
Preventing the Onset and Developmental Progression of Adolescent Drug Use

Implications for the Gateway Hypothesis

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Efforts to combat the problem of drug abuse have involved a combination of strategies including education, treatment, law enforcement, and mass media campaigns. Among these, approaches intended to prevent the onset and developmental progression of drug use among adolescents have received considerable attention in recent years. A particularly fruitful area of research has involved the development and testing of school-based prevention approaches targeting youth during the early adolescent years. This research has demonstrated that at least some approaches to drug abuse prevention can produce substantial reductions in the incidence and prevalence of adolescent drug use. Moreover, this research clearly indicates that ongoing intervention during junior high school can result in durable prevention effects that last at least until the end of high school. Finally, the effectiveness of school-based prevention approaches has been demonstrated for a relatively broad range of students including White, suburban youth, and inner-city minority youth.

A necessary precondition for the development of effective prevention approaches is an understanding of both the causes of drug use and its developmental progression. Together they provide essential information concerning the nature and timing of preventive interventions. Research delineating the etiologic determinants of adolescent drug use has highlighted the importance of an array of interpersonal and intrapersonal factors for promoting and sustaining drug use and has provided guidance to program developers concerning the appropriate focus of preventive interventions. The growing body of etiologic evidence deriving from longitudinal research has led to a realignment of prevention objectives, away from an emphasis on knowledge concerning the adverse consequences of

drug use and toward a focus on social and psychological factors. Similarly, research concerning the developmental progression of drug use indicates that it proceeds from the use of legal and widely available substances to the use of illegal substances. As a consequence, prevention approaches have generally targeted the use of tobacco and alcohol, two substances whose use is identified as occurring at the beginning of this progression. An implicit assumption of contemporary prevention approaches is that if they are successful, they will not only reduce the initiation of drug use but will also disrupt its developmental progression.

The purpose of this chapter is to summarize nearly two decades of research with a school-based approach to drug abuse prevention called *Life Skills Training* (LST) and examine the extent to which it not only prevents drug use but disrupts its developmental progression. Within the context of a broader discussion of the impact of this prevention approach on the initiation and developmental progression of drug use, special attention is given to the implications of this research for the Gateway Hypothesis. The chapter begins with a discussion of perspectives on the developmental progression of adolescent drug use, describes the LST prevention program, summarizes research testing the efficacy of the LST prevention approach with respect to its impact on the initiation and developmental progression of drug use, and ends with implications for the Gateway Hypothesis and future prevention efforts.

Perspectives on the Developmental Progression of Drug Use

Progression as a Multidimensional Process

The initiation and early stages of drug use typically occur at the beginning of adolescence, escalating from the onset of drug-taking behavior to progressively more serious involvement with drugs. However, whereas the general developmental trajectory of drug use is relatively well understood, what appears to be a simple progression from nonuse to use of one or more substances is more complex than is readily apparent. One source of this complexity is that the developmental course of adolescent drug use is multidimensional. These dimensions include the frequency of drug use, consumption or amount of a drug or drugs used per drug-taking occasion, use of single versus multiple substances, use of licit versus illicit drugs, and use of specific drugs or classes of drugs.

Frequency and Amount. Frequency of drug use progresses from nonuse to initial use, to occasional (annual or monthly) use, and to more frequent (weekly and daily) patterns of use along with an escalation of the amount used. The amount of a given drug used on each drug-taking occasion escalates along a continuum ranging from light to heavy use. With dependency-producing drugs, this escalation in both the frequency and amount of use typically eventuates in the development of tolerance (as larger and/or more frequent administrations of the drug are required to produce the same psychoactive effect) and in both physical and psychological dependence.

Single Versus Multiple Substances. Another way in which drug use can develop is through progression from the use of a single substance to the use of two or more substances. Individuals typically start with the use of a single substance. As frequency and amount of drug use escalate, the likelihood increases that they will proceed to use a second or a third substance.

Licit Versus Illicit Substances. Drug use also tends to progress from the use of legal substances to the use of illegal substances. For example, individuals may progress from the use of substances that are legal for adults (tobacco and/or alcohol) to the use of substances that are illegal (marijuana, cocaine, heroin, hallucinogens, and so on).

Substance-Specific Progression. The other way the sequence of drug use appears to progress is in terms of the type of drug or drugs used. The notion that the development of drug-taking behavior involves progression through a series of stages based on the use of specific substances has been a source of controversy for many years. Still, it is based on empirical evidence indicating that for most individuals alcohol and tobacco are the first substances used. Because of their availability, inhalants may also be among the first used. Individuals may later progress to the use of marijuana.

The use of tobacco, alcohol, inhalants, and marijuana provides adolescents with an introduction to the world of drugs. For some individuals, the use of these drugs may lead to the use of stimulants, opiates, hallucinogens, cocaine, and other illicit drugs. The probability of using any substance in this developmental progression increases significantly with the use of one or more drugs earlier in the progression. The use of tobacco, alcohol, and inhalants significantly increases the risk of use of

problems. From this perspective, occasional drug use is a risk factor for drug abuse and other drug-related problems. For this reason, drug abuse prevention programs targeting youth have focused on preventing the early stages of drug involvement as a method of reducing drug abuse risk. For middle or junior high school students, this might involve attempting to prevent onset or occasional (annual or monthly) use. For high school students, it might involve attempting to deter more serious levels of drug involvement (e.g., weekly or daily use of a single drug, use of multiple drugs, or “heavy” use) as well as preventing drug-related problems such as accidents or violence.

More specifically related to the Gateway Hypothesis is the notion that use of drugs that are legal for adults (tobacco and alcohol) and/or use of marijuana will eventuate in the use of illicit drugs such as heroin and cocaine. Although this is often used as the rationale for focusing on the prevention of tobacco, alcohol, and marijuana, prevention studies have generally not addressed the crucial issue of whether preventing Gateway drug use is an effective strategy for preventing the use of illicit drugs other than marijuana.

Both because mortality and morbidity are associated with tobacco and alcohol and because the use of marijuana increases the risk of using other illicit substances, drug abuse prevention programs have usually focused primarily on preventing the use of tobacco, alcohol, and marijuana. Moreover, because there is a direct relationship between the age of onset and the subsequent development of serious drug-related problems, prevention programs are likely to be valuable even if they merely delay drug use initiation or prevent the transition from occasional use to more serious levels of drug involvement.

Approaches to Prevention

Over the past 20 years, considerable attention has been given to the identification and testing of intervention approaches offering the potential of preventing the initiation and early stages of drug use. A variety of approaches have been tested, including public information campaigns, school-based approaches, family interventions, and community-based prevention approaches. Perusal of the growing prevention literature indicates that most prevention research has been conducted with approaches designed to be implemented in school settings. One reason is that schools are a natural site for implementing and testing prevention programs targeting children and adolescents. Schools not only provide

component is similar to that contained in many psychosocial drug abuse prevention programs that focus on the teaching of social resistance skills. Included is material concerning the (1) short- and long-term consequences of drug use; (2) knowledge about the actual levels of drug use among both adults and adolescents in order to correct normative expectations about drug use; (3) information about the declining social acceptability of cigarette smoking and other drug use; (4) information and class exercises demonstrating the immediate physiologic effects of cigarette smoking; (5) material concerning media pressures to smoke, drink, or use drugs; (6) information concerning the techniques used by cigarette and alcoholic beverage advertisers to promote the use of these drugs and skills for resisting them; and (7) techniques for resisting direct peer pressure to smoke, drink, or use drugs.

Effectiveness for Preventing Initiation and Escalation of Drug Use

The primary objective of drug abuse prevention research over the past three decades has been to identify approaches capable of preventing the initiation and/or escalation of drug use and provide evidence of their effectiveness. It has become clear that many prevention approaches are able to increase health knowledge and promote antidrug attitudes, but very few are capable of changing behavior and deterring drug use. It was not until the end of the 1970s and beginning of the 1980s that evidence that some prevention approaches could deter drug use began to emerge (Bangert-Drowns, 1988; Botvin, 1999; Botvin & Botvin, 1992; Hansen, 1992). Since then a growing research literature has documented the efficacy of several promising prevention approaches, including the Life Skills Training program.

During the 1980s and 1990s, our team of researchers at Cornell conducted a series of evaluation studies testing the effectiveness of the Life Skills Training (LST) program. These studies were conducted in a logical sequence to determine the effectiveness of this promising approach with different forms of drug use, when implemented by different program providers, and with different populations. The initial LST research focused on cigarette smoking and involved predominantly White middle-class populations. More recent research extended this work to other forms of drug use including the use of alcohol, marijuana, and illicit drugs other than marijuana. In addition, this research examined the effectiveness of the LST approach when used with inner-city

alcohol use was conducted with seventh graders from two comparable New York City public schools ($N = 239$) randomly assigned to experimental and control conditions (Botvin, Baker, Renick, Filazzola, & Botvin, 1984). The intervention was modified to include material concerning the potential consequences of alcohol use, and, where appropriate, skills were taught in relation to situations that might promote alcohol use. At the six-month follow-up, significantly fewer (54%) experimental students reported drinking in the past month compared to controls.

A larger study was conducted to replicate the alcohol results and to test the generalizability of the LST approach to marijuana use. The study included 1,311 seventh-grade students from 10 suburban New York junior high schools (Botvin et al., 1984). Results found significant prevention effects for tobacco, alcohol, and marijuana use at the four-month initial posttest. Adolescents who participated in the LST program drank significantly less alcohol per drinking occasion and were drunk less often. The LST program reduced occasional (monthly) marijuana use by 71% and regular (weekly or daily) marijuana use by 83%.

Research also indicates that drug initiation can be prevented with minority youth. For example, several studies with minority youth show that LST can reduce smoking initiation (Botvin, Dusenbury, Baker, James-Ortiz, & Kerner, 1989; Botvin et al., 1992; Botvin et al., 1989) and occasional use of alcohol (Botvin, Schinke, Epstein, & Diaz, 1994). More recently, a large randomized trial involving a predominantly (97%) minority sample of inner-city girls ($N = 2,209$) from 29 schools found that the LST program significantly reduced lifetime and occasional smoking (Botvin, Griffin, Diaz, Miller, & Ifill-Williams, 1999). Although the effect was significant, the prevention program cut smoking by approximately 30% among inner-city, minority youth rather than the 50% reductions found in studies with White suburban populations.

Preventing Escalation in the Frequency of Use

Evidence also supports the efficacy of school-based prevention programs to prevent escalation in the frequency of use. Research with the LST approach has shown that it is capable of preventing the progression of cigarette smoking from lifetime use to occasional use or from occasional use to regular use. For example, one study indicated that initial prevention effects, assessed in terms of occasional (monthly) smoking during seventh grade, resulted in a 56% reduction in regular (weekly) smoking one year later (Botvin & Eng, 1982). Similarly, a study with 902 seventh

Impact on the Use of Multiple Gateway Drugs

In order to assess the impact of the prevention program on more serious levels of drug involvement, the Botvin et al. (1995) study also compared prevention and control students in terms of regular (monthly or weekly) use of tobacco, alcohol, and marijuana use. At the end of the 12th grade, there were 44% fewer LST students than controls who used all three Gateway drugs one or more times per month and 66% fewer LST students who reported using all three substances one or more times per week. The strongest prevention effects were produced for the students who received the most complete implementation of the prevention program and whose teachers attended annual training workshops and received ongoing support from project staff.

Preventing Illicit Drug Use

Long-term follow-up results from the large-scale prevention trial discussed previously also provided evidence that the LST prevention program can reduce illicit drug use (Botvin, Griffin, Diaz, Scheier, Williams, & Epstein, in 2000). An underlying assumption of primary prevention efforts is that if they prevent or reduce the use of tobacco, alcohol, and/or marijuana they will have a corresponding impact on the use of other substances further along the developmental progression. In other words, preventing Gateway drug use would be expected to reduce the use of illicit drugs such as cocaine or heroin. However, although this rationale is commonly used to justify targeting Gateway drug use, it has never been directly tested.

The impact of the LST program on illicit drug use was addressed by analyzing data collected from an anonymous subsample of students involved in the long-term follow-up study described. Data were collected by mail from 454 individuals (mean age = 18.86) who were contacted after the end of the 12th grade. The length of follow-up was 6.5 years from the initial baseline. The survey assessed the use of 13 illicit drug categories, following those used by the University of Michigan *Monitoring the Future* study (Johnston, O'Malley, & Bachman, 1994). These categories included marijuana, cocaine, amphetamines, methaqualone [Quaaludes], barbiturates, tranquilizers, heroin, narcotics other than heroin, inhalants, amyl or butyl nitrites, LSD, phenylcyclohexyl piperidine (PCP), and 3, 4-methylenedioxymethamphetamine (MDMA).

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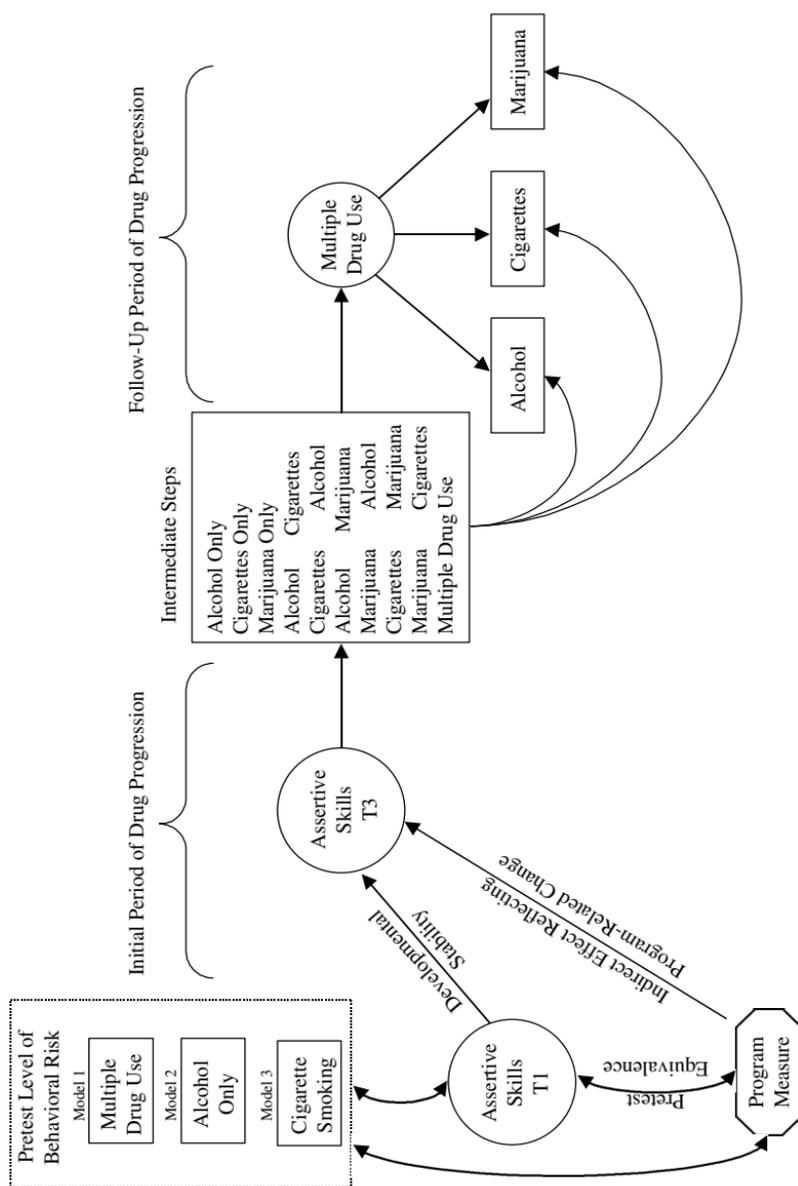


Figure 6.1. General framework for testing intervention effects on developmental progression.

assertiveness. The Multiple Drug Use latent construct is derived from measures of cigarette, alcohol, and marijuana use.

A major strength of SEM is the ability to detect general program effects and, controlling for these effects, search for program-related effects on specific prevention components. The exact method to examine general and specific effects involves using post hoc specification searches. Briefly, specification searches include positing paths from the program measure to individual program components (e.g., assertive behavior or drug refusal skills). These paths reflect treatment effects on skills controlling for change in assertive competence.

In addition to testing intervention effects, specification of paths from early (pretest) drug use to later use of specific drugs (e.g., alcohol use) provides a means of examining the plausibility of stage sequences and program-related disruption of those sequences. For instance, program effects can promote reductions in multiple drug use (cigarette, alcohol, and marijuana use) as well as reductions in the use of a specific substance (e.g., alcohol only).

In order to test specific stage sequences on the basis of drug type, inclusion criteria for the analyses based on self-reported drug use varied. The far left-hand side of Figure 6.1 shows the inclusion criteria utilized for each model. Model 1 examined developmental progression and intervention effects by using the entire panel sample (students present at pretest and three follow-ups) and included all patterns of drug use. This model provides a test of the intervention on multiple drug use and tests whether early forms of drug use (e.g., alcohol use) influence later progression to increased drug involvement (e.g., alcohol and marijuana use). To illustrate a stage sequential test, a path was specified from alcohol use in the seventh grade to marijuana use in the ninth grade along with a path from marijuana use in the ninth grade to later Multiple Drug Use. This developmental sequence tests directly whether early alcohol use promotes later and more involved drug use through the intermediate stage of marijuana use.

Model 2 included a test of whether early alcohol involvement influences Multiple Drug Use and whether cigarette use represents a necessary intermediate stage. In contrast to Model 1, Model 2 included a pretest latent construct of alcohol involvement reflected by indicators tapping frequency, intensity, and drunkenness. One important difference between Model 1 and Model 2 is the exclusion of pretest smokers in Model 2, which provides a means to test whether cigarette use represents an essential stage between early alcohol and later multiple drug use.

Gateway drug use. These findings indicate that the impact of the LST program was mediated by increasing generic assertive skills, assertive efficacy, and drug refusal skills. Among those youth reporting baseline alcohol use, the LST program reduced the risk of later marijuana use as well as multiple drug use. Among youth reporting baseline smoking behaviors but no alcohol use, improvements in assertiveness reduced the likelihood of experimentation with alcohol use and multiple drug involvement. Moreover, the findings of this study provide additional support for the Gateway Hypothesis.

Summary and Conclusions

Advances in drug abuse prevention research have identified several promising approaches. The results of two decades of research with Life Skills Training, a multicomponent prevention approach, provide strong empirical evidence that the program can produce substantial reductions in tobacco, alcohol, and marijuana use; booster sessions can both sustain and enhance initial prevention effects; and the program produces prevention effects that are durable and long-lasting. The findings of this research also indicate that Life Skills Training can disrupt the developmental progression of drug use. This prevention approach can reduce initial cigarette smoking, the transition from occasional to regular use, multiple drug use (cigarettes, alcohol, and marijuana), and use of illicit drugs other than marijuana.

Although the prevention research discussed in this chapter was not designed explicitly to examine the Gateway Hypothesis, this body of research does provide general support for it. The findings from 20 years of research with the LST program indicate that preventing the use of substances hypothesized to occur at the very beginning of the developmental progression (tobacco and alcohol use) not only deters the use of those substances, but also deters the use of marijuana and of at least some illicit drugs other than marijuana. Moreover, a study designed to test one hypothesized mediational mechanism for the LST program as well as to examine the impact of the prevention program on deterring the progression of drug use provides further support for the Gateway Hypothesis. Although variations were identified in terms of progression among Gateway substances, the LST program was able to disrupt the progression of drug use regardless of the developmental sequence. Future prevention efforts should focus on preventing the use of all three Gateway

drugs both because prevention of Gateway drug use is important to public health and because it is also likely to deter progression to the use of other drugs.

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