Adolescence is a time of significant change, development, and risk. During the formative adolescent years, young people increasingly interact with the larger social world and acquire new cognitive representations that shape their current and future life choices. Curious adolescents explore their world, try new things, test limits, and take risks. Given the current prevalence and availability of both licit and illicit drugs, it is not surprising that this stage of novelty and exploration often involves the initiation of substance use (Johnston et al., 2004). Although substance use in adolescence typically involves experimentation, rather than problem use, adolescent substance use is associated with a host of consequences, including academic problems, risky sexual activity, and unsafe driving practices (Everett et al., 1999; National Institute of Alcohol Abuse and Alcoholism, 1997).

Recent evidence demonstrates that changes in cognitive representations, such as expectancies and memory associations, often predict and mediate changes in substance use. The research presented in this book illustrates how measures of implicit cognition provide a unique and powerful tool for assessing the cognitive changes that precede and accompany substance use. By identifying
the cognitive structures and processes that underlie substance use, implicit cognition theory has the potential to inform the development of effective, theory-based prevention programs. The purpose of this chapter is to describe the application of implicit cognition to adolescent substance use and explore how models of implicit cognition may be used to develop effective and persuasive prevention programs that target the cognitive processes directly influencing adolescent substance use.

UNDERSTANDING ADOLESCENT SUBSTANCE USE

Generally, first substance use, including alcohol (especially intoxication), tobacco, marijuana, and other illicit drugs, occurs after age 12 and before age 24, with many transitions including initial experimentation and problem substance use occurring before age 18. These trends cross international borders and, although certain substances undergo cyclical changes in their overall prevalence and are characterized by changing trends in use (e.g., ecstasy, crystal methamphetamine; Johnston et al., 2004), the pattern of progression across the teen years remains remarkably steady. What is most evident and typical of studies across this age range is the remarkable growth of drug use across a range of measures and drugs.

Recently, researchers have focused on identifying individuals and situations with greater risk for substance use and abuse. Longitudinal examinations of substance use with latent growth curve modeling have resulted in the identification of subsets of users that differ in their substance use progression and substance-related problems. For example, Flory et al. (2004) classified adolescents into distinct subgroups based on their use (or nonuse) of alcohol and marijuana. For alcohol, early onset users had more dysfunctional outcomes (e.g., arrests, alcohol abuse/dependence, marijuana abuse/dependence) than either late onset users or nonusers, whereas for marijuana both early and late onset users had more dysfunctional outcomes than nonusers.

Other researchers have identified risk factors that are associated with the growth of substance use in adolescence. These risks include substance use by peers (e.g., Brook et al., 1999), aggression and delinquent behavior (e.g., Raskin-White et al., 2001), and family factors such as family substance use, lack of parental monitoring, and parent-child conflict (Wills & Yaeger, 2003). Individual differences in personality traits and comorbid psychiatric disorders also contribute to youth transitions in substance use (see Conrod & Stewart, in press). These risk factors and the stage of progression in substance use are important to the development of effective prevention and early intervention for youth substance use and suggest the need for tailored programs addressing differing motivations and stages of substance use (see Stewart et al., 2005).

A further differentiation of individual risk derives from Prochaska and DiClemente’s (1983) transtheoretical model of change, which proposes that the acquisition and cessation of behaviors progresses along a series of stages: precontemplation, contemplation, preparation, action, and maintenance. This stage model of behavior change has implications for treatment. The treatment goal is to move individuals from a more harmful stage to a safer one. Similarly, the acquisition of substance-use behavior in adolescents can be characterized according to stages of progression where substance use progresses along a continuum from nonuse, through intention to use, experimentation, regular use, abuse, and dependence (cf. Dimeff et al., 1999). The addition of intention as a construct dichotomizes nonusers into two groups: those who intend to use drugs or alcohol in the foreseeable future and those who have no
intention to use. The rationale for including intention is similar to the readiness construct in the transtheoretical model. Individuals who are openly considering future substance use are hypothesized to be in a different stage of risk than those who have given it no thought or have concluded that they will never use. In addition, our work with alcohol use (Krank et al., 2003) suggests that intentions can be reliably measured and that intentions to drink increase concomitantly with changes in alcohol-related cognitions. This stage model is useful to illustrate how implicit cognitions may be used to measure the stage of risk and help to tailor prevention efforts before any actual use has occurred.

It is within this multistage framework of youth substance use that we explore the contribution of implicit memory to the prevention of substance abuse.

**IMPLICIT COGNITION AND SUBSTANCE-USE TRANSITIONS IN YOUTH**

Cognitive measures associated with substance use are useful adjuncts to understanding and predicting transitions in adolescent substance use. Substance-use associations change both concurrently and in advance of actual substance-use transitions (Goldman et al., 1999; Krank et al., 2003, 2005; Stacy, 1997). These methods can be used in prevention in a number of ways. First, they add a measure of risk to target individuals or populations for particular types or intensities of intervention. In addition, cognitive methods provide sensitive measures of intervention efficacy, potentially differentiating those who are reached by the intervention from those who are not. Further, we argue here that implicit memory measures tap the associative structures of adolescent incentive motivation and provide a window into the processes of behavioral choice related to substance use.

These potential applications indicate that implicit cognitive approaches provide an innovative theoretical basis for substance-use interventions and point to new directions for program development and evaluation.

**COGNITIVE CHANGES AND THE PREDICTION OF SUBSTANCE USE IN ADOLESCENTS**

There have been a number of approaches to measuring cognitive changes that predict substance use. Our focus is on associative memories about substance use and alternative behaviors. The measures we use include both explicit outcome expectancies, implicit behavioral associates, and ambiguous word associations (see below for details). Using the expectancy paradigm, studies in adolescents have shown that alcohol-related associations are formed prior to drinking initiation (Christiansen et al., 1982) and that positive alcohol outcome expectancies prospectively predict consumption in adolescent drinkers (Christiansen et al., 1989). Goldman et al. (1999) argue that alcohol outcome expectancies (1) correlate with alcohol use, (2) predate actual drinking experience, (3) predict future drinking, (4) are modified by drinking experiences, and (5) mediate other antecedent influences. Implicit measures of substance-use associations also reveal a strong proximal relationship with substance use. Evidence from alcohol use in adolescents demonstrates that implicit measures of substance-use memory associations (1) correlate independently with alcohol use when demographic and other cognitive variables are controlled, (2) change before substance use begins, and (3) predict future drinking independently of demographic, personality, and other cognitive variables.

We have examined the relationship between cognitive associations and substance use in a cross-sectional sample of 1,724
students in grades 7 through 12 of a single school district in British Columbia, Canada. The data were collected from groups of students by survey in the spring of 1997. Drug- and alcohol-use patterns are similar to those described above for national and regional surveys of youth in this age range (Krank & Johnson, 1999). The study investigated the relationship between cognitive associations and alcohol and marijuana use. Participants were administered two implicit measures, behavioral associates and ambiguous word associations (from Stacy, 1997), for both alcohol and marijuana. These implicit tests were placed at the beginning of the survey to prevent contamination with subsequent questions about drinking and marijuana use. Behavioral associates were assessed by asking students to write down the first behavior or action that came to mind in response to a number of outcome phrases, such as having fun, feeling good, or feeling dreamy. The phrases were selected as high-frequency, self-generated outcomes for drinking alcohol or smoking marijuana based on previous research (Stacy et al., 1994). Open-ended responses were coded as alcohol or marijuana associates or both (see Stacy, 1997; Stacy et al., Chapter 6) and composite scores were calculated based on the sum of responses that mentioned alcohol or drinking behavior as well as using marijuana, respectively. In the ambiguous word-association task students were asked to write the first word that came to mind in response to a word with dual meanings, one of which was related to alcohol or marijuana. For example, the probe draft might elicit responses of paper or beer. Similarly, word probes, such as pot and weed, have multiple meanings, but some responses, such as reefer, stoned, or smoke are clearly marijuana-related in the context of these probes. Again, cumulative scores of the number of alcohol and marijuana interpretations of target probes were taken as the implicit measures of alcohol or marijuana associations.

These implicit measures correlate strongly with measures of alcohol and marijuana use, respectively. Table 28.1 shows the results of regression analyses using implicit memory measures and alcohol outcome expectancies to predict each of three measures of alcohol use and one measure of intention to use alcohol. The intention analysis was conducted only on nondrinkers. All regression analyses controlled for grade and gender. This study also assessed explicit positive- and negative-outcome expectancies for alcohol use with a standardized questionnaire (Leigh & Stacy, 1993). Each of the four regression analyses was highly significant. Alcohol-implicit memory measures predict drinking quantity, frequency of use in past 30 days, and recency of use after controlling for outcome expectancies, grade, and gender. As expected, the outcome-expectancy measures also predicted alcohol use after controlling for grade and gender. The implicit-alcohol association measures, however, predicted variance in alcohol use independently of the explicit measure of alcohol outcome expectancies. Intention to drink in nondrinkers was predicted by homographs and positive-outcome expectancies; however, neither behavior associates nor negative-outcome expectancies predicted intention. In the case of behavior associates, this is because very few nonusers produced any alcohol responses to the outcome phrases. By contrast, the behavior associates were stronger predictors of level of alcohol use in those students who had begun to drink.

In this same study, these implicit measures also predict current marijuana use and future intention to use in non-users. The behavioral associates and homographs measures of marijuana associations strongly correlated, $r = .351, p < .001$. Nevertheless, both homograph and behavioral associate measures contributed independently to the prediction of marijuana use (beta = .210, $t(1, 771) = 6.0, p < .001$; beta = 1.85, $t(1, 771) = 5.25, p < .001$, respectively) and intention to use
Table 28.1  Regression of Implicit Cognitive Measures of Alcohol Associations and Grade and Gender on Measures of Alcohol Use and Intention

<table>
<thead>
<tr>
<th></th>
<th>Quantity</th>
<th>Days in past 30</th>
<th>Recency</th>
<th>Intention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beta/R</td>
<td>t</td>
<td>Beta/R</td>
<td>t</td>
</tr>
<tr>
<td>Model</td>
<td>.587*</td>
<td></td>
<td>.468*</td>
<td></td>
</tr>
<tr>
<td>Behavior Associates</td>
<td>.113</td>
<td>5.10*</td>
<td>.118</td>
<td>4.90*</td>
</tr>
<tr>
<td>Homograph</td>
<td>.131</td>
<td>5.86*</td>
<td>.166</td>
<td>6.81*</td>
</tr>
<tr>
<td>Positive Exp.</td>
<td>.260</td>
<td>11.8*</td>
<td>.216</td>
<td>8.97*</td>
</tr>
<tr>
<td>Negative Exp.</td>
<td>-.249</td>
<td>-11.7*</td>
<td>-.215</td>
<td>-9.25*</td>
</tr>
<tr>
<td>Gender</td>
<td>-.095</td>
<td>-4.6*</td>
<td>.001</td>
<td>.025</td>
</tr>
<tr>
<td>Grade</td>
<td>.194</td>
<td>9.20*</td>
<td>.009</td>
<td>.399</td>
</tr>
</tbody>
</table>

NOTE: Behavioral Associate = number of alcohol-related behavior responses to outcome cue words fun, relaxed, happy, good time, forgetting problems, and powerful (range 0–6); Homograph = number of alcohol-related responses to ambiguous words with possible alcohol meaning: draft, mug, ice, cooler, shot, bottle (range 0–6); Positive Exp. = average score on positive expectancy items from Leigh and Stacy (1993; range 0–6); Negative Exp. = average score on negative expectancy items from Leigh and Stacy (1993; range 0–6).

*All models significant at \( p < .001 \); Quantity, days and recency models \( df = 6, 1587 \); Intention model \( df = 6, 306 \); * significant at \( p < .001 \)
(beta = .462, t(1, 1411) = 20.2, p < .001; beta = .191, t(1, 1411) = 8.3, p < .001, respectively) controlling for gender and grade in the model. This pattern contrasts slightly with that found for alcohol in that marijuana behavior associates were produced in non-users and did predict intention to use (Krank et al., 2003). For both marijuana and alcohol, higher implicit memory scores predicted increased intentions to use in the future among non-users. These observations suggest that implicit measures of memory associations may be valuable in predicting an early transitional stage in substance use. Given the strong relationship between intentions and actual behavior (Ajzen, 1985), these findings provide added support for implicit cognitions as prospective predictors.

Even stronger evidence that confirms Stacy’s (1997) findings that implicit measures of alcohol are useful prospective predictors of alcohol use comes from longitudinal data that we have collected from 1,303 adolescents. In that study, implicit alcohol associations predict drinking 12 months later using a number of drinking measures including the number of days drinking in the past 30, usual number of drinks, recency of last drinking episode, and recency of last time drunk. Strikingly, the initiation of drinking during the 12 months was also predicted by the homograph measure in adolescents who had not had any previous drinking history (Krank et al., 2003, 2005). This is the same pattern as is found in the intention measure for nonusers in Table 28.1.

**Implicit Memory and Substance Use**

We turn now to consider the question of why implicit memory is so strongly predictive of substance use. Our contention is that implicit memory measures reflect the same memory associations that underlie incentive motivation and behavioral choice. Specifically, implicit memory methods tap into the situation-behavior-reinforcer associations that are central to incentive motivation and other reinforcement-based explanations of behavioral choice. Implicit methods are uniquely important to substance use because they open new windows to these “memories” of motivationally significant relationships.

**Implicit Cognition, Incentive Motivation, and Behavioral Choice Theory**

Recent theories of substance use and addiction are heavily influenced by representations of substance-use behaviors and their association with reinforcing outcomes. Although not explicitly cognitive, incentive motivation theories of substance use are based on anticipation or memory of positive or reinforcing consequences of a behavior (Robinson & Berridge, 1993; see for a review Krank, 2003). Behavioral choice theory provides another associative learning theory of addictive behavior (Vuchinich & Tucker, 1996). According to behavioral choice theories, preference for substance use depends on both the reinforcing outcome associated with substance use and the potential reinforcing outcomes of other activities. Both incentive motivation and behavioral choice theories postulate that substance use is governed by learned associations between actions and outcomes. Whereas incentive theories of addiction focus on the uniquely powerful or qualitatively distinct reinforcement value of abused substances arising from their direct action in particular brain regions, behavioral choice theories emphasize preference for an activity within the context of other activities and the availability of reinforcing substitutes. The analytical approach is behavioral, but the theory assumes cognitive representations of behavior-outcome...
associations. It is worth noting here that incentive motivation and behavioral choice theories do not necessarily involve conscious or rational decision making. Implicit cognition methods may be particularly powerful tools for investigating the unconscious influences on behavior choice.

**Contributions of Implicit Cognition to Associative Theories of Substance Use**

Implicit memory methods provide new measures to assess associations between substance use and its anticipated outcomes that are reflective of incentive motivations and behavioral reinforcer associations underlying choice. Indeed, measuring behavior-outcome associations without explicit awareness may overcome resistance in the assessment process (Stacy, 1997). Implicit methods may also access memories that are inaccessible to awareness (e.g., see Ames et al., Chapter 23) and reveal unconscious influences on behavior (Greenwald & Banaji, 1995; Jacoby & Kelley, 1990). Implicit cognition may be particularly important in adolescence, a developmental stage marked by impulsivity, risk-taking, and novelty-seeking. Such behaviors are more easily influenced by unconscious processes and are related to levels of early substance use (Cooper et al., 2003). The relative lack of preplanning in adolescents underscores the importance of prevention programs that identify the implicit factors influencing impulsive substance use. Finally, implicit cognition advances our understanding of substance abuse by expanding the focus beyond response outcome associations to include situational, contextual, and social stimulus elements (Krank & Wall, Chapter 19; Krank et al., 2005). Thus, implicit measures capture a richer complex of associative elements, including outcomes, words, contexts, and affect. Prevention approaches can turn this wealth of subjective information into material for building persuasive messages to mitigate risk.

**IMPLICIT COGNITION AND PREVENTION**

A wide array of methods has been applied to the prevention and treatment of substance abuse in adolescents (Monti et al., 2001; Wagner & Waldron, 2001). Our goal here is not to review the prevention literature; rather we will explore the ways implicit memory research can enhance prevention programs to reach a greater percentage of at-risk teens with more effective and individually tailored methods. From the transitional stage model described earlier, the goal of prevention is the modification of individual substance-use trajectories either to (1) impede progression to increased or more harmful use, or (2) aid in the return to reduced or less harmful use. Such prevention strategies are effective only to the extent that they make contact with the individual and change the individual’s future behavior. The cognitive approach to prevention further assumes that changing the appropriate underlying cognitions in an individual will result in positive behavioral change. For example, many adolescents overestimate levels of substance use in their peers and society at large (e.g., Sussman et al., 1988). Programs that challenge these mistaken beliefs are effective in reducing problem use (e.g., Marlatt et al., 1998).

Implicit memory research indicates new directions for prevention, including (1) early identification of and intervention for at-risk individuals or populations, (2) sensitive measures of intervention success, and (3) targeting relevant cognitive representations for change (see also Wiers et al., 2004). In addition, the implicit processing approach to adolescent interventions has some general implications for effective persuasion. Specifically, prevention is persuasive only to the extent that the
message is processed, relevant, and retrieved at the right time. To be effective, prevention programs must change the cognitive processing of associations that influence behavioral choice at the times of most significant risk.

**Early Identification of Levels of Risk in Individuals or Populations**

Implicit measures of substance-use associations are proximal predictor variables and thus can be sensitive indicators of an individual’s stage and level of risk. Recent approaches to secondary prevention have shown the value of identifying high-risk groups or individuals for targeted substance-use interventions (Conrod & Stewart, in press; Stewart et al., 2005). Identifying at-risk individuals or groups allows tailoring prevention programs to match individual needs (Dimeff et al., 1999; for a recent review, see Sussman et al., 2004). Tailoring prevention programs for target groups involves matching the intervention with the severity of risk and aligning prevention methods with the antecedent conditions of substance use. From our earlier discussion, stage of initiation differentiates individual differences in adolescent substance-use risk. Youth differ in their past history of substance use, problems associated with use, and their future intentions to use. Moreover, cognitive changes predict these progressive stages of risk. Thus, implicit memory measures may be used to identify the stage of risk and aid in identifying individuals who will benefit from different prevention programs. Specifically, individuals who have already started drinking need a different approach than those who are merely contemplating drinking or those who have not even begun to consider the possibility. Implicit memory measures provide unobtrusive ways of differentiating youth who are in these various stages of risk. In addition, the nature of substance-use associations at these stages of risk should lead to tailored prevention programs that selectively target the memory associations that need to change.

**Measuring Change**

 Implicit substance-use associations are also useful in identifying who has successfully benefited from prevention programming. We have already argued that implicit alcohol associations predict nonusers who intend to use alcohol and prospectively predict patterns of drinking in both drinkers and nondrinkers. Increases in implicit alcohol associations along with positive outcome associations independently predict alcohol risk-taking behaviors in adolescents. This means that effective prevention should impede the growth of such associations. In individuals who are nonusers or infrequent users, it may be difficult to determine whether an intervention has successfully resulted in behavior change. Intentions and cognitions, both explicit and implicit, may be the most effective means for determining the effects of a prevention program in nonusers and experimenters. Future research using implicit memory measures may provide further validation for the effectiveness of prevention programs targeted at altering specific substance-related cognitions.

**Targeting Specific Cognitive Changes in Prevention**

Beyond the predictive utility of implicit measures of substance use, evidence reviewed earlier suggests that associations with substance use are causal mediators of substance use in adolescents (see also Goldman et al., 1999; Krank et al., 2003, 2005; Stacy, 1997). Modifying the processing of memory associations that place individuals at risk can have a protective effect. From the perspective of incentive motivation and behavioral choice theories, the development of prevention programs should benefit from
methods that minimize the effects of positive associations with substance use. Methods that should be helpful include enhancing negative associations with substance use, preventing the learning of positive associations with substance use, and promoting learning of positive associations with nonsubstance-use behaviors that would compete with substance use. Such prevention programs would target anticipated and actual changes in substance-use cognitions that increase the risk of substance-use transitions. Implicit methods are useful not only in identifying risky cognitions, but also in identifying alternative associations that have protective effects.

**Normative Behavioral Associations and Behavioral Choice**

Behavioral choice theories and behavioral economics have recently been applied to health-related behaviors (see Bickel & Vuchinich, 2000) and substance use (Vuchinich & Tucker, 1988). Madden (2000) defines behavioral economics as the examination of factors that influence consumer behavior. Accordingly, the choice to use substances varies as a function of (1) direct constraints on access to substances, and (2) the availability of other reinforcers and constraints on access to them (Vuchinich & Tucker, 1988). In a recent sample of British Columbia students, 56.6 percent and 45.5 percent of youth reported that alcohol and marijuana, respectively, were either “easy” or “very easy” to obtain. Consequently, to produce change, other behaviors of equal or greater reinforcement value need to be easily available for selection. For example, increasing constraints on access to substances (e.g., price increases for legal substances or enforcement strategies) should be coupled with decreasing constraints on access to alternatives (e.g., funding for after-school programs). According to behavioral choice theory, these methods fit well with community or family-oriented prevention designed to provide alternative activities.

Implicit memory approaches may be used to enhance the development of effective applications of behavioral choice theories through a more complete exploration of the associations governing adolescent choice at various stages of substance-use initiation. The behavioral associate (described above) and situational associate (see Stacy et al., Chapter 6) tasks illustrate how implicit measures may be used to assess the range of behavioral options available to adolescents and identify those behaviors that, from a behavioral choice perspective, may be substitutes for substance use. In both tasks, the response field is open to nondrug alternatives. In fact, we have found that nondrug users give exclusively nondrug-related responses to outcome probes such as have fun. Similarly, situational probes, such as Friday or Saturday night, elicit drinking responses in drinkers, but alternative behaviors in nondrinkers. These associations may translate into choices youth make when navigating environments in which both substance use and alternative behaviors are available.

Identifying potential behavioral substitutes available to adolescents may inform the development of substance-abuse prevention programs. Specifically, instead of promoting abstinence through emphasizing the negative consequences of alcohol use, interventions may highlight alternatives to substance use and broaden youths’ menu of choices. As Bigelow (2001) stated, “The most effective way to reduce and eliminate an undesirable behavior is to provide a competing attraction” (p. 302). In prevention approaches, these normative activities that compete with substance use should provide contrast to develop discrepancies for change. The idea is that these contrasts would motivate alternative, safer behaviors much the same way that normative levels of drinking motivate reduced drinking in heavy users. Direct encouragement and training in alternative behaviors is obviously the strongest approach.
Such alternative behavior training fits well in community-, school-, and family-based approaches. Cognitive approaches that encourage alternative behavioral associations with contexts or outcomes that are often linked to substance use should be developed in primary prevention. These cognitive methods are particularly suited for those not yet involved in substance use.

**General Implications of Cognitive Approaches to Future Prevention Efforts**

The focus of the foregoing analysis is the cognitive impact of messages youth receive and their relevance to behavioral choice and prevention. We turn now to the general implications of the cognitive perspective in prevention. Wiers and colleagues (2004) have presented a detailed analysis of how some principles of learning and memory impact prevention approaches. We present here just a couple of salient points from this perspective to emphasize that prevention messages to be effective must be encoded in a manner that makes them retrievable in the situational context where decisions about substance use are made (typically not when parents are around). The encoded message must be relevant and result in new learning that counters risky cognitions. Unfortunately, few programs pay attention to how the prevention message is processed and even fewer evaluate its impact on cognitions that influence behavioral choice. Prevention programs need to evaluate the changes in the substance-use associations that are known to precede changes in behavior. Our analysis suggests that behavioral associations that compete with substance use are critical for change. We need to measure not only risky behaviors and cognitions, but also positive associations and other desirable outcomes to validate early whether an intervention is effective.

**Discrepancy and Surprise**

Recent motivational enhancement approaches to therapy emphasize the importance of discrepancy in persuasive messages (Miller & Rollnick, 2002). Both traditional learning and computational cognitive theories give insight into why discrepancy is so important. The central feature of the influential Rescorla and Wagner (1972) theory of associative learning was the discrepancy hypothesis. Simply stated, the degree of new learning depends on the discrepancy between an expected and an actual outcome. Surprising events are processed more, resulting in more associative or interpretive encoding. New learning depends on surprise generated by the contrast between expected and actual events. A prevention message that is surprising or unexpected is more likely to result in the new learning that is essential for change.

**Retrieval Factors**

The contexts of substance-use associations should be incorporated into the prevention message because they are likely to be critical to memory retrieval and behavioral decision making (see Krank & Wall, Chapter 19, for a more complete discussion). For example, substance-use associations about self and others like “me” (peers, role models, and family) are likely to be more influential than those about others. When making decisions about whether “I” should do something, associations of self with situations and outcomes become relevant retrieval cues. The social context of substance-use associations suggests that the target audience should identify with the messenger. The messenger must be believable. A cognitive perspective argues that social context is important to the prevention message. From the present perspective, future research should examine how the messenger
might interact with the message to produce cognitive changes that are most effective in protecting the individual against substance use. More generally, prevention programs should consider their impact on the accessibility of substance use and alternative associations in contexts where decisions will be made.

FUTURE DIRECTIONS IN PREVENTION RESEARCH

From our analysis of behavioral choice and implicit memory theories, a primary goal of cognitive prevention approaches should be to produce alternative behavioral associations that are both incompatible with and more accessible than cognitive changes that antedate substance-use transitions. Recently, both primary (Cruz & Dunn, 2003) and secondary (Dunn et al., 2000) prevention programs have begun to address cognitive associations (substance-use outcome expectancies) directly. These approaches are based on the expectancy challenge approach to problem drinking (Darkes & Goldman, 1998; for a critical overview, see Jones et al., 2001). In the expectancy challenge, drinkers are confronted with a placebo drinking experience and led to face the conclusion that many of the effects of drinking are based on expectancy and not alcohol. The premise of this approach is that the realization that their positive expectancies are false will reduce drinking. In recognition that placebo drinking would not be appropriate in prevention, cognitive expectancy challenge procedures were designed to modify memory configurations and strengthen associations between alcohol and negative affect (e.g., slow, sleepy) and physical (e.g., sick, rude) effects. The application of implicit memories for substance-use associations should take this kind of cognitive approach in new directions.

Brief Screening and Targeted Intervention

Cognitive approaches to substance-use prevention efforts need to target the stage of risk. From our perspective, there is little value in challenging associations that are not currently present. Thus, cognitive challenge or false expectation approaches would not be appropriate in nonusers. In those who have not used, but intend to use, cognitive challenges to the expected effects of substance use would be appropriate. These challenges, however, are likely to differ from those aimed at individuals who are already drinking and have some direct experience with the drug’s effects. We propose a two-stage brief intervention process for school-based prevention derived from the BASICS (Brief Alcohol Screening and Intervention for College Students) approach to secondary prevention (Dimeff et al., 1999). The first phase of the program would assess the current stage of risk in target school populations (e.g., grades seven through nine). In addition to tools assessing the current level of use and other risk factors, we would add implicit measures of substance-use associations, long-term goals, alternative behaviors, and future intentions. In the second phase of the program, individuals would be grouped according to the current level of use and future intentions to use. Behavioral associations, alternative behaviors, and long-term goals would be used to provide individual feedback and tailor the prevention messages to the specific group. Although the secondary prevention typically uses individual interventions, Marlatt and his colleagues (1998) have shown that they can be effective for heterogeneous groups.

Cognitive Inoculation Training

One specific example of how targeted approaches could be applied is inoculation training. Nonusers in particular would
benefit from programs designed to protect them from media and peer influences. During the teen years, youth are increasingly exposed to drug and alcohol references in popular culture and through their exposure to individuals in their immediate environments, including family and friends. Advertising, music, and movies depict substance use with greater frequency than real life and often in images that typically show positive outcomes and rarely show adverse outcomes (Grube, 1993; McIntosh et al., 1999). Media exposure to others using drugs and alcohol is a significant risk for substance use (Villani, 2001). Implicit memory measures may be useful in identifying the nature of the changes that result from social learning before actual substance use begins (e.g., messages in popular media; Fleming et al., 2004; Stacy et al., 2004). One effective campaign to reduce teen smoking involved portrayals of cigarette manufacturers as manipulators (Goldman & Glantz, 1998). From a cognitive perspective, this prevention approach succeeds by “inoculating” teens against the messages found in smoking advertisements and movies depicting smokers. The prevention message allows the young person to encode cigarette exposure in the popular media as deception. Protection against veiled and often not so veiled messages about the positive consequences of substance use may be useful in prevention venues that target nonusers, intending smokers, and experimenters. Such inoculation training would be directed at a critical portrayal of media sources of information about substance use including alcohol advertising.

CONCLUSION

The real war on drugs is the battle for the hearts and minds of our youth. Adolescence is a critical period for the initiation of substance use and, for some, represents the first stage in an increasingly problematic continuum of use. Cognitive representations of substance use change concurrently and in advance of substance-use transitions. Implicit memory methods allow for the measurement without resistance, which may be particularly important for adolescents, whose propensity for impulsivity and risk-taking implies unconscious or unplanned behavior. Moreover, such measures tell us about the structure of the associations that influence choice behavior. Thus, further understanding of adolescents’ implicit cognitions concerning substance use may serve as an important theoretical basis for the evaluation and development of substance-abuse prevention programs. This focus on implicit cognition has the potential to take the prevention field into several new directions, including (1) early identification of at-risk individuals or populations for targeted interventions, (2) sensitive measures of intervention success, (3) identification of cognitive representations that should be targets for producing behavior change, and (4) greater understanding of the most persuasive methods for message delivery that produce new learning and will be most effective when decisions about substance use are made.

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