INTRODUCTION

This chapter concerns the theoretical foundations of drug use prevention program development and research. We first briefly discuss the nature of theories in the social sciences and then actual theories of drug use onset and behavior change; finally, we focus on the functions and roles of theory and their methodological applications.

WHAT IS THEORY?

“A theory is a systematically related set of statements, including some law-like generalizations, that is empirically testable” (Rudner 1966, p. 10). Theories or models are abstractions that enable us to represent part of the world by a simpler structure. They simplify decisionmaking and help us predict the future. Most important, they help us generalize from one instance, location, or group to another.

Most social science theories provide us with ‘orienting statements’ (Homans 1967) about social phenomena rather than with strictly mathematical laws that are more common in the basic sciences.' These orient us to look for determinants of social phenomena in certain places rather than others. Thus, when considering the determinants of children’s drug use, Marxists look for causes in the economic structure of society rather than in individual development; biologists (and many with medical training) may look for genetic determinants; sociologists look to patterns of social interaction and social influences of parents, peers, and advertising: and psychologists look to personality and cognitive areas. All such orienting statements and the theories derived from them may be plausible, and they are not mutually exclusive (Biglan and Lichtenstein 1964). Any given view of reality reflects as much the theoretical perspective or methods of the observer as it does the object being.
viewed (Campbell 1969). However, one perspective may be more useful than others in specific applications.

Theories of Drug Use Onset

Researchers have developed numerous theories of drug use. Lettieri and colleagues (1984) analyzed 43 of them. Murray and Perry (1985) and Newcomb and Bentler (1988) each provide analysis of smaller sets of the major theories. With few notable exceptions, most of these theories were derived from narrow disciplinary perspectives and on the basis of cross-sectional correlates of drug use.

Predictors of Drug Use. There is agreement on the major predictors of drug use, and reviews of the correlates of drug use are numerous (e.g., Braucht et al. 1973; Flay et al. 1983; Gorsuch and Butler 1976; Hawkins et al. 1985; Huba and Bentler 1980; Jessor 1979; Jessor and Jessor 1977; Johnston et al. 1982; Kandel 1978a, 1978b, 1980, 1982; Kandel et al. 1978; Lettieri and Ludford 1981; Miller et al. 1983; Murray and Perry 1985; Sadava 1987; Smith and Fogg 1978; Wingard et al. 1979, 1980). Hawkins and colleagues (1985) provide by far the most thorough and comprehensive review. However, one is struck by the large number of correlates in the absence of any theoretical framework (Shore 1985). First, many correlates are found only in cross-sectional studies; second, there is no information about the relationships among the correlates; and third, investigators use different labels with different orientations for the same phenomenon or construct or the use of the same label for different constructs or phenomena.

To build a parsimonious theoretical framework, we consider the predictors found in 24 prospective studies covering the childhood through young adult years (table 1). There is reasonable consistency among studies in the domains of variables found to predict drug use prospectively. Figure 1 shows five classes of variables that we believe encompass the most important predictors of drug use confirmed repeatedly in prospective studies. They are also common to the most developed and integrated theories of drug use behavior.

Knowledge, Attitude, and Behavior (KAB) Change. Starting from the right of figure 1, and the most proximal to actual drug use, are the intrapersonal cognitive, affective, and conative variables, or KAB. These include knowledge of physiological and social consequences of use; personal beliefs (expectancies, perceived risk, susceptibility) regarding consequences; general values (e.g., toward health, independence) and specific evaluations of these consequences; attitudes toward drug use and related issues; behavioral intentions; trial behavior; stages of behavior (e.g., alcohol, tobacco, marijuana,
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**Table 1.** Characteristics of longitudinal studies of teenage alcohol and other drug use.
harder drugs, etc. (Kandel 1975); and established adult behavior patterns. Theories of how these variables relate to each other abound, and we have attempted some integration of these and other theories and variables in figure 2 (Flay 1981; Flay et al. 1983).

**Social Learning Theory.** The second set of variables for which relationships to behavior are well established are the social learning variables of opportunities for observation and modeling of the behavior; opportunities to use (or availability); social normative beliefs, including collective ignorance of norms; and social reinforcement (positive and negative). Bandura (1977, 1986) and Akers (1977) have developed the relations among these variables from the psychological and sociological perspectives, respectively. Any particular behavior is more likely to occur when it is differentially reinforced and is seen as desirable by important others. Fishbein and Ajzen (1975) and Ajzen and Fishbein (1980) have incorporated social normative beliefs into their theory of reasoned action for the prediction of behavioral intentions. Several groups (Akers and Cochran 1983; Akers et al. 1979; Elliott et al. 1985; Hawkins et al. 1986; Hawkins and Weis 1985) also have applied Akers' version of social learning theory to predict and explain delinquency behavior, including drug use (see below).

**Social Environment.** Sociologists and others have established that social environment variables most distal from behavior (see the left of figure 1) predict drug use. Thus, the structure of the economic, legal, social, and educational systems of a society are determinants of behavior. In particular, role strain (Merton 1957) and social disorganization or breakdown may lead to inadequate socialization that in turn alters the social bonding and social learning variables (e.g., observation, opportunities). These may then lead to increased drug use among, for example, the disadvantaged (Wilson 1987).

**Social Bonding.** Sociologists believe that the mechanisms through which social organization affects drug use concern social bonding. Thus, conventional bonds with family, peers, school, and other community groups are important. For example, researchers have shown that breakdown of family bonding leads to increased probability of bonding with delinquent peers as shown in figure 3 (Elliott et al. 1985).

**Intrapsychic Variables.** Both sociologists and psychologists have suggested that "intrapsychic" variables might complete the link between social bonding and KAB variables. Sociologists suggest that poor family bonding leads to stress (inability to cope, rebelliousness, risk-taking) and distress (withdrawal, self-derejection, depression). Several researchers have shown a link between social stress or distress variables and substance use (Shiftman and Wills 1985;
Shontz and Spotts 1986; Winick 1974, 1986) as early as grade 1 (Kellam et al. 1982). On the other hand, strong family and other conventional bonding can lead to the development of positive social skills and competencies, strong self-efficacy regarding these, and high self-esteem. Psychologists have suggested that personality factors (e.g., locus of control) affect one’s ability to cope with social situations and one’s desire for and response to drug use (Kaplan 1975; Kaplan et al. 1982, 1984).

Interactional theorists emphasize interactions between personal and environmental variables in addition to independent effects (Sadava 1987; Sadava and Forsyth 1977). Protective combinations may be found by examining interactions. For example, the increased risk of drug use due to childhood depression may be decreased or eliminated by having a nonworking parent or it may be increased by latchkey status (Richardson et al. 1989). Brook and colleagues (1984, 1985) found that adolescents with poor psychological adjustment and lack of goal orientation were less at risk if their mothers were psychologically stable.

Summary. The above-mentioned five classes of variables seem to encompass all variables included in other broad theories. For example, the Jessor and Jessor (1977) personality, perceived social environment, and behavior variables are all accounted for by the above domains, as are most of the domains in the University of California-Los Angeles domain theory (Huba et al. 1984; Huba and Bentler 1980, 1982; Newcomb et al. 1988). We hope that this particular integration of the predictors of drug use provides more orienting statements about macrolevel relationships and processes (both psychological and sociological) than any other single theory or model. However, we are still left with a certain uneasiness; that is, we may have suggested greater agreement between different investigators’ theoretical constructs and points of view than they would accept. On the other hand, some such integration is necessary if we ever are to make progress in understanding the onset of drug use and abuse (Akers 1989). Specific theories and integrations within domains should continue to guide microlevel relationships.

FUNCTIONS OF THEORY

What is the value of all this theory, integrated or not? We now consider 12 functions or roles of theory in the development and testing of drug use prevention programs in three sections: roles in program development, roles in program evaluation, and larger scientific functions.
Roles in Drug Use Prevention Program Development

Link Theoretical Elements and Program Components. Theories of drug use provide us with guidelines or orienting statements for program development. They show us the intervening variables that need to be targeted and suggest the type of curriculum components that might be effective. For example, a focus on the KAB domain suggests informational and values clarification approaches. A focus on social learning domains suggests clarification and correction of social influences and training in social skills. The intrapsychic domains suggest self-esteem enhancement and stress-coping approaches. The social bonding domain suggests family communication patterns and the use of peer leader/models. The social environment domain suggests improved socialization and large changes in society.

Reach Consensus Regarding Magnitude of Program Effects. Formal social science theories should inform us of the magnitude of program effects that we can realistically expect from any particular program. Careful consideration of the probabilistic and stochastic nature of most links in social science theories would lead to more conservative estimates of preventive effects of any particular approach than those that we have made in the past. For example, we should not expect information to play a large role when knowledge and beliefs can be influenced by so many other sources and when the translation of knowledge into behavior depends on so many other factors. As another example, we should never have expected that teaching social skills in a one-shot program could, by itself, lead to large and lasting changes. Certainly, the more distal the intervening variable targeted by an activity, the smaller can be the expected effect on behavior. Similarly, the greater the number of intervening variables left unaddressed by an intervention, the smaller its effects on behavior should be.

Suggest Need for Comprehensive Programs. As suggested above, any one microlevel theory describes only a portion of the total phenomenon of drug use; thus, integration would appear to be necessary to obtain a more complete view. We also saw that many of the theories overlap considerably and that this overlap of various theories also suggests a need for integration (figure 2). They all demonstrate the need to consider multiple theories and operationalizations to understand drug use to develop and evaluate prevention programs. Reliance on any one theory or discipline is inappropriate and inadequate (Evans 1988). They all suggest that an effective prevention program must be comprehensive, which probably also means delivery over an extended period of years rather than months, weeks, or days.

Roles in Prevention Program Evaluation

Link Program Components and Intervening Variables. All program effects are achieved through a set of short-term processes involving intervening variables. Each component of a program is designed to affect a certain intervening variable or set of variables. Theory enables us to specify these linkages, measure the appropriate variables, and conduct the appropriate analyses of process (Dwyer 1983; Judd and Kenney 1981). For example, Project STAR (Students Taught Awareness and Resistance) includes components to correct knowledge of consequences of drug use, improve communication with friends, and decrease intentions to use drugs in the future. We have been able to demonstrate that these variables did indeed change as hypothesized (MacKinnon et al., unpublished manuscript). In another study, the Television, School, and Family Project, we found that social influences information changed social influences knowledge/beliefs and not knowledge of consequences and vice versa (Sussman et al. 1989).

Inform Program Implementation/Dissemination. No program is effective unless implemented appropriately so as to reach the intended audience, hold their attention, be credible to them, and teach them something. Theory can inform us about program delivery. How a program is delivered, by whom, and under what conditions (settings) all intervene between the program and its effects. For example, whether a curriculum is delivered by a teacher or a peer (or both) might determine how well students accept and learn from it (Brannon et al., in press). Fidelity of curriculum delivery will determine its effects on theoretically relevant intervening variables (Sobol et al. 1989).

Inform External Validity. Program theory should inform us as to the external validity or generalizability of program effects by target audience and social environment characteristics.

Target audience characteristics and Interactions. Target audience characteristics may interact with program approaches or components (Lipsey et al. 1985), and theory should be able to inform us of these potentials. For example, social influence prevention programs might be effective for those students at risk of becoming drug users because of social influences but not those at risk because they are rebellious.

Inform social environment characteristics and Interactions. Theory also informs us of possible interactions between the social environment and program approaches or components (Lipsey et al. 1985). For example, programs might be more effective in schools with articulated policies supporting a drug-free environment than in others (Pentz et al., in press), and we might
expect some prevention programs to be effective in middle-class suburbs but not in disadvantaged neighborhoods.

Inform Construct Validity. All program treatments must operate through a set of theoretically derived intervening processes to produce the desired effects.

Clarify cause-effect relationships and Intervening variables. Theory can help us design programs and measures to address cause-effect relationships and many intervening variables. For example, in Project STAR, we not only demonstrated program effects on intervening variables but also showed that these changes mediated behavior change (MacKinnon et al., unpublished manuscript).

Suggest short-term versus long-term effects. All long-term goals must be achieved through a set of short-term processes or effects. For example, one goal of most prevention programs is to lower the prevalence of drug use by the end of high school or after. This might be achieved by reducing the intentions to use drugs or the probability of trying drugs earlier. Theory helps us specify these variables and their relationships and the timeframe over which it is reasonable to expect certain levels of effects.

Suggest unintended effects. The same intervening processes needed to produce desired effects also may produce other, perhaps unintended and undesirable, effects. For example, increasing knowledge of the consequences of drug use might lead to a lower desire to use them and less use, or it might lead to an increased desire to try them (Goodstadt 1980). Decreasing cigarette use among male adolescents may be substituted with increased use of smokeless tobacco. Theory should help us foresee potential unintended program effects. Alternatively, detection of unintended effects can enlarge our knowledge base about drug use and its prevention (Chen and Rossi 1980).

Inform Measurement. Theory can inform us what to measure when testing or evaluating a prevention intervention. The important classes of variables are expected outcomes, intervening variables, implementation processes, program content, audience characteristics, environmental and setting characteristics (e.g., school characteristics), and unintended effects.

Help Explain Effects of Nontheoretically Derived Programs. Sometimes practitioners with little or no theoretical background may design effective prevention programs. Application of theory during a formal evaluation can help explain the effects of such programs, and once such effects are theoretically understood, they may be improved or built on.

Large Scientific Roles

In addition to specific roles of theory in program development and evaluation, theories of any behavior and its alteration allow us to (1) discriminate between program and theory failure, (2) contribute to social science knowledge, and (3) contribute to research efficiency.

Discriminate Program Failure and Theory Failure. Failure to find program effects can be due to wrong theory, poor translation of theory into program, poor program implementation, or poor evaluation design (Bickman 1987; Suchman 1967; Weiss 1972). Theory failure has occurred if intervening variables have changed as hypothesized but behavior has not. Program failure has occurred if expected changes did not occur. This determination is possible only if the evaluation and program have a strong theoretical basis.

Contribute to Social Science Knowledge. Tests of prevention programs can be an important source of social science data (Chen and Rossi 1983). Use of theoretically meaningful program process and outcome variables, that is, variables with high construct validity (Cook and Campbell 1979), can lead to important contributions to social science (Bickman 1987). Tests of prevention programs can be just like basic research in that we attempt to understand the relationships between program variables and outcomes. There are many gaps in our understanding of drug use; good theory-based research and evaluation can help fill these gaps.

Improve Long-Term Research Efficiency. Better understanding of why each evaluated program was or was not effective will lead to more efficient research efforts in the long term.

IMPLICATIONS FOR METHODS

We discuss the implications of theory for methods of research in four major groups: implementation quality, external validity, construct validity, and special method-theory relationships. The major implications for each of the first three areas concerns measurement and analysis. In all future research, we need to construct indicators of implementation quality, external validity, and construct validity and link variations in them with ultimate program effects.

Implementation Quality

Theories of drug use onset and behavior change can inform program delivery/implementation as well as program content; however, a specific theory of program implementation also might be helpful (Chen and Rossi 1983). At the
simplest level, ultimate program effects depend not only on program content but also on mode and quality of delivery and on attention and learning by the audience. Determinants of quality of delivery and students’ attention include such factors as (1) the nature of the program and its content; (2) social, political, and financial support at the school district and community levels; (3) teacher (and peer) training; and (4) acceptance of the program by teachers, parents, and students (figure 4).

Thus, in evaluating drug prevention programs, we should measure program content, implementation methods and integrity (Sechrest et al. 1979), and program acceptance by students, parents, teachers, other officials, and other community groups. We then need to conduct analyses to establish links between each of these and program effects.

External Validity

We know very little from studies conducted to date about the external validity or generalizability of their findings. Generalizability concerns the transferability of an effective program-for whom is it effective and under what conditions of implementation/dissemination? Most rigorous studies of recent smoking prevention programs, for example, have been conducted on white middle-class populations (Flay 1985). We still do not know for sure whether they are effective for various socioeconomic and ethnic groups.

We know relatively little about the students for whom the psychosocial approaches are most effective. Most studies have not performed separate analyses by sex, grade, prior experience with substances, or other characteristics of the study participants. Where such analyses have been done, differences have sometimes been found: for example, results from some studies of the social influences approach to smoking prevention suggest that males and females are equally influenced by a teacher-led program but that they may be differentially influenced by a peer-led program (Flay 1985).

Another area that past research has not yet addressed sufficiently concerns broader issues of program dissemination. Once we have an efficacious program, how will it be disseminated? Should regular teachers be trained? If so, how? Would some other group, such as school nurses or health agency volunteers, be more effective? What is the potential role of the media? Will those programs found to be most efficacious under research conditions also be found most effective under real-world conditions (Flay 1986)? All such questions remain for further research to answer.
Construct Validity

Construct validity of the treatment concerns questions of whether the various components of a program have the immediate effects expected of them and whether any immediate effects on presumed mediating variables are related to subsequent behavior. Each component of a program is designed to produce a particular effect, and it is the combination of all those effects that should prevent drug use. Few past studies reported program effects on presumed mediating variables, and even fewer attempted to link any such changes to subsequent drug use behavior. The investigations of the more general life/social skills approaches have been more diligent at including assessments of presumed mediating variables (McCaul and Glasgow 1985). An analysis by Glasgow and McCaul (1985), however, demonstrates great inconsistency across studies in those mediating variables affected by the same or very similar programs tested by the same researchers and no attempts to link changes in mediating variables to behavior change.

In addition to measuring and describing their program and its implementation in detail, future researchers will need to assess program effects on presumed mediating variables (e.g., attitudes, intentions, resistance skills) and attempt to link changes in presumed mediators with changes in subsequent smoking behavior. Such research also will enhance our knowledge about the process of becoming a drug user, which in turn may lead to further improvements in future programs.

Special Method-Theory Relationships

Three areas of theory and methodology have special implications for each other: social environment and sample size, social norms and unit of assignment, and predictors of drug use and attrition.

Social Environment and Sample Size. From a methodological perspective, assigning only one or two schools (or other units such as communities) per experimental condition is of concern because of possible nonequivalence and confounds. Several smoking and drug use prevention studies suggest wide between-school variation in the rate of smoking and drug use by students. Although we have only limited understanding of the environmental causes of variation in substance use behavior, recent models of the onset process suggest that one’s social environment is a very important determinant of drug use. Thus, both recent theory and data suggest that (1) more than one unit (school or classroom) should be assigned to each experimental condition of future studies; (2) samples should be sufficiently large to permit systematic exploration of classroom and school characteristics; and (3) more effort is needed to understand the relationships between school or classroom characteristics and variation in drug use.

Social Norms and Unit of Assignment. Most school-based researchers assign whole schools to experimental conditions, but some assign classrooms within schools. Unit of assignment has other implications in addition to those addressed in the preceding paragraph. Psychosocial approaches to prevention might change the social norms of complete social systems; thus, in addition to improving relevant social skills, these programs might reduce the social pressures to use substances. No study has yet provided data to determine this. Studies that used within-school as well as between-school control groups could be informative. If programs do change norms for complete schools of classrooms, then multiple experimental conditions should not be assigned within schools. On the other hand, if program effects are mediated mostly by development of skills, then experimental conditions could be assigned within schools, classrooms, or any other social unit (although “contamination” of treatments could still be a problem). Tests are needed to determine whether psychosocial prevention programs of various types change norms in complete social systems (Best et al. 1984).

Predictors of Drug Use and Attrition. Attrition has been noted as a serious problem in longitudinal studies of school populations. Some work has been done on methods for testing whether the attrition experiences in any particular study relate to internal and external validity (Biglan and Ary 1985; Hansen et al. 1985) and on minimizing attrition (Pierie et al. 1989). However, the possible relationship between predictors of smoking onset and attrition has not yet received attention. For example, there is evidence that a major predictor of adolescent substance use is “rebelliousness.” Although there has been little explanation of the psychological processes involved, it seems dear that rebelliousness probably also predicts absenteeism and school dropout rate. This means that students at high risk of becoming drug users are the same students who are most likely to drop out. Future research needs to include assessments of the predictors of attrition; then if high-risk students are indeed dropping out of studies, further work will be needed to minimize such attrition or to find analytical approaches to adjust for it (Heckman 1976).

CONCLUSIONS

We have attempted to accomplish three things. First, we reviewed and integrated major predictors of drug use in five theoretical domains. Second, we established 12 ways in which theory is important to the enterprises of prevention program development, program evaluation, and science. Third, we derived the methodological implications of theory.
Theory is important. Without it, we would be even more lost than we have been to date in developing effective prevention programs; however, more diligent attempts to use theory will lead to more effective programs in the future. Without theory, our evaluations would have been even less useful than they have been; however, closer attention to theory will lead to more useful research and evaluations. Without theory, the science of prevention would not have advanced at all. Prevention theory has advanced significantly, particularly during the past decade, but it will advance more rapidly with greater use and application of existing theory and with further attempts to clarify, test, and improve existing theory.

NOTES

1. Jim Dwyer brought this view to our attention.
2. Few theorists address the issue of differential prediction of drug use onset and continuing use leading to abuse. The pattern of predictors for use of different substances or for use at different levels (experimentation/onset, continuing use/abuse) may differ (the specific factor model). For example, the relative strength of parent and peer influences probably varies as a function of both regular adolescent development and stage of adoption of substance use (Flay et al. 1983). In contrast, a common factor model suggests that the same factors predict lower or higher levels or involvement for all substances. These two views make different predictions and suggest different analyses (Hays et al. 1987). However, a common factor etiology model is not compatible with a simplex model for stages of adoption of drug use. Each substance may have a separate threshold value or level (similar to item characteristic curves in psychological test theory) on an underlying substance use dimension. A low subject score on this dimension implies no substance use; a very high score implies use of all substances; and an intermediate score implies use of all substances whose thresholds are less than that score. Environmental and intrapersonal factors might predict this underlying score.
3. Other variables such as normative expectations, knowledge of social influences, and resistance skills did not change as hypothesized, perhaps due to poor measurement.

REFERENCES


ACKNOWLEDGMENT

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