The role of drug use outcome expectancies in substance abuse risk: An interactional–transformational model

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Abstract

While a variety of risk factors for substance abuse have been identified, the psychological mechanisms underlying the transmission of risk is unclear based on studies using traditional risk-outcome research designs. The present paper identifies drug use outcome expectancies as a common etiological mechanism involved in substance abuse risk. Existing literature findings are reviewed and integrated according to an interactional–transformational (IT) model of developmental psychopathology. This model identifies the preliminary (mediating) and secondary (moderating) role of drug expectancies as important operations involved in the development of substance use patterns. Advantages of the IT model over traditional trait-based or environmental models are discussed, along with implications for intervention and future research. © 2006 Elsevier Ltd. All rights reserved.

Keywords: Expectancies; Developmental psychopathology; Risk factor; Substance abuse

1. Introduction

A common approach in developmental psychopathology research involves examining the impact of risk factors and protective influences on problematic behavior. In substance abuse, a variety of risk factors have been identified, including intrapersonal characteristics such as low levels of education...
(Johnston & O’Malley, 1986), non-religiosity (Adlaf & Smart, 1985), impulsivity (Hartzler & Fromme, 2003; McCarthy, Kroll, & Smith, 2001; Moeller & Dougherty, 2002), emotional distress (Felix-Ortiz & Newcomb, 1999), drug accepting attitudes and cognitions (Cloninger, Sigvardsson, & Bohman, 1988), physiological and genetic predispositions (Schuckit, 1994), and the presence of comorbid psychopathology (Kilpatrick et al., 2000). In addition, numerous interpersonal risk factors have been identified, including presence of substance-using family members and peers (Sussman, Dent, & Stacy, 1999), exposure to popular media (Casswell, Gilmore, Silva, & Brasch, 1988), and various forms of physical and sexual abuse (Cohen, Brown, & Smailes, 2001). Thus, a wide range of influences across numerous domains may contribute to the development of substance abuse.

In general, risk factors for substance abuse have been studied independently, with little attention given to identification of a common underlying vulnerability factor that may connect them. Having an integrated model in which risk factors are linked together by a common mechanism would help to: (a) explain how some seemingly unrelated risk factors produce similar substance use outcomes; (b) promote a parsimonious explanation of substance abuse risk applicable to a wide range of circumstances; (c) organize the already diverse vulnerability literature; (d) guide future research; and (e) provide a practical intervention target.

This paper focuses on drug use outcome expectancies, which are beliefs regarding the anticipated consequences of substance use, as a common vulnerability factor for substance abuse. We use the interactional–transformational (IT) model of developmental psychopathology to integrate research identifying the etiological role of drug expectancies in the development of substance abuse (Lewis, 2000). Because the IT model stresses the importance of risk factors that mediate and moderate the effects of other vulnerabilities on maladaptive behavior, it provides a suitable framework by which expectancies can be identified as significant etiological influences in the development and progression of substance abuse. The current paper is organized into four sections. The first section presents general findings uncovered by the risk-outcome model, the research paradigm in which vulnerability is typically studied. In addition, approaches to developmental psychopathology are evaluated and their applications to behavioral problems are considered. In the second section, the drug expectancy construct and the developmental process of expectancy formation are reviewed. This section examines how expectancies are thought to affect behavior and the methods that influence the mental construction of drug expectancies. The third section presents findings that support an IT model of substance abuse development in which drug expectancies mediate or moderate the impact of other risk factors. While most of this literature examines developmental pathways in alcohol abuse, similar processes presumably underlie vulnerability to other substances. The paper concludes by proposing a specific model upon which IT concepts might be evaluated in clinical practice and research. Despite limitations, this new approach offers significant advantages over existing risk-outcome paradigms.

2. Risk factors and their impact on the development of substance abuse

2.1. Risk factors identified using the risk-outcome approach

2.1.1. Family and social variables

The prediction of substance abuse based on family history has been a robust finding (Compton, Cottler, Ridenour, Ben-Abdallah, & Spitznagel, 2002). Familial substance abuse can affect vulnerability
in multiple ways. Physiological systems that modulate the pleasurable and aversive effects of drug exposure may be transmitted genetically (McCarthy, Wall, Brown, & Carr, 2000; Uhl, Blum, Noble, & Smith, 1993). Drug using family members may have positive attitudes regarding use, conferring additional risk to offspring (Brown, Tate, Vik, Haas, & Aarons, 1999). Peer drug use may also increase risk of substance abuse through social modeling influences (Zogg, Ma, Dent, & Stacy, 2004) and by increasing the opportunity to obtain and consume drugs (Sussman et al., 1999; Voelkl & Frone, 2000).

2.1.2. Personality traits and behavioral tendencies

Substance abuse vulnerability can also arise from a variety of intrapersonal factors, such as personality traits or behavioral tendencies. For example, drug use is associated with academic problems, such as delinquency, school failure, and negative attitudes about school, suggesting that struggling adolescents may engage in drug-seeking behavior as a means of escape (Voelkl & Frone, 2000). Personality traits leaving individuals vulnerable to substance use have been described under the constructs of impulsivity (Moeller & Dougherty, 2002), disinhibition (Patterson & Newman, 1993), sensation-seeking (Kalichman, Tannenbaum, & Nachimson, 1998), type II (Cloninger, 1987), and lack of future time perspective (Zimbardo & Boyd, 1999). Individuals with these traits typically show a tendency to focus on rewards, learn less from punishment, and continue active responding in search of reward even when passive avoidance of punishment is adaptive. This active, reward-seeking response style combined with failure to learn from punishment might maintain drug-taking behavior in spite of negative consequences. Some hypothesize that these traits are supported by and exert their influence on behavior through a specific physiological motivational system (Gray, 1991).

2.1.3. Social and emotional functioning

Social and environmental factors in the form of maltreatment and victimization may lead to substance abuse by modulating intrapersonal characteristics that are associated with vulnerability (Cohen et al., 2001; Sussman et al., 1999). For example, maltreatment may lead to elevation of stress, depression, and anxiety, which are proximal antecedents of drug use (Cooper, Russell, Skinner, Frone, & Mudar, 1992; Kidorf & Lang, 1999). Victimization and feelings of insecurity may increase substance use as a way of coping (Sussman et al., 1999), especially in individuals who lack an adequate and mature set of psychological coping skills. Adolescents with inadequate social support and social skills may be at risk for substance abuse (Spooner, 1999; Van Hasselt, Null, Kempton, & Bukstein, 1993). Spooner (1999) hypothesizes that poor social functioning escalates risk because individuals who lack social skills tend to be rejected by prosocial peers and associate with antisocial drug-using peers.

2.1.4. Distal factors

While emotional factors may acutely impact substance use patterns, distal factors have more of a delayed and chronic impact on drug-taking behavior. A recent cross-national study demonstrated that being male, non-married, of a low socioeconomic status (SES), and living in an urban setting were associated with drug dependence (Furr-Holden & Anthony, 2003). This may be because these individuals are less likely to stay in high school (Crum, Ensminger, Ro, & McCord, 1998) or attend college (Johnston, O’Malley, & Bachman, 1987) and more likely to affiliate with delinquent peers (Moss, Lynch, & Hardie, 2003). Other sociological variables, such as cultural norms (Moore, 1994) and occupational status have been identified as possible risk factors for future substance use (Frank, Jacobson, & Tuer, 1990). These distal factors have been argued to effect daily substance use patterns
indirectly or conditionally through other characteristics (Johnstone, 1994). More empirical research is needed to isolate mechanisms of distal risk transmission.

2.1.5. Current substance use

Current drug use is a vulnerability factor for future substance abuse. Alcohol and cigarette use are known to be significant risk factors for the initiation of illicit drug use (Bailey, 1992; Yu & Williford, 1992). More recently, use of alcohol, hallucinogens, or cocaine has been associated with current stimulant use (Sussman et al., 1999). These findings support the notion that alcohol and cigarettes serve as a risk factor for alcoholism and a “gateway” to illicit drugs. This phenomenon has been explained as a manifestation of a problematic externalizing behavior in which all maladaptive behaviors, including substance use, increase over time. However, this account is primarily descriptive, leaving the psychological mechanisms underlying this process is unclear.

Overall, a variety of risk factors increases the chances of developing substance use problems. Risk-outcome investigations identify what, but not how, risk impacts drug-taking behavior. In order to better understand the mechanisms underlying the risk-outcome relationship, models of developmental psychopathology have been used to identify more specific causal pathways through which risk impacts drug use (Lewis, 2000).

2.2. An interactional–transformational model of developmental psychopathology

Developmental psychopathology is defined as the study of maladaptive behaviors and processes across time (Lewis, 2000). Lewis (2000) proposes three broad models of developmental psychopathology. The trait model hypothesizes that stable individual characteristics result in the expression of certain behaviors while environment has little impact on behavior. Traits are seen as stable tendencies that continually impact psychopathological risk throughout development by increasing vulnerability or serving as protective factors. For example, neuroticism is considered to be an important risk factor for the development of anxiety disorders (Chorpita & Barlow, 1998). While this approach is appealing because of its simplicity, it does not account for changes in behavior across time and situations. In contrast, the environmental model proposes that behavior results from environmental contingencies and individuals are relatively passive in these transactions. Environmental models account for data showing that maltreated children develop more psychopathology than non-maltreated individuals (Cohen et al., 2001), however they do not explain instances in which environmental contingencies fail to change behavior as predicted. For example, it has been demonstrated that certain resilient individuals develop little or no psychopathology despite experiences of significant adversity (Luthar, Cicchetti, & Becker, 2000). Despite shortcomings of both, trait-based and environmental models have been attractive to researchers because they fit the traditional risk-outcome paradigm. In contrast, the interactional–transformational (IT) model takes into account both the inconsistency and stability of behavior across and within contexts and lends itself to a different research approach.

The IT model proposes that psychopathology is caused by an interaction of multiple influences (Ladd & Burgess, 2001). Interactive processes are believed to underlie diathesis–stress models of emotional disorders, in which the presence of vulnerability factors, such as depressive attributional-style, is believed to produce the onset of affective distress only in the presence of stressful life events (Conley, Haines, Hilt, & Metalsky, 2001). The notion of transformation refers to changes in environmental or intrapersonal risk factors as a result of previous conditions. Hence, one risk factor can transform another,
which in turn modifies one’s vulnerability to developing psychopathology. For example, recent evidence indicates that childhood maltreatment damages emotion regulation abilities, causing increased risk of anxiety and depression (Maughan & Cicchetti, 2002). IT models build on traditional risk-outcome approaches by providing causal explanation of the mechanisms through which (mediation) and the conditions under which (moderation) the risk-outcome relationship holds. The IT approach of developmental psychopathology lends itself to two specific research paradigms: (1) moderational models, in which the relation between risks and behavior problems is amplified or reduced by other factors; and (2) mediational models, in which risk factors transform other vulnerabilities that cause psychopathology.

Recent efforts in developmental psychopathology research have employed IT models to better understand the mechanisms underlying the development of behavioral problems (see Margolin and Gordis, 2000 for a review of mediators and moderators of the behavioral consequences of interpersonal violence). A growing literature indicates that drug expectancies are important vulnerability factors that both mediate and moderate the effect of other risks on the development of substance abuse. Before evidence for specific expectancy-based IT pathways is reviewed, the drug expectancy construct is examined.

3. Drug expectancies and their association with substance abuse

3.1. The expectancy construct

Based on social learning perspectives, outcome expectancy theory proposes that people engage in certain behaviors based on their beliefs of the behavior’s specific reinforcing effects (Bandura, 1977). In applying expectancy theory to substance use, it is assumed that drug-taking behavior is motivated by the desire to attain particular outcomes associated with drug consumption. Typically, drug expectancies have been dichotomized into positive and negative forms. Positive expectancies (e.g., “I expect to feel a sense of excitement and pleasure if I use cocaine”) are thought to motivate increases in drug-taking behavior, whereas negative expectancies (e.g., “I expect to feel lousy the day after drinking”) represent motivation to restrict substance use (Oei & Morawska, 2004). The major component of expectancy theories of substance abuse is that variation in the valence and strength of expectancies explains individual differences in substance use patterns and intra-person variation in drug use across contexts. Information-processing approaches view drug expectancies as informational structures in long-term memory (Goldman & Darkes, 2004). Within this framework, the content of these expectancies is thought to be less important than their accessibility (i.e., likelihood to be activated from memory) in drug-using situations (McCusker, 2001; Rather & Goldman, 1994).

Although there is some research on the content of marijuana and stimulant expectancies (e.g., Aarons, Brown, Stice, & Coe, 2001), most of the research to date has focused on the specific components of alcohol expectancies (see Jones, Corbin, & Fromme, 2001 for a review). Common positive expectations of drinking outcomes include social assertion, enhanced cognitive and motor functioning, sexual arousal, reduction of negative affect and distress, and physical and social pleasure (Jones et al., 2001). Negative alcohol expectancies involve perceptions that drinking causes sickness, sadness, dizziness, sleepiness, and dangerous behavior (Rather & Goldman, 1994). The most prominently used measure of alcohol expectancies is the Alcohol Expectancy Questionnaire (AEQ: Brown, Christiansen, & Goldman, 1987).
The AEQ focuses on positive expectancies and has six subscales related to enhancement of global positive outcomes, social and physical pleasure, sexual experience, power and aggression, social assertiveness, and relaxation. Early research by Brown and colleagues (Brown, 1985a,b; Brown, Goldman, Inn, & Anderson, 1980) indicated that specific expectancy scales were related to different substance use patterns. They found that light drinking was associated with global positive expectancies, while heavy drinking patterns were related to expectations of tension reduction, aggression, enhanced sex and social pleasure. Abusive drinking patterns were more likely to be related to global positive expectancies and social assertion expectancies. More recent investigations have failed to support psychometrically distinct scales of the AEQ, suggesting that it is most useful to think of this instrument as measuring a general belief about alcohol's desirable effects (Leigh, 1987, 1989a, b). Items measuring expectations of negative outcomes also appear to converge upon a common construct (Leigh & Stacy, 1993). While some research suggests that the expectancy subscales have demonstrated poor discriminant validity (Leigh, 1987, 1989a, b), unidimensional expectancy measures robustly predict substance use patterns, although positive expectancies are typically a more powerful motivator of substance use than negative expectancies (Jones et al., 2001; Leigh & Stacy, 1993).

3.2. Developmental trajectory of expectancy formation

Research from several studies indicates that drug expectancies change along with developmental maturation (Dunn & Goldman, 1998; Smith, Goldman, Greenbaum, & Christiansen, 1995). Exposure to substance-using models in peers, family members, and the media is likely to facilitate construction of drug expectancies even before use is first initiated (Brown, Creamer, & Stetson, 1987; Casswell et al., 1988). This information tends to become stronger, more developed in long-term memory, and more positive in valence as one initiates and maintains use (Dunn & Goldman, 1998; Sher, Wood, Wood, & Raskin, 1996; Smith et al., 1995). Several studies have shown that as adolescents become older and begin drinking, the positive effects of alcohol become more salient (Dunn & Goldman, 1998; Zogg et al., 2004). In contrast, thoughts about cocaine tend to become more negative with increased age (Bridges et al., 2003). However, research of the developmental trajectories of expected outcomes of stimulant, hallucinogen, and opioid use requires further clarification. On the whole, important changes in the cognitive organization of drug expectancies occur throughout development.

To summarize, drug expectancies are cognitive representations that can be conceptualized in terms of their effects on behavior or as distinct memory structures that influence decisions to consume drugs through memory activation. Expectancies are formed through direct experience with substance use or through social processes. Furthermore, drug expectancies change throughout development, which indicates that environmental and intrapersonal experiences can transform expectancies. These findings raise further questions: How does this process impact the development of substance use problems and how do expectancies enhance the impact of other risk factors on drug use outcomes?

4. The role of expectancies in substance abuse risk

IT models of developmental psychopathology point to two possible research designs. The first involves examining whether expectancy variables directly or indirectly mediate the relation between...
risk and drug use. This method tests the hypothesis that a vulnerability factor transforms expectancies, which in turn impacts drug-taking behavior, indicating the mechanisms through which risk factors influence behavior (see Fig. 1, point A). Partial mediation may also be present, in which a risk factor modifies drug-taking behavior both directly and through expectancies (see Fig. 1, point B). The second paradigm explores whether expectancy variables moderate the effect of risk on drug use. This model tests the hypothesis that a risk factor affects drug-taking behavior with greater or lesser effect depending on one’s expectancies, demonstrating mechanisms under which risk factors influence behavior (see Fig. 1, point C). As shown in Table 1, findings in the existing literature document the mediational and moderational function of expectancies across numerous domains of risk. We summarize several pertinent examples of IT pathways demonstrated in the literature to illustrate how expectancies operate in substance abuse risk.

4.1. Family and social variables

The interaction of positive expectancies and familial history of alcoholism have been shown to predict problem drinking symptoms (Conway, Swendsen, & Merikangas, 2003; Ohannessian, Hesselbrock, Tennen, & Affleck, 1994), suggesting several pathways by which family history influences drug use. Individuals with substance abusing parents may see a greater opportunity to take drugs, which would promote drug-seeking behavior in those who believe that substance use produces desired outcomes.

A. Full Mediational Pathway

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Maladaptive Expectancies</th>
<th>Substance Use</th>
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B. Partial Mediational Pathway

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<tr>
<th>Maladaptive Expectancies</th>
<th>Risk Factor</th>
<th>Substance Use</th>
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C. Moderational Pathway

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<th>Maladaptive Expectancies</th>
<th>Risk Factor</th>
<th>Substance Use</th>
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Fig. 1. Mediational and moderational pathways in expectancy-based interactional–transformational models of substance use development.
These children may also have family members with accepting attitudes about substance use, making them more likely to act on their expectancies. In addition to exerting a moderating effect, drug expectancies may also mediate the relationship between family and social factors and substance use. Family and peer attitudes about drinking (Ouellette, Gerrard, Gibbons, & Reis-Bergan, 1999; Wood, Read, Palfai, & Stevenson, 2001), the perception that one’s friends use drugs (Hine, McKenzie-Richer, Lewko, Tilleczek, & Perreault, 2002; Wood et al., 2001), perceived pressure from peers to use substances (Wood et al., 2001), and normative beliefs about substance use (Fearnow-Kenny, Wyrick, Hansen, Dyreg, & Beau, 2001) may alter drug expectancies and subsequent drug use patterns. Family and peers may promote religiosity, which has been shown to reduce substance use though promoting negative expectancies (Galen & Rogers, 2004). Taken together, findings from these studies suggest that social influences, such as familial substance abuse, may enhance the development of drug expectancies, which in turn impact drug-taking behavior.

In combination with many social modeling influences, heritability is a major component of family history risk (Merikangas, 2002). To the extent that offspring of substance abusers inherit nervous systems that enhance the pleasurable effects and diminish the aversive consequences of drug intoxication, as some research suggests (Uhl et al., 1993), this, in turn, may promote positive expectancies and motivate substance use. Alternatively, individuals can inherit biological characteristics that lower the risk for drug use (Wall, Thomasson, Schuckit, & Ehlers, 1992). McCarthy et al. (2000) found that women who experience facial flushing, tachycardia, hypotension, nausea, and vomiting in response to moderate alcohol drinking were less likely to expect tension reduction, enhanced sexuality, and general positive outcomes from drinking, which further predicted lower levels of alcohol consumption. They also demonstrated that these women were less likely to act on positive alcohol expectancies than women with typical responses to alcohol. On the whole, results from several investigations indicate that expectancies interact with or mediate the impact of risk due to biological and social components of a family history of substance abuse.

4.2. Personality traits and behavioral tendencies

Models identifying the importance of impulsive personality traits in the development and maintenance of drug problems (Cloninger, 1987; Moeller & Dougherty, 2002; Patterson & Newman, 1993) have recently been extended to include the mediational and moderational role of expectancies (McCarthy et al., 2000; Sher, Walitzer, Wood, & Brent, 1991). For example, the acquired preparedness model proposes that impulsivity promotes the development of positive expectancies and inhibits generation of negative expectancies, resulting in a greater likelihood of substance abuse. Several studies have supported this mediational model in predicting marijuana use (Vangsness, Bry, & LaBouvie, 2005), cocaine use (Stacy, Newcomb, & Bentler, 1995), and alcohol use in college student (McCarthy et al., 2000) and adolescent populations (Barnow et al., 2004). In a similar vein, Powell, Bradley, & Gray (1992) showed that the association between impulsivity and cue-elicited craving in treatment-seeking opiate abusers was mediated by positive opiate expectancies. Kalichman et al. (1998) examined the influence of sensation seeking traits on pre-sex substance use in gay and bisexual men and showed that this relation was partially mediated by expectations that drug and alcohol use enhances sexual outcomes. There is also evidence for a moderational pathway involving impulsivity and expectancies in which disinhibited individuals are at greater risk of substance abuse if they hold more positive expectancies (McCarthy et al., 2000).
<table>
<thead>
<tr>
<th>Substance(s)</th>
<th>Risk/protective factor</th>
<th>Expectancy variable</th>
<th>Mediation?</th>
<th>Moderation?</th>
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<tbody>
<tr>
<td><strong>Family and social variables (sample)</strong></td>
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<tr>
<td>Ouellette et al. (1999) (adolescents)</td>
<td>Alcohol</td>
<td>Parental and peer drinking</td>
<td>General positive expectancies</td>
<td>+</td>
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<tr>
<td>Conway et al. (2003) (adults)</td>
<td>Alcohol</td>
<td>Family history of alcoholism</td>
<td>Global positive changes</td>
<td>+</td>
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<tr>
<td>Simons-Morton (2004) (sixth grade students)</td>
<td>Alcohol</td>
<td>Parental attitudes about substance use and disruptive behavior</td>
<td>General expectancies</td>
<td>NR</td>
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<tr>
<td>McCarthy et al. (2000) (Asian American female college students)</td>
<td>Alcohol</td>
<td>Genetically transmitted sensitivity to alcohol</td>
<td>General positive expectancies</td>
<td>+</td>
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<tr>
<td>Voelkl and Frone (2000) (high school students)</td>
<td>Alcohol and marijuana</td>
<td>Ease of use</td>
<td>Enhanced performance</td>
<td>NR</td>
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<tr>
<td>Hine et al. (2002) (adolescents)</td>
<td>Tobacco</td>
<td>Peer tobacco use</td>
<td>General expectancies</td>
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<td>Negative affect control</td>
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<td>Social costs</td>
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<td>Weight control</td>
<td>−</td>
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<tr>
<td>Trudeau et al. (2003)</td>
<td>Alcohol, tobacco, and marijuana</td>
<td>Assertiveness</td>
<td>General negative expectancies</td>
<td>+</td>
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<td></td>
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<td>Decision making skills</td>
<td>General negative expectancies</td>
<td>+</td>
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<td><strong>Personality traits and behavior tendencies (sample)</strong></td>
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<tr>
<td>McCarthy et al. (2001) (male undergraduates)</td>
<td>Alcohol</td>
<td>Disinhibition</td>
<td>General positive expectancies</td>
<td>−</td>
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<tr>
<td>Katz et al. (2000) (college students)</td>
<td>Illicit drugs</td>
<td>Sensation seeking</td>
<td>General beneficial outcomes</td>
<td>NR</td>
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<td>Low social conformity</td>
<td>General risky outcomes</td>
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<td>Alcohol</td>
<td>Sensation seeking</td>
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<td>Low social conformity</td>
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<tr>
<td>Trudeau et al. (2003) (young adolescents)</td>
<td>Alcohol, tobacco, and marijuana</td>
<td>Assertiveness</td>
<td>General negative expectancies</td>
<td>+</td>
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<tr>
<td>Study and Population</td>
<td>Substance</td>
<td>Risk Factor</td>
<td>Outcome</td>
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<td>Copeland and Carney (2003) (undergraduate women)</td>
<td>Tobacco</td>
<td>Poor dietary restraint</td>
<td>Appetite and weight control</td>
<td>+</td>
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<tr>
<td>Kalichman et al. (1998) (gay and bisexual male adults)</td>
<td>All substances</td>
<td>Sensation seeking</td>
<td>Enhanced sexual outcomes</td>
<td>+</td>
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<td>Stacy et al. (1995) (community volunteers)</td>
<td>Cocaine</td>
<td>Boredom susceptibility</td>
<td>General positive expectancies</td>
<td>+</td>
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<tr>
<td>Social/emotional functioning (sample)</td>
<td>Griffin et al. (2001) (adolescents)</td>
<td>Alcohol and tobacco</td>
<td>Social competence</td>
<td>+</td>
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<tr>
<td>Mooney and Corcoran (1989) (rural female undergraduates)</td>
<td>Alcohol</td>
<td>Low assertiveness</td>
<td>Global positive outcomes</td>
<td>NR</td>
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<td>Enhanced sexuality</td>
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<td>Social and physical pleasure</td>
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<td>Enhanced social assertiveness</td>
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<td>Relaxation and tension reduction</td>
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<td>Increased arousal and aggression</td>
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<td>General positive outcomes</td>
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<td>Mooney and Corcoran (1989) (rural male undergraduates)</td>
<td>Alcohol</td>
<td>Low assertiveness</td>
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<td>General positive expectancies</td>
<td>+</td>
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<tr>
<td>Stacy et al. (1995) (community volunteers)</td>
<td>Cocaine</td>
<td>Depression</td>
<td>General positive expectancies</td>
<td>+</td>
</tr>
<tr>
<td>Other risk factors (sample)</td>
<td>Tapert et al. (2003) (substance use disordered adolescents)</td>
<td>Alcohol</td>
<td>Language skills</td>
<td>+</td>
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<td></td>
<td>Levy and Earleywine (2003) (college students)</td>
<td>Alcohol</td>
<td>Poor studying attitudes</td>
<td>+</td>
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<td></td>
<td>McCarthy et al. (2002) (treated young adults)</td>
<td>Alcohol</td>
<td>Educational attainment</td>
<td>+</td>
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<td>Hine et al. (2002) (adolescents)</td>
<td>Tobacco</td>
<td>Current tobacco use</td>
<td>General expectancies</td>
</tr>
<tr>
<td></td>
<td>Stacy et al. (1995) (community volunteers)</td>
<td>Cocaine</td>
<td>Polydrug use</td>
<td>General positive expectancies</td>
</tr>
</tbody>
</table>

+ Denotes evidence of an effect. – Denotes evidence of no effect. NR denotes that effect was not reported. If not otherwise stated, IT pathways involve the transmission of risk in which positive relationships between risk factors and substance use are amplified or positively mediated by expectancy variables.

The current table provides a general overview of mediational and moderational effects of expectancies on substance use risk. Only relevant findings are included. For more detailed understanding, reader should consult original papers.

* Denotes IT pathways involving protective factors in which positive relationships between protective factors and decreased substance use are amplified or positively mediated by expectancy variables.
4.3. Social and emotional functioning

Cooper and colleagues found that individuals experiencing stressors or negative affect were more likely to drink if they reported positive alcohol expectancies about mood regulation (Cooper, Frone, Russell, & Mudar, 1995; Cooper et al., 1992). Other investigators examining the relation between particular types of expectancies and specific areas of social and emotional functioning report that men with social anxiety drink more during a socially stressful period if they expect alcohol to increase their assertiveness (Kidolf & Lang, 1999). For example, Mooney and Corcora (1989) found that for less assertive college students, the expectation that alcohol would facilitate social assertion predicted drinking behavior; however, for high assertive students, drinking patterns were not predicted by the expectation of enhanced social assertion. Trudeau et al. (2003) found that assertive students were more likely to develop negative cigarette, alcohol, and marijuana expectancies, which prevented substance use initiation. In addition, they reported that students with good decision-making skills tended to develop stronger negative expectancies, and were less likely to start using substances. Thus, children with these skills may be better able to see the negative long-term effects associated with substance use than those lacking decision-making capabilities. Taken together, these findings indicate that specific social and emotional vulnerabilities may interact with particular expectancies to influence drug-taking behavior.

4.4. Other distal factors

Evidence suggests that individuals with above average language abilities are more prone to alcohol involvement and alcohol dependence symptoms if they hold positive alcohol expectancies (Tapert, McCarthy, Aarons, Schweinsburg, & Brown, 2003). Theoretically, these individuals have the capacity to engage in higher-level cognitive processes, which may enhance their ability to foresee future positive outcomes of alcohol use. McCarthy and colleagues demonstrated that the effect of educational achievement on drinking behavior was partially mediated by the expectations that drinking causes global positive outcomes (McCarthy, Aarons, & Brown, 2002). However, more specific studies are necessary to replicate these findings and investigate the theoretical mechanisms behind such pathways.

4.5. Current use

A large base of findings indicates that present substance use causes future use through the enhancement of positive expectancies (Hine et al., 2002; Sher et al., 1996; Smith et al., 1995; Willner, 2001). For example, alcohol use may serve as a “gateway” to illicit drug use through the formation of positive drug expectancies, although this hypothesis has not been tested longitudinally (Willner, 2001). Longitudinal studies have used structural equation modeling techniques to demonstrate reciprocal relationships between expectancy formation and alcohol use in novice drinkers (Sher et al., 1996; Smith et al., 1995; Willner, 2001). In adolescents and undergraduates, the reciprocal relationship appears to be a positive feedback loop between positive expectancies and use (Sher et al., 1996; Smith et al., 1995). However, a 9-year prospective study of individuals who aged from 18 years at time one to 27 years at time two found no evidence of a prospective effect of drug use on expectancies (Stacy, Newcomb, & Bentler, 1991). Divergence in outcomes across different aged samples may indicate that the effect of use on expectancy formation varies as a function of developmental stage (Sher et al., 1996).
The expectancy-based IT pathways reviewed in this paper demonstrate that a variety of risk factors operate in a similar fashion, either by being mediated or moderated by the presence of drug use outcome expectancies. In some cases, the effect of a single vulnerability factor on substance use can be both mediated and moderated by expectancies (McCarthy, Brown, Carr, & Wall, 2001; McCarthy et al., 2001). This suggests that the mediational and moderational developmental processes may be linked, combining to play a major role in substance abuse risk. The following section explores the joint influence of mediational and moderational processes.

5. An expectancy-based IT model of substance abuse risk

5.1. A two-process framework

Cognitive-developmental theories of anxiety and depression propose that the structural relation between risk, cognitive, and clinical variables differs as a function of developmental stage (Chorpita & Barlow, 1998; Cole & Turner, 1993). In early childhood, risk factors may lead to the construction of maladaptive cognition, which mediates the impact of risk on emotional expression. The moderational effects of cognition on risk-outcome relations are believed to operate during later stages of development (e.g., the effect of risk on emotional functioning is amplified by the presence of cognitive vulnerability). That is, the presence of early risk may promote a maladaptive cognitive framework (i.e., mediational pathway). Later in adolescence and adulthood, cognitive vulnerability may begin to operate as an amplifier for risk factors (i.e., moderational pathway).

The normative path of cognitive–psychological development supports this dual process approach to developmental psychopathology. In typical development, symbol formation develops at the end of infancy (Piaget, 1962; Vygotsky, 1978), the emergence of logical or scientific thought occurs during middle childhood (Inhelder & Piaget, 1969; Vygotsky, 1986), and the construction of a conception of self is a slow process that develops from infancy through adolescence (Stipek, Recchia, & McClintic, 1992). These developmental milestones mark changes in the overall capacity for abstract thought and suggest that children do not have the capability to construct stable abstract cognitions (like those that would promote psychopathology) until later stages of development. Therefore, risk factors may not be able to interact with cognitive factors to produce psychopathology at earlier ages because risk-enhancing cognitions are not readily accessible. However, in later stages of development when risk-enhancing cognitions become more solidified, they can become activated in the presence of other risk factors to enhance vulnerability to psychopathology.

There is also empirical support for a two-process model. In two studies, Cole and Turner comparatively evaluated moderational and mediational models of depression in a sample of children and adolescents (Cole & Turner, 1993; Turner & Cole, 1994). They found support for a mediational model in which a non-cognitive risk factor (i.e., unpleasant events) influenced a cognitive risk factor (i.e., negative attributional style), which in turn predicted depression. Under the dual process framework, they also hypothesized that a moderational model would operate only in the older adolescents and would not be observable in the younger children. Their hypothesis was supported by evidence of an Age × Event × Cognition interaction.

The notion that differential pathways exist across developmental levels can be applied to explain the development of substance abuse. Although research has not typically examined whether the statistical association (i.e., moderation vs. mediation) between expectancies and risk-outcome pathways differ as a
function of developmental stage, this may be the case. We integrate these ideas into a two-process conceptual model of expectancy-implicated pathways to substance abuse (see Fig. 2).

The model proposes a preliminary process in which risk factors foster the construction of expectancies in early stages of development before drug use begins, a time sometimes referred to as the “critical period” (Miller, Smith, & Goldman, 1990). Believing that substance use can produce desired outcomes serves as a motivator for initial substance use. As part of this preliminary mediational process, specific substance use experiences provide first hand information leading to the development of stronger expectancies that become stored in memory and further influence drug-taking behavior. Indeed, substance use has been shown to prospectively predict the development of more positive expectancies in younger (Sher et al., 1996; Smith et al., 1995) but not older individuals (Stacy et al., 1991). In a secondary process, established expectancies play a moderational role by setting up cognitive conditions that, in the presence of risk factors, increase substance use. The vulnerability factors originally involved in mediating processes remain present, however their influence on substance use behavior may vary depending on the strength and valence of existing expectancies (McCarthy et al., 2001; McCarthy et al., 2000; Stacy et al., 1991). Moreover, the influence of new vulnerability factors on substance use, which were not involved in the preliminary process, are also enhanced under conditions of frequent activation of strong positive expectancies and infrequent activation of weak negative expectancies.

To illustrate the utility of this model, consider the IT processes that may take place when family history of alcoholism acts as a risk factor for alcohol abuse. An adolescent observes his alcoholic father drinking at parties and after work and begins to form the expectation that alcohol produces pleasure and relieves stress, the first stage of the preliminary (mediational) process. Later, he attends a party where he sees friends enjoying themselves while drinking. Because of his positive expectations, he too decides to drink, starts enjoying himself, and feels less anxious. Consequently, his expectancies are confirmed, becoming stronger and more accessible in memory and his motivation to drink at parties and in other social situations increases. A secondary (moderational) process may later begin to operate that involves

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Fig. 2. A general expectancy-based model of substance use development proposing that the development of substance use problems is driven by two processes. In a preliminary process, the influence of risk factors on drug taking is mediated by maladaptive expectancies. Substance use may help confirm and solidify expectancies in memory. In a secondary moderational process, the impact of risk factors on substance use is amplified by the presence of maladaptive expectancies.
his father’s permissive attitude about high school drinking, a component of the original risk factor of family history of abuse. Under these conditions, this adolescent is likely to act on his expectancies without fear of being punished. However, other adolescents who hold more negative alcohol expectancies may be less likely to take advantage of their parents’ permissive attitudes about adolescent drinking. The present example illustrates how a single risk factor (family history of substance abuse) might operate in preliminary and secondary IT processes. However, in many instances, multiple risk factors may operate individually or collectively, thus the two-process model accounts for a variety of situations and specific vulnerabilities. The model also isolates expectancies as a common etiological component in substance abuse vulnerability, and an appropriate target for intervention.

5.2. Implications for intervention

An expectancy-based IT model of substance abuse vulnerability points to four possible intervention alternatives: preventing the onset of risk, transforming already present risk factors, altering expectancy formation trajectories, and modifying current maladaptive expectancies. The first two alternatives are typically the less efficient means of reducing drug use behavior, especially when risk factors are distal and final (e.g., parental divorce, neighborhood climate, biological predispositions) (Trudeau et al., 2003). However, interventions targeting expectancies have shown some promise (Cruz & Dunn, 2003; Darkes & Goldman, 1993, 1998; Dunn, Lau, & Cruz, 2000; Musher-Eizenman & Kulick, 2003).

Most of the drug expectancy intervention literature has explored the use of brief alcohol expectancy challenges (Cruz & Dunn, 2003; Darkes & Goldman, 1993, 1998; Dunn et al., 2000; Musher-Eizenman & Kulick, 2003). These challenges typically begin by asking participants to consume alcohol or placebo-alcohol beverages, with the drinkers being blind to their condition. The intent is to provide drinkers with a direct experience of the true pharmacological effects of alcohol in contrast to the effects caused by outcome expectancies. Through group discussion, drinkers learn that alcohol is a central nervous system depressant with known pharmacological effects (e.g., sleepiness, nausea, and dizziness), whereas many of the desired behavioral effects are due to expectations more than pharmacology (see Darkes and Goldman, 1993 for a review of their protocol). Expectancy challenges are effective in weakening positive alcohol outcome expectancies and strengthening negative alcohol outcome expectancies in memory (Dunn et al., 2000). It is unknown whether challenges produce lasting effects; however, they have been shown to reduce alcohol intake for up to 6 weeks beyond active treatment (Darkes & Goldman, 1993, 1998; Dunn et al., 2000; Musher-Eizenman & Kulick, 2003). Moreover, decreases in drinking parallel decreases in the strength of positive alcohol outcome expectancies in subjects participating in expectancy challenges (Darkes & Goldman, 1993; Dunn et al., 2000).

Expectancy challenges for children aim to prevent the development of positive expectancies, thereby interrupting the preliminary (mediational) process in substance abuse risk (Cruz & Dunn, 2003). Childhood challenges rely solely on instructional strategies to teach pre-adolescents about the biological effects of alcohol and dispel myths about drinking. Initial findings have demonstrated that this intervention successfully modified 4th graders’ alcohol expectancies (Cruz & Dunn, 2003). Future studies will examine whether these cognitive changes persist throughout adolescence and reduce high-school alcohol consumption.

Beyond alcohol, brief expectancy-based interventions have been shown to cause reductions in drinking, cigarette smoking, and use of other substances, such as marijuana (D’Amico & Fromme, 2000; Marlatt et al., 1998). While single-session prevention programs are efficient at reducing short-term drug-
taking behavior, these positive changes may not be maintained over longer durations (D’Amico & Fromme, 2000). On the other hand, long-term interventions have been quite successful in changing expectancies and preventing substance use (Kivlahan, Marlatt, Fromme, & Coppel, 1990). For example, the Alcohol Skills Training Program involves 8 weekly, 90-min sessions that emphasize relapse prevention skills, include a placebo drinking session in a simulated tavern to identify alcohol outcome expectancies and to challenge inappropriate attributions of pleasurable effects to drug rather than setting, and present information from research on alcohol expectancies. In one study, this program demonstrated a 38.5% reduction in weekly alcohol consumption in comparison to 21.6% for a lecture based alcohol education program and 16% for assessment only (Kivlahan et al., 1990).

5.3. Limitations

Although a promising research area, there are several notable limitations of many expectancy-based IT investigations and the general two-process model. For example, interactional and transformational models of developmental psychopathology have been criticized for being too broad (Lewis, 2000). Within this paradigm, there are literally thousands of combinations of risk factors, mediators, and moderators that can influence the development of psychopathology. Some may argue that the addition of mediators and moderators reduces the parsimony of simpler trait-based or environmental models. Although IT explanations can be more complex than risk factor models, we argue that environmental or trait approaches do not adequately account for the developmental processes that result in substance use and abuse. Unlike IT-models, risk-outcome approaches fail to explain: (1) why people with similar risk factors often do not have the same vulnerability to developing substance abuse; (2) how distal risk factors can impact immediate drug use behaviors; and (3) why so many different classes of risk factors can result in the same developmental outcome of substance abuse. Thus, the IT model’s drawbacks, including complexity and breadth, are outweighed by its capability to adequately account for the various paths to substance abuse. Overall, the IT model, with its focus on a common etiological mechanism, offers an efficient and more focused approach than risk-outcome models.

A major limitation of many expectancy-based IT investigations is the over-reliance on self-report assessment, which can cause a method bias that spuriously inflates effect sizes (Shadish, Cook, & Campbell, 2002). Many have argued that expectancies impact drug-taking behavior both through implicit cognition, which involves automatic processes that occur in the absence of conscious deliberation, and explicit cognitive processes that require deliberate retrieval of information (McCusker, 2001; Roehrich & Goldman, 1995; Weingardt, Stacy, & Leigh, 1996; Wiers, Van Woerden, Smulders, & De Jong, 2002). In fact, recent evidence indicates that both explicit and implicit cognition contribute uniquely to the prediction of substance use behavior (Cox, Hogan, Kristian, & Race, 2002; Waters et al., 2003; Wiers et al., 2002), however relatively few studies have examined implicit expectancies from a developmental perspective. Because little is known about implicit processes and their relation to specific risk factors, future IT studies of substance abuse risk use may wish to employ assessment techniques that measure implicit cognition (e.g., Stacy & Newcomb, 1998).

5.4. Future research

Although there has been increased interest in the investigation of expectancy-based IT pathways, some major gaps in the literature remain. These include examining pathways to “hard drug” abuse (e.g.,
stimulants, opioids, and hallucinogens), identifying the role of developmental stages in substance abuse risk, evaluating trajectories involving protective influences, and extending the IT model. Using the IT framework can help clarify how research on substance abuse risk might proceed and be utilized.

All expectancy-based IT pathways contain three classes of variables: (i) a primary risk/protective variable; (ii) an expectancy variable; and (iii) a drug use outcome variable. However, different developmental trajectories might incorporate variables that tap different constructs within the three classes. As discussed earlier, the primary risk variable could index personality constructs, social and emotional functioning, other distal factors, or could even be a protective factor, such as assertiveness (Trudeau et al., 2003). The expectancy variable could be represented as global positive or negative expectancies or more specific cognitions, such as drug use to enhance sexual performance (Kalichman et al., 1998). The outcome variable could be either initiation of use, duration and frequency of use, severity of abuse or dependence, or comorbid substance use and mental disorder status.

Although the content of variables may vary, the functional relationship among variables in expectancy-based IT pathways does not differ across pathways. That is, regardless of the substance of interest, primary risk/protective factor, type of expectancy, or outcome variable, the IT model proposes that expectancies function to mediate and moderate relationships between primary risk factors and outcomes. Thus, the IT model provides a general framework for investigations of substance abuse risk.

5.4.1. “Hard drugs” and IT models

The bulk of expectancy-based IT model research has examined the impact of expectancies on alcohol, marijuana, and tobacco use development (“non-hard drugs”). Very few studies have looked at drug expectancies in opiate, stimulant, hallucinogen, and other “hard drug” use. The distinction could be critical for several reasons and necessitates further research of expectancy-based IT pathways in hard drug abuse.

First, risk factors for hard drug abuse may be different from those associated with marijuana, tobacco, and alcohol use disorders. Kilpatrick et al. (2000) demonstrated that for a specific risk factor, the degree of substance abuse risk varies depending on the drug. For example, family history of any drug use disorder showed approximately a 2-, 4-, and 8-fold increase in risk for developing alcohol, marijuana, and hard drug use disorders, respectively. This study also demonstrated that certain variables that were associated with increased risk for one substance were not risk factors for other substances. For instance, male adolescents were at greater risk of marijuana and alcohol/dependence than women; however, gender did not associate with hard drug abuse/dependence (Kilpatrick et al., 2000).

Second, the expectancy construct differs between hard drugs and alcohol, marijuana, and tobacco. Although there is modest overlap between hard and non-hard drug expectancies (e.g., both include global positive and negative effects as well as relaxation and tension reduction expectations; Schafer & Brown, 1991), some expected outcomes of hard drug use are unique to the particular substance. The motivational checklist that assesses opiate expectancies contains several items unique to opiate abuse, including relief of physical withdrawal symptoms, pleasure of a “rush,” and fear of criminal conviction (Powell et al., 1992). The Cocaine Effect Expectancy Questionnaire contains items exclusive to cocaine use, such as “I grind my teeth when I’m on cocaine” (Schafer & Brown, 1991).

Third, the relation between outcome expectancies and type of substance use outcome may differ depending on the substance. Schafer and Brown (1991) compared the association between use status and cocaine and marijuana expectancies among college students. They found that a dimension of marijuana
expectancies characterized by global negative effects discriminated primarily between non-users and all use groups (i.e., infrequent, recreational, and regular users). However, a similar dimension of expectancies for cocaine use demonstrated the ability to distinguish between infrequent and regular cocaine users.

The distinction between hard and non-hard drugs has several implications for IT models. Primarily, pathways modeling hard versus non-hard drug use outcomes might incorporate different constructs in their representation of the three classes of variables in expectancy-based IT models. Based on previous findings reviewed above (Schafer & Brown, 1991; Kilpatrick et al., 2000), models examining the development of cocaine abuse might incorporate family history of drug dependence as a primary risk factor, teeth grinding as an expectancy variable, and heaviness of use as an outcome variable. Pathways modeling alcohol use outcomes would be less likely to include these variables and might focus more on family history of alcohol use as a primary risk factor (Conway et al., 2003).

The functional relationship among variables in expectancy-based IT pathways does not differ across substances. Indeed, several studies have identified the mediating role of expectancies in predicting outcomes in cocaine (Stacy et al., 1995) and opiate (Powell et al., 1992) abuse. Therefore, future studies can employ the IT framework to elucidate the developmental processes underlying hard drug abuse but should be aware of the types of constructs pertinent to hard drug abuse risk.

5.4.2. Developmental stages and individual differences in substance use outcomes

Although many investigations have identified both mediational and moderational structural pathways, there is a need to clarify the developmental stages at which each type of pathway is most prevalent. The two-process framework hypothesizes that expectancies mediate the impact of primary risk factors on use outcome during early stages of development and moderate their impact during later development. To investigate this phenomenon, Chorpita and Barlow (1998) suggested that the trend of moderational effects be modeled over time (i.e., the slope of Risk × Expectancy term across developmental stages). This can be examined by looking at a three-way interaction involving risk, expectancies, and age in predicting use outcome. If results are consistent with the two-process hypothesis, the three-way interaction should be the result of a significant moderation of risk by expectancies in older subjects but no such moderation in younger subjects.

IT pathways might result in different types of outcomes in younger and older individuals. A preliminary (mediational) process may drive the initiation of use in youths. The escalation and maintenance of use as well as problems due to drug use may be driven by secondary (moderational) processes among experienced users at later developmental stages. There is some initial evidence in support of this notion. One study demonstrated that initiation of substance use in 12-year-olds was explained by expectancy mediation but not moderation of a protective factor (Trudeau et al., 2003). In a separate study, the moderating effects of expectancies on family history of alcohol abuse/dependence in adults were significant only when predicting problem drinking symptoms but not quantity and frequency of alcohol use (Conway et al., 2003).

5.4.3. Extending the IT model

While the typical expectancy-based IT model solely incorporates three classes of variables, the IT framework can be extended to examine more specific pathways. For instance, the moderational pathway can be expanded in order to differentiate between individuals whose use is explained by moderational processes and those whose use is not explained by such influences. This approach
attempts to identify a three-way interaction between a primary risk/protective factor, expectancies, and a secondary factor in the prediction of substance use outcomes. Cooper et al. (1995) utilized this methodology in demonstrating that the relationship between negative emotions and drinking to cope was greater among those who held strong positive expectancies and that this moderational process was strongest in those who were poor copers (a three-way Negative Emotion × Expectancy × Coping Interaction). Examining three-way interactions such as these might identify those individuals who may benefit the most of interventions targeting both expectancies and a primary risk factor.

Mediational pathways in IT models can also be extended. One approach involves demonstrating that an expectancy-mediated pathway that predicts use, in turn affects a final variable, such as drug-related social consequences. Kalichman et al. (1998) utilized this method in demonstrating that the influence of sensation seeking traits on pre-sex substance use in gay and bisexual men was mediated by sexual enhancement expectancies. They extended this model by showing that pre-sex substance abuse predicted risky sexual behavior. Mediational models can also be clarified through identification of mediators between primary expectancies and outcomes. For example, Trudeau et al. (2003) examined an IT model that identified behavioral willingness to engage in use (i.e., beliefs that one will use if offered drugs) as a mediator of the effect of alcohol expectancies on alcohol consumption.

5.4.4. Protective influences

Drug expectancy research has not focused much on how expectancies act as protective influences, except in a few studies (Levy & Earleywine, 2003, 2004; McCarthy, Brown et al., 2001; Trudeau et al., 2003). Protective factors are thought to have a strong effect on substance abuse outcomes (Chassin, Carle, Nissim-Sabat, & Kumpfer, 2004); however, little is known about the mechanisms in which they exert their influence in relation to expectancies (although see Darkes, Greenbaum, & Goldman, 2004; Galen & Rogers, 2004). Further identification of IT pathways that incorporate primary protective factors may illuminate potential methods for preventative interventions.

5.4.5. Validating and using the IT model

The clinical relevance of IT models is limited by the degree to which directional causality can be inferred from IT studies. This is important because if expectancies are merely a consequence or correlate of addictive behavior rather than causal mediational and moderational factors, they would not be suitable treatment targets.

Correlational mediational pathways are vulnerable to alternative explanations in which: (1) the direction of influence among variables might be incorrectly inferred (e.g., substance use might enhance positive expectancies and/or risk factors); or (2) a fourth (confounding) variable, such as a risk-enhancing personality trait or demographic factor, may independently influence all variables, resulting in their relationships. While prospective correlational studies might avoid the pitfalls of incorrect directionality because of temporal space between assessments of primary, mediational, and outcome variables, they remain vulnerable to confounding variable explanations.

Experimental studies that manipulate expectancies and primary risk/protective factors are capable of demonstrating causality in mediational IT models. To test a specific mediational pathway, two experiments must be conducted: (i) a first experiment involving manipulation of primary risk/protective variable; and (ii) a second experiment involving manipulation of the expectancy variable. The hypothesized mediational pathway is supported if the first experiment demonstrates: (1) significant
effects on expectancy and substance use outcome variables in the predicted direction; and (2) statistical evidence that the effect of the experimental manipulation on substance use was mediated by changes in expectancies. Validation of the pathway also would require that the second experiment demonstrates that the manipulation results in: (1) a significant effect of the substance use outcome variable in the predicted direction; and (2) effects on the primary risk/protective variable that are either non-significant or significantly smaller than the substance use outcome variable effect. It should be noted that mediational pathways involving non-malleable primary risk variables (e.g., family history of substance abuse; demographic characteristics) cannot be tested using this approach.

Associations involving moderation are less vulnerable to plausible alternative explanations (Shadish et al., 2002). Nonetheless, moderational IT models still can benefit from experimental evaluation. The experimental approach examines the effect of an intervention targeting expectancies and attempts to demonstrate a risk factor by treatment interaction in the prediction of substance use outcomes. An expectancy-based moderational IT pathway is supported if: (1) a risk factor by treatment interaction is significant; and (2) the interaction is driven by a greater difference between treatment and control subjects in those that have a primary risk factor (e.g., family history of alcoholism) than those who do not. A similar logic could be applied to protective factor moderational pathways. Examination of risk/protection by treatment interactions can identify those individuals who would benefit most from expectancy challenge interventions (“treatment matching”).

A laudable goal of IT pathways research is the identification of as many specific risk trajectories as possible using methodologies that give the strongest evidence for causal inferences. This literature would aim to isolate trajectories with specific (as opposed to general) risk/protective factors (e.g., social anxiety vs. negative affect), expectancy variables (e.g., drinking to enhance social outcomes vs. general positive outcome expectancies), and substance use outcomes (e.g., alcohol use status vs. severity of alcohol dependence). In addition, extension of IT models to abuse-related consequences could further add to this literature.

Identification of specific pathways can inform treatment approaches. For example, one well-researched IT pathway is the acquired preparedness model (McCarthy, Kroll et al., 2001), which proposes that the effects of an impulsive personality on substance use is mediated and moderated by expectancies. Clinicians making use of this information would be aware that the etiological influence of expectancies is greater in impulsive than non-impulsive patients. Therefore, treatments targeting expectancies would be strongly suited for such individuals, whereas patients low in impulsivity would not benefit as greatly from expectancy modification interventions, although they may still be indicated. Furthermore, clinicians could make use of expectancy mediation. As mentioned in Section 5.2, mediational pathways indicate that clinicians can treat patients with immutable risk factors by targeting the expectancies through which they exert their effects. If pathways with specific trajectories are identified, clinicians can target more specific primary risk factors and expectancy cognitions.

6. Conclusion

There is a growing literature suggesting that drug and alcohol outcome expectancies play a major role in the development of substance abuse. This paper outlines this research and concludes that expectancies are a common mediating or moderating etiological process in the development of drug and alcohol problems. To specify the etiological role of expectancies and other risk factors, a two-process IT model
of substance abuse risk is presented whereby mediating and moderating pathways involving expectancies are proposed to occur at different developmental stages. This model points to expectancy-based targets for prevention and treatment that vary depending on whether preliminary or secondary processes are operating. Although an initial conceptual model is presented, the developmental genesis of substance use problems requires further clarification. Future examinations of IT pathways will likely add to our understanding of the mechanisms underlying substance abuse vulnerability so that more effective interventions can be developed.

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