003; Sussman, 1996). However, programmes that bring high-risk youths together in order to address their specific needs may in some cases produce unintended negative consequences if an environment is created where acting out is the norm and/or the youths tend to reinforce each other's negative behaviours (Poulin, Dishion & Burraston, 2001). More work is needed in developing and testing theory-based drug prevention programmes for teens in high school and how school-based prevention can address the needs of students with varying levels of involvement with substances.

University programmes. For many students, college is the first time living away from parents, and is a time to learn and explore new ideas and perspectives. Many students experiment with substances during these years. In particular, alcohol use among college students is a major health and social problem. The literature on college drinking shows that 80–95% of college students in the USA drink at least some alcohol, with almost half (45%) engaging in binge drinking, defined as five or more drinks in a row for men or four or more in a row for women); one in five college students is a frequent binge drinker (Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994). In a study of over 17,000 college students, Wechsler et al. (1994) found that frequent binge drinkers were much more likely to experience serious health or other negative consequences due to their drinking, compared to other students. In this study, almost half (47%) of frequent binge drinkers had five or more drinking-related problems since the beginning of the school year. However, most college-age binge drinkers see their behaviour as normative and do not consider themselves to be problem drinkers. Therefore, one prevention strategy is to develop indicated programmes for college alcohol use that focus on frequent binge drinkers, providing education, referral, and normative education to this group of students. Campus-wide campaigns to change perceived norms regarding alcohol and drug use (e.g., that most students do use, for example) also appears to be an effective prevention strategy (Haines & Spear, 1996). In addition to alcohol prevention programmes, drug prevention programmes are common on college campuses, however, very few of these interventions have been evaluated and little is known about their effectiveness in changing behaviour (Larimer, Kilmer, & Lee, 2005).

Characteristics of effective drug prevention programmes

A series of literature reviews and meta-analytic studies have helped to inform us of the essential characteristics of drug prevention programmes that are effective

in changing behaviour. By examining the scientific literature in school-based prevention that has accumulated over the past 20 years, there are several 'lessons learned' about the quality and effectiveness of adolescent drug prevention programmes delivered in schools (Botvin & Griffin, 2003). This body of research contains a number of findings regarding the key components and characteristics of programmes that work (Cuijpers, 2002; Dusenbury & Falco, 1995; Gottfredson, & Wilson, 2003; McBride, 2003; Midford, 2002; Springer et al., 2004). Effective drug prevention programmes: 1) are guided by a comprehensive theoretical framework that addresses multiple risk and protective factors; 2) provide developmentally appropriate information relevant to the target age group and the important life transitions they face; 3) include material to help young people recognize and resist pressures to engage in drug use; 4) include comprehensive personal and social skills training to build resilience and help participants navigate developmental tasks; 5) provide accurate information regarding rates of drug use to reduce the perception that it is common and normative; 6) are delivered using interactive methods (e.g., facilitated discussion, structured small group activities, role-playing scenarios) to stimulate participation and promote the acquisition of skills; 7) are culturally sensitive and include relevant language and audiovisual content familiar to the target audience; 8) include adequate dosage to introduce and reinforce the material; and 9) provide comprehensive interactive training sessions for providers to generate enthusiasm, increase implementation fidelity, and give providers a chance to learn and practice new instructional techniques.

Future directions for substance abuse prevention

Most school-based drug prevention programmes, especially those being implemented outside the USA, have not been tested as part of a rigorous evaluated study. Thus, an important next step is for rigorous evaluation research to be conducted on the most promising drug prevention programmes and practices. In the USA in particular, there are now several effective research-based prevention programmes that have been shown to prevent the onset and escalation of alcohol, tobacco, and other drugs during adolescence. Many of these evidence-based programmes were tested initially in small, highly controlled efficacy trials, with implementation occurring under highly controlled conditions with high levels of implementation fidelity. If shown efficacious under such optimal conditions, some interventions have then been tested in larger effectiveness trials in which conditions are less controlled and somewhat less than ideal. Ultimately, it is hoped that programmes that show effects in the early stages can be packaged and widely disseminated to prevention practitioners (i.e., end-users) for use in real-world school settings. At this stage, however, implementation fidelity typically suffers and key programme components are modified in most situations (Dane & Schneider, 1998). A large number of studies have shown that evidence-based prevention programmes are generally not as effective when delivered by prevention practitioners in the field, compared to their original efficacy or levels of effectiveness.

One challenge in prevention is to identify the barriers to implementation fidelity and to develop methods to address and overcome them. Another approach may be to develop 'built-in' modifications, such as incorporating a menu of alternative activities that a provider can select from without compromising the core components or underlying theory of a prevention programme. In some cases, adaptations of evidence-based prevention programmes may be made in an effort to adapt the programme to fit real or perceived local needs (probably an appropriate adaptation) or because the provider does not have a thorough understanding of the programme and its underlying causal mechanism (not likely to be an appropriate adaptation). Some have argued that any local adaptation of a programme reduces its effectiveness (Elliott & Mihalic, 2004), although others acknowledge that programme adaptation is inevitable and programmes that are adaptable and flexible are more likely to be adopted and institutionalized (Rogers, 1995). Further research is needed to understand how and why adaptations to evidence-based prevention programmes occur in real world settings and ways to balance the relative trade-offs associated with adaptation and implementation fidelity.

'Take-home' points:

- Substance use involves a developmental progression that is typically characterized by onset during early adolescence, a peak in late adolescence, and a gradual reduction during young adulthood.
- The most effective prevention programmes are delivered interactively and teach skills to help young people refuse drug offers, resist pro-drug influences, correct misperceptions that drug use is normative, and enhance social and personal competence skills.

Future directions:

- An important next step is for rigorous evaluation research to be conducted on the most promising drug prevention approaches to determine their

effectiveness with different populations around the world.

- Research is also needed to identify potential barriers to the large-scale dissemination, implementation, and institutionalization of effective prevention programmes.

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