
Relapse Prevention for Alcohol and Drug Problems

That Was Zen, This Is Tao

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Relapse prevention, based on the cognitive-behavioral model of relapse, has become an adjunct to the treatment of numerous psychological problems, including (but not limited to) substance abuse, depression, sexual offending, and schizophrenia. This article provides an overview of the efficacy and effectiveness of relapse prevention in the treatment of addictive disorders, an update on recent empirical support for the elements of the cognitive-behavioral model of relapse, and a review of the criticisms of relapse prevention. In response to the criticisms, a reconceptualized cognitive-behavioral model of relapse that focuses on the dynamic interactions between multiple risk factors and situational determinants is proposed. Empirical support for this reconceptualization of relapse, the future of relapse prevention, and the limitations of the new model are discussed.

Relapse prevention (RP) is a cognitive-behavioral approach with the goal of identifying and preventing high-risk situations for relapse. In this article we summarize the major tenets of RP and the cognitive-behavioral model of relapse, including recent empirical support for hypothesized determinants of relapse. We also provide a brief discussion of meta-analyses and reviews of controlled trials incorporating RP techniques. Finally, we describe a reconceptualization of the relapse process and propose future directions for clinical applications and research initiatives.

Relapse: That Was Then

In 1986, Brownell and colleagues (Brownell, Marlatt, Lichtenstein, & Wilson) published an extensive, seminal review on the problem of relapse in addictive behaviors. Relapse has been described as both an outcome—the dichotomous view that the person is either ill or well—and a process, encompassing any transgression in the process of behavior change. Essentially, when individuals attempt to change a problematic behavior, an initial setback (lapse) is highly probable. One possible outcome, following the initial setback, is a return to the previous problematic behavior pattern (relapse). Another possible outcome is the individual's getting back on track in the direction of positive change (prolapse). Regardless of how relapse is defined, a general reading of case studies and research literature demonstrates that most individuals who attempt to change their behavior in a certain direction (e.g., lose weight, reduce

hypertension, stop smoking, etc.) will experience lapses that often lead to relapse (Polivy & Herman, 2002).

Twenty-five years ago, Marlatt (1978) obtained qualitative information from 70 male alcoholics regarding the primary situations that led them to initiate drinking during the first 90 days following inpatient treatment. On the basis of their responses, Marlatt (1985) proposed a cognitive-behavioral model of the relapse process, shown in Figure 1, which centers on the high-risk situation and the individual's response in that situation. If the individual lacks an effective coping response and/or confidence to deal with the situation (low self-efficacy; Bandura, 1977), the tendency is to give in to temptation. The decision to use or not use is then mediated by the individual's outcome expectancies for the initial effects of using the substance (Jones, Corbin, & Fromme, 2001). Individuals who decide to use the substance may be vulnerable to the "abstinence violation effect," which is the self-blame and loss of perceived control that individuals often experience after the violation of self-imposed rules (Curry, Marlatt, & Gordon, 1987).

Relapse Prevention

The cognitive-behavioral model forms the basis for RP, an intervention designed to prevent and manage relapse in individuals who have received, or are receiving, treatment for addictive behavior problems (Carroll, 1996). Treatment approaches based on RP begin with the assessment of potentially high-risk situations for relapse. A high-risk situation is defined as a circumstance in which an individual's attempt to refrain from a particular behavior (ranging from any use of a substance to heavy or harmful use) is threat-

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The phrase "That was Zen, this is Tao" is attributed to Peter da Silva. *Zen* has been defined as the art of seeing into the nature of one's own being, whereas *Tao* (according to the *Oxford English Dictionary Online*, 2004) is defined as "the way to be followed, the right conduct, doctrine or method."

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ened. The circumstances that are high-risk, people (e.g., drug dealers), places (e.g., favorite bars), and events (e.g., parties) often vary from person to person and within each individual. Challenging an individual's expectations for the perceived positive effects of a substance and discussing the psychological components of substance use (e.g., placebo effects) help the client make more informed choices in threatening situations. Likewise, discussing the abstinence violation effect and preparing clients for lapses may help prevent a major relapse.

High-risk situations often arise without warning (R. C. Hawkins & Hawkins, 1998). Marlatt and Gordon (1985, p. 49) described the problem of "apparently irrelevant deci-

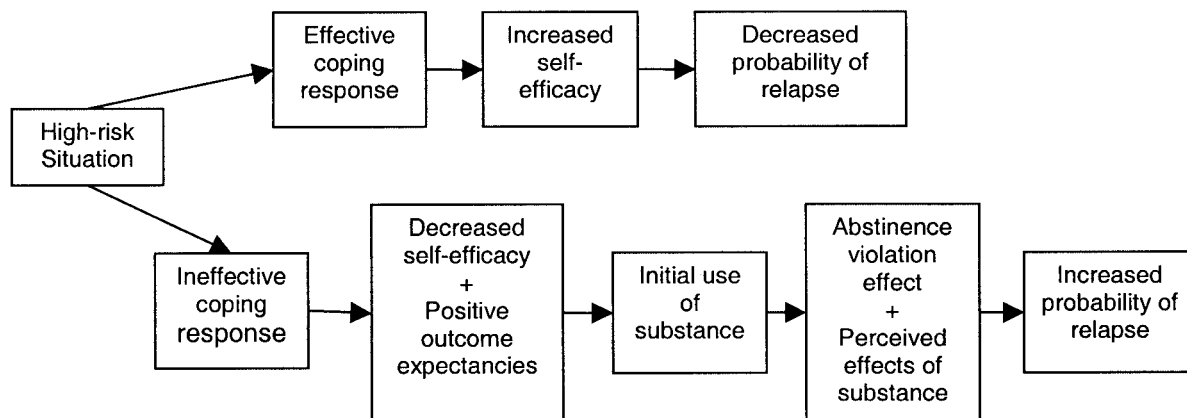
sions," which are decisions that a person makes without realizing the implications of the decision leading to the possibility of a lapse. For example, a man who is trying to abstain from drinking takes a shortcut that entails walking past his favorite bar. Although he had no intention of drinking or stopping at his favorite bar, the decision to take that particular route could present a risky situation (Marlatt, 1985). In the assessment of high-risk situations, a role-play measure, such as the Alcohol-Specific Role Play Test (Monti et al., 1993), can be used to assess observable responses in high-risk and seemingly non-high-risk situations. Education about the relapse process, the likelihood of a lapse occurring, and lifestyle imbalance may better equip clients to navigate the rough terrain of cessation attempts.

Effectiveness and Efficacy of Relapse Prevention

Several studies have evaluated the effectiveness and efficacy of RP approaches for substance use disorders (Carroll, 1996; Irvin, Bowers, Dunn, & Wang, 1999), and there is evidence supporting RP for depression (Katon et al., 2001), sexual offending (Laws, Hudson, & Ward, 2000), obesity (Brownell & Wadden, 1992; Perry et al., 2001), obsessive-compulsive disorder (Hiss, Foa, & Kozak, 1994), schizophrenia (Herz et al., 2000), bipolar disorder (Lam et al., 2003), and panic disorder (Bruce, Spiegel, & Hegel, 1999). Carroll (1996) conducted a narrative review of 24 randomized, controlled trials, including studies of RP for smoking, alcohol, marijuana, and cocaine addiction. Carroll concluded that RP was more effective than no treatment and was equally effective as other active treatments (e.g., supportive therapy, interpersonal therapy) in improving substance use outcomes.

Several studies have shown sustained main effects for RP, suggesting that RP may provide continued improvement over a longer period of time (indicating a "delayed emergence effect"), whereas other treatments may only be

Figure 1
Cognitive-Behavioral Model of Relapse





G. Alan Marlatt

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effective over a shorter duration (Carroll, Rounsaville, Nich, & Gordon, 1994; J. D. Hawkins, Catalano, Gillmore, & Wells, 1989; Rawson et al., 2002). These findings suggest a lapse–relapse learning curve, in which there is a higher likelihood of a lapse immediately following treatment, but incremental changes in coping skills lead to a decreased probability of relapse over time. Polivy and Herman (2002) candidly described the problem of learning new behaviors—as many as 90% of individuals do not achieve behavior change on their first attempt.

Irvin and colleagues (1999) conducted a meta-analysis of RP techniques in the treatment of alcohol, tobacco, cocaine, and polysubstance use. On the basis of 26 studies, representing a sample of 9,504 participants, the overall treatment effects demonstrated that RP was a successful intervention for reducing substance use and improving psychosocial adjustment. Relapse prevention was most effective for individuals with alcohol problems, suggesting that certain characteristics of alcohol use are particularly amenable to the current RP model. Scientist-practitioners should continue to modify RP procedures to incorporate the idiosyncrasies of other substances (e.g., cocaine, cigarettes, and heroin) and nonsubstance (e.g., depression, anxiety) relapse. For example, Roffman, Stephens, Simpson, and Whitaker (1990) have developed a marijuana-specific RP intervention that has produced greater reductions in marijuana use than a comparison social support treatment.

Relapse Replication and Extension Project

The wide clinical application of RP led the National Institute of Alcohol Abuse and Alcoholism to sponsor a replication of Marlatt's original taxonomy (Marlatt, 1978) for classifying relapse episodes. Collaborators at three research centers (Brown University; the Research Institute on Ad-

dictions in Buffalo, NY; and the University of New Mexico) recruited 563 participants from 15 treatment sites that represented a number of different treatment approaches and settings (e.g., cognitive–behavioral treatment [CBT] and 12-Step, and including both outpatient and inpatient treatment). The Relapse Replication and Extension Project (RREP) focused on the identification of high-risk situations and examined the reliability and validity of the taxonomic system for classifying alcohol relapse episodes (Lowman, Allen, Stout, & the Relapse Research Group, 1996).

The data and research questions used in the RREP raised significant methodological issues concerning the predictive validity of Marlatt's (1978) relapse taxonomy and coding system (Longabaugh, Rubin, Stout, Zywiak, & Lowman, 1996; Stout, Longabaugh, & Rubin, 1996). On the basis of the findings, a major reconceptualization of the relapse taxonomy was recommended (Donovan, 1996; Kadden, 1996). Longabaugh and colleagues suggested a revision of the taxonomy categories to include greater distinction between the inter- and intrapersonal determinants, more emphasis on craving, and less focus on hierarchically defined relapse codes. In contrast, Donovan concluded that the RREP did not adequately test the assumptions of the broader cognitive–behavioral model of relapse, on which several RP intervention strategies are based. Many of the RREP findings, including the influence of negative affect, the abstinence violation effect, and the importance of coping in predicting relapse, are in fact quite supportive of the original RP model (Marlatt, 1996).

In response to the criticisms provided by the researchers in the RREP (Donovan, 1996; Kadden, 1996; Longabaugh et al., 1996), as well as to other critiques of RP and the cognitive–behavioral model of relapse (Allsop & Saunders, 1989; Heather & Stallard, 1989), we have devoted the remainder of this article to a review of relapse risk factors and the relapse process. Although no single model of relapse could ever encompass all individuals attempting all types of behavior change, a more thorough understanding of the critical determinants of relapse and underlying processes may provide added insight into the treatment and prevention of disorders susceptible to relapse.

Determinants of Relapse: This Is Now

Intrapersonal Determinants

Self-efficacy. Self-efficacy is defined as the degree to which an individual feels confident and capable of performing a certain behavior in a specific situational context (Bandura, 1977). As described in the cognitive–behavioral model of relapse, higher levels of self-efficacy are predictive of improved alcohol treatment outcomes in both males and females, for inpatient and outpatient treatment, and for short (1 year) and long-term (3 year) follow-ups (Burling, Reilly, Moltzen, & Ziff, 1989; Greenfield et al., 2000; Project MATCH Research Group, 1997; Rychtarik, Prue, Rapp, & King, 1992). In general, self-efficacy is a predictor of outcomes across all types of addictive behaviors, including gambling (Sylvain, Ladouceur, & Boisvert, 1997), smoking (e.g., Baer, Holt, Lichtenstein, 1986), and

drug use (e.g., Sklar, Annis, & Turner, 1999). Yet despite the preponderance of evidence demonstrating a strong relationship between self-efficacy and treatment outcomes, the mechanism by which self-efficacy influences outcome has not been determined (Maisto, Connors, & Zywiak, 2000; Sklar et al., 1999).

The measurement of self-efficacy continues to be a challenge, especially considering the context-specific nature of the construct. Although several self-report instruments have been developed to measure past and current self-efficacy in relation to alcohol and drug use (e.g., Annis, 1982; DiClemente, Carbonari, Montgomery, & Hughes, 1994), these measures are limited to assessing self-efficacy within circumscribed contexts rather than in individualized high-risk situations. One promising assessment strategy, Ecological Momentary Assessment (EMA), is the use of personal digital assistants to collect data in real time (Stone & Shiffman, 1994). On the basis of data collected with EMA, Shiffman and colleagues (2000) found that baseline self-efficacy was as predictive of the first smoking lapse as were daily self-efficacy measurements, demonstrating the stability of self-efficacy during abstinence. However, daily variation in self-efficacy was a significant predictor of smoking relapse progression following the first lapse, above and beyond baseline self-efficacy and pretreatment smoking behavior. Using the same methodology, Gwaltney and colleagues (2002) showed that individuals who experience a smoking lapse as well as those who abstain from smoking following treatment are capable of discriminating nonrisk from high-risk situations, with situations that are rated as high-risk (e.g., negative affect contexts) receiving the lowest self-efficacy ratings.

Outcome expectancies. Outcome expectancies are typically described as an individual's anticipation of the effects of a future experience (S. A. Brown, Goldman, & Christiansen, 1985). These expectancies influence behavioral responding, depending on the strength and valence (whether the person anticipates either a positive or a negative experience) of the expectancy, and the previous effects of a substance. Experimental studies (using placebo designs) have demonstrated that an individual's expectancies play a major role in the subjective experience of a substance, regardless of whether the substance is a placebo or the actual drug (Juliano & Brandon, 2002; Marlatt & Rohsenow, 1980).

Treatment outcome studies have demonstrated that positive reinforcement outcome expectancies (e.g., "A cigarette would be relaxing") are associated with poorer treatment outcomes (Connors, Tarbox, & Faillace, 1993) and that negative outcome expectancies (e.g., "I will have a hangover") are related to improved outcomes (Jones & McMahon, 1996). Jones and colleagues (2001) concluded that although expectancies are strongly related to outcomes, there is very little evidence that targeting expectancies in treatment leads to changes in posttreatment consumption. One possible explanation for these findings is that expectancies influence outcome via their relationship with other predictors of relapse. For example, Cohen, Mc-

Carthy, Brown, and Myers (2002) demonstrated that expectations partially mediate the relationship between negative affect and smoking behavior.

Craving. The maintenance of positive expectancies in the anticipation of consumption has been shown to be significantly related to increased subjective reports of craving (Palfai, Davidson, & Swift, 1999). Craving is possibly the most widely studied and poorly understood concept in the study of drug addiction (Lowman, Hunt, Litten, & Drummond, 2000). One common finding is that craving is a poor predictor of relapse (e.g., Kassel & Shiffman, 1992; Tiffany, Carter, & Singleton, 2000). Drummond, Litten, Lowman, and Hunt (2000) proposed that the subjective experience of craving may not directly predict substance use, but relapse may be predicted from the correlates and underlying mechanisms of craving. For example, Sayette, Martin, Hull, Wertz, and Perrott (2003) experimentally demonstrated that cue exposure was predictive of nicotine craving, but only for smokers who were deprived of nicotine. These findings are consistent with previous research demonstrating that during abstinence, the perceived availability of a substance plays a large role in craving responses (for a review, see Wertz & Sayette, 2001).

Siegel, Baptista, Kim, McDonald, and Weise (2000) proposed that both craving and symptoms of withdrawal may act as drug-compensatory responses, which are conditioned by several exposures to drug-related stimuli (e.g., seeing an advertisement for a desired brand of cigarettes) paired with the physical effects of a drug. Therefore drug cues elicit a physiological response to prepare the individual for the drug effects. On the basis of this model, withdrawal and craving may be limited to situations in which preparatory responses to drug effects have been learned (Siegel et al., 2000; Wenger & Woods, 1984).

Studies on the role of cue reactivity in addiction have demonstrated that drug-related stimuli elicit self-reported craving and increased physiological responding, but cue reactivity has not been shown to be a consistent predictor of relapse (Carter & Tiffany, 1999; Rohsenow, Niaura, Childress, Abrams, & Monti, 1990). Niaura (2000) presented a dynamic regulatory model of drug relapse in which cues are proposed to activate attentional processes, craving, positive outcome expectancies, and physiological responses. Efficacy and coping are described as "the braking mechanisms for the affective/urge circuits" (Niaura, 2000, p. 159), whereby high self-efficacy and/or an effective coping response can prevent the escalation of preparatory drug responding. Taken out of the laboratory, cue reactivity could have an impact on the treatment and assessment of addictive behavior (Carter & Tiffany, 1999). For example, measures of cue reactivity could be used to identify an individual's high-risk situations for relapse.

Motivation. Motivation may relate to the relapse process in two distinct ways: the motivation for positive behavior change and the motivation to engage in the problematic behavior. This distinction captures the ambivalence that is experienced by individuals attempting to change an addictive behavior (Miller & Rollnick, 2002). The hesitancy toward change is often highly related to both self-

efficacy (e.g., “I really want to quit shooting up, but I don’t think that I’ll be able to say no”) and outcome expectancies (e.g., “I would quit drinking, but then I would have a hard time meeting people”). Prochaska and DiClemente (1984) proposed a transtheoretical model of motivation, incorporating five stages of readiness to change: precontemplation, contemplation, preparation, action, and maintenance. Each stage characterizes a different level of motivational readiness, with precontemplation representing the lowest level of readiness (DiClemente & Hughes, 1990).

According to the tenets of operant conditioning, the motivation to use in a particular situation is based on the positive or negative reinforcement value of a specific outcome in that situation (Bolles, 1972). For example, if an individual is in a highly stressful situation and holds the positive outcome expectancy that smoking a cigarette will reduce his or her level of stress, then the incentive of smoking a single cigarette has high reinforcement value. Baker, Piper, McCarthy, Majeskie, and Fiore (2004) have demonstrated that perceived or expected reductions in negative affect and withdrawal symptoms (Piasecki et al., 2000) provide negative reinforcement value for smoking behavior and may be described as motivation to use. These findings highlight the feedback mechanism that may be operating in motivational circuits, whereby consumption is influenced both by expectations derived from previous experience and by the perceived effects of a substance in the moment. If these expectations provide reinforcement, then the individual will more likely be motivated to continue using.

Coping. Several types of coping have been proposed, including stress, temptation, cognitive, and behavioral coping (Shiffman, 1984), as well as approach and avoidance coping (Moos, 1993). Recently, Chung, Langenbucher, Labouvie, Pandina, and Moos (2001) demonstrated that increased behavioral approach coping (e.g., meditation and/or deep breathing exercises) was predictive of fewer alcohol problems (i.e., alcohol problem severity and alcohol dependence symptoms) and reduced interpersonal and psychological problems 12-months following treatment. Gossop, Steward, Browne, and Marsden (2002) found that patients who used more cognitive coping strategies (e.g., “urge-surfing”; Marlatt, 1985) had lower rates of relapse to heroin use.

Litt, Kadden, Cooney, and Kabela (2003) demonstrated that self-efficacy and coping independently predicted successful treatment outcomes and that higher levels of readiness to change enhanced the use of coping skills. In this study the availability of coping skills following treatment was a significant predictor of outcome, regardless of the treatment received. Both CBT and interpersonal psychotherapy led to substantially greater increases in coping skills. These results are consistent with a recent review conducted by Morganstern and Longabaugh (2000), who concluded that changes in coping skills following cognitive-behavioral interventions do not uniquely mediate substance abuse outcomes, compared with other active treatments. On the contrary, using a participant-generated role-play measure of coping called the Cocaine Risk Re-

sponse Test, Carroll, Nich, Frankforter, and Bisighini (1999) found significant improvements on CBT-type coping skills in those individuals assigned to CBT but not in those assigned to comparative treatments.

To date, very little is known about the cognitive-behavioral processes that underlie current definitions of coping. E. A. Skinner, Edge, Altman, and Sherwood (2003) have suggested the use of hierarchical structures of coping “families” based on functional classes of behavior. One coping family, self-reliance, may be a potential predictor of outcome following treatment for addictive behavior. Self-reliance, which incorporates emotional and behavioral regulation, emotional expression, and emotional approach coping, resonates with the notion of self-regulation (defined as the monitoring and altering of one’s behavior), which has been shown to be associated with substance abuse, impulsivity, and risk taking (J. M. Brown, Miller, & Lawendowski, 1999).

A recent analogy provided by Baumeister, Heatherton, and Tice (1994) described self-regulation as a type of muscle, which may be strengthened and which may also become fatigued. The “fatigue” of self-regulation, or loss of self-control associated with repeated use of self-control resources, provides an explanation for why individuals are more likely to use an ineffective coping strategy when they are experiencing stress and/or negative affect. Consistent with this explanation is the finding of Muraven, Collins, and Neinhans (2002) that individuals who experienced self-regulation fatigue tended to consume more alcohol and reach higher blood alcohol levels than those whose ability to self-regulate was not depleted. These data suggest that considering previous definitions of coping as well as current research on self-regulation may help elucidate the functional relationship between coping processes and treatment outcomes.

Emotional states. Several studies have reported a strong link between negative affect and relapse to substance use (e.g., Hodgins, el Guebaly, & Armstrong, 1995; Shiffman, Paty, Gnys, Kassel, & Hickcox, 1996). Baker and colleagues (2004) have recently identified negative affect as the primary motive for drug use. According to this model, excessive substance use is motivated by positive and negative affective regulation such that substances provide negative reinforcement when they provide relief from negative affective states (Khantzian, 1974; Tennen, Afleck, Armeli, & Carney, 2000). A recent study using EMA provided support for this model, with alcohol consumption being prospectively predicted from nervous mood states and cross-sectionally associated with reduced levels of nervousness (Swendsen et al., 2000).

In Marlatt’s (1978) original study of relapse precipitants, negative affect was an unambiguous predictor of lapses following treatment. Today, advancements in technology and methodologies have complicated an understanding of the affect-relapse relationship (Kassel, Stroud, & Paronis, 2003). Cohen and colleagues (2002) demonstrated, as mentioned earlier, that negative affect is mediated by outcome expectancies in the prediction of smoking behavior, and Gwaltney and colleagues (2001) found ab-

stinence self-efficacy to be lowest in negative affect contexts. Baker and colleagues (2004) have provided evidence for the association between postcessation negative affect and relapse; however, the interdependence of negative affect and withdrawal severity remains unclear (Kenford et al., 2002). Furthermore, precessation negative affect, including comorbid major depression, is not consistently related to increased relapse risk (Burgess et al., 2002).

Interpersonal Determinants

Functional social support, or the level of emotional support, is highly predictive of long-term abstinence rates across several addictive behaviors (e.g., Beattie & Longabaugh, 1999; Dobkin, Civita, Paraherakis, & Gill, 2002; Havassy, Hall, & Wasserman, 1991; McMahan, 2001). The quality of social support, or the level of support from nonsubstance abusers (Dobkin et al., 2002), has also been related to relapse. For example, low levels of high-quality support (i.e., support for abstinence), including interpersonal conflict (Cummings, Gordon, & Marlatt, 1980) and high levels of low-quality support (social pressure to use substances), are predictive of lapse episodes (S. A. Brown, Vik, & Craemer, 1989).

The structural dimension of social support, or the availability of support, has been shown to moderate the relationship between social support and relapse. Beattie and Longabaugh (1999) found that the presence of a support system of people who encouraged abstinence mediated the relationship between general support and outcomes. Unfortunately, increased substance use may increase alienation from non-substance-abusing friends and family members. This restructuring of social networks may involve a feedback mechanism whereby increased use is associated with a decrease in support from nonsubstance abusers, which may lead to more substance use (Peirce, Frone, Russell, Cooper, & Mudar, 2000).

Future Directions in the Definition, Measurement, and Treatment of Relapse: This Is Now

Conceptualizing the Relapse Process

Synthesizing recent empirical findings into a unified theory involves reconceptualizing relapse as a multidimensional, complex system. The proposed model is similar to dynamic developmental models (e.g., Courage & Howe, 2002; Dodge & Pettit, 2003; van der Maas & Molenaar, 1992) in that the focus is on the interrelationships between dispositions, contexts, and past and current experiences. However, unlike previous models, the proposed model of relapse focuses on situational dynamics rather than on developmental changes. In our research and clinical work, we have observed seemingly insignificant changes in levels of risk (e.g., slight decreases in mood ratings) kindle a lapse episode, often initiated by a minor cue. For example, increased stress level may trigger a high-risk situation in which a slight reduction in coping efficacy (McKay, Alterman, Mulvaney, & Koppenhaver, 1999) greatly increases the likelihood of the person's using an ineffective coping

response, thereby increasing the probability of a lapse (Rabois & Haaga, 2003).

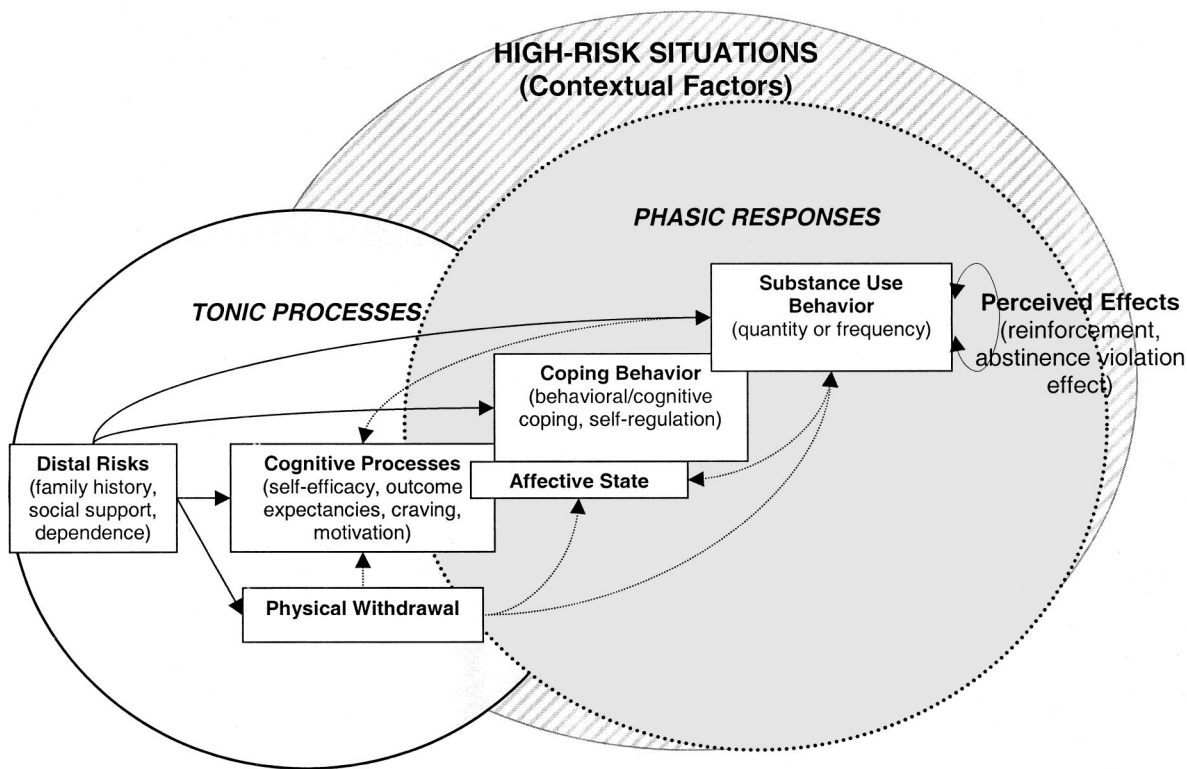
At any moment, individuals who are attempting to maintain new health behaviors (e.g., sticking with a diet, abstaining from drinking or drug use) are often faced with the challenge of balancing contextual cues and potential consequences. We propose that multiple influences trigger and operate within high-risk situations and influence the global functioning of the system, a process that embodies principles of self-organization (Barton, 1994; Kauffman, 1995).¹ This self-organizing process incorporates the interaction between background factors (e.g., years of dependence, family history, social support, and comorbid psychopathology), physiological states (e.g., physical withdrawal), cognitive processes (e.g., self-efficacy, outcome expectancies, craving, the abstinence violation effect, motivation), and coping skills. These factors were also included in the original model of relapse proposed by Marlatt and colleagues (Brownell et al., 1986; Marlatt & Gordon, 1985). Unlike Marlatt's earlier model, which has been criticized for the hierarchical classification of relapse factors (Longabaugh et al., 1996), the current model does not presume that certain factors are more influential than others.

As shown in Figure 2, the reconceptualized dynamic model of relapse allows for several configurations of distal and proximal relapse risks. Distal risks (solid lines) are defined as stable predispositions that increase an individual's vulnerability to lapse, whereas proximal risks (dotted lines) are immediate precipitants that actualize the statistical probability of a lapse (Shiffman, 1989). Connected boxes are hypothesized to be nonrecursive—that is, there is a reciprocal causation between them (e.g., coping skills influence drinking behavior, and in turn, drinking influences coping; Gossop et al., 2002). These *feedback loops* allow for the interaction between coping skills, cognitions, craving, affect, and substance use behavior (Niaura, 2000). The role of contextual factors is indicated by the large striped circle in Figure 2, with substance cues (e.g., walking by the liquor store) moderating the relationship between risk factors and substance use behavior (Litt, Cooney, & Morse, 2000).

The timing of risk factors is also inherent in the proposed system, whereby temporal relationships between distal risk determinants and hypothesized proximal relapse precipitants play an important role in relapse proneness (Piasecki, Fiore, McCarthy, & Baker, 2002). We have

¹ Although there is no agreed upon definition of *self-organization*, many authors describe self-organization by the characteristics of emerging systems—namely, systems in which small changes in parameters within a system result in large, qualitative changes at the global level. The following is a definition of self-organization provided by Camazine and colleagues (2003): "Self-organization is a process in which patterns at the global level of a system emerge solely from numerous interactions among the lower-level components of the system. Moreover, the rules specifying interactions among the system's components are executed using only local information, without reference to the global pattern" (p. 8). For a more psychologically minded description of self-organization, we recommend the book *Clinical Chaos*, edited by Chamberlain and Butz (1998).

Figure 2
Dynamic Model of Relapse



illustrated time-dependent interactions with light gray circles in Figure 2. The white and gray circles represent tonic and phasic processes (the phasic circle is contained within the high-risk situation circle). The circle on the far left (solid border) represents tonic processes, indicating an individual's chronic vulnerability for relapse. Tonic processes often accumulate and lead to the instigation of a high-risk situation, providing the foundation for the possibility of a lapse. The phasic response (dotted border) incorporates situational cognitive, affective and physical states, and coping skills utilization. The phasic response is conceptualized as the cusp, or turning point, of the system, where behavioral responding may lead to a sudden change in substance use behavior. Alternatively, an individual may promptly use an effective coping strategy (e.g., self-regulation) and experience a de-escalation of relapse risk.

The interrelationship between tonic and phasic processes in the prediction of lapses and relapse has been demonstrated in several recent studies on the dynamics of posttreatment outcomes. Shiffman and colleagues (2000) demonstrated that baseline self-efficacy (tonic) predicts lapses, and daily variation in self-efficacy (phasic) predicts the progression from a lapse to relapse. The self-reported experience of craving (e.g., "urges"; Rohsenow & Monti, 1999) appears to be an acute risk for relapse, as urge ratings

are increasing (phasic process), but stable levels of urge (tonic process) do not necessarily add predictive power above and beyond that predicted by the initial increase in urge ratings (Shiffman et al., 2000).

Litt and colleagues (2003) demonstrated that baseline readiness to change (tonic process) was not directly related to drinking outcomes, but it did influence outcome through its effect on coping (phasic process). Hedeker and Mermelstein (1996), however, showed that a decline in momentary motivation (phasic process) was a significant predictor of relapse in individuals who were attempting to quit smoking. Also, they found that the experience of a lapse led to further reductions in motivation, a finding that is consistent with the abstinence violation effect (Curry et al., 1987). It has been demonstrated that the relationship between post-cessation negative affect and outcomes is mediated by self-efficacy (Cinciripini et al., 2003) and outcome expectancies (Cohen et al., 2002); however, pre-cessation negative affect and/or comorbid major depression are not significantly related to outcome (Burgess et al., 2002), demonstrating that affect may be operating within both tonic and phasic processes.

Together these empirical findings demonstrate that responding in a high-risk situation is related to both distal and proximal risk factors operating within both tonic and

phasic processes. Recognizing this complexity may provide clinicians with an edge in the treatment of addictive behaviors and the prevention of relapse (R. C. Hawkins & Hawkins, 1998). The clinical utility of the proposed model depends on clinicians' ability to gather detailed information about an individual's background, substance use history, personality, coping skills, self-efficacy, and affective state. The consideration of how these factors may interact within a high-risk situation (which could be assessed in treatment using cue reactivity or client-generated role-play exercises) and how changes in proximal risks can alter behavior leading up to high-risk situations will enable clients to continually assess their own relapse vulnerability. As Kauffman (1990), one of the pioneers in the study of complex systems, stated, "The internal portrait, condensed image, of the external world carried by the individual and used to guide its interactions, must be tuned, just so, to the ever evolving complexity of the world it helped create" (p. 320).

Future Research Strategies

The theoretical conceptualization of relapse presented in this article is not new to the study of addictive behaviors; substance abuse treatment outcomes have consistently been described as dynamic and complex (Brownell et al., 1986; Donovan, 1996; Niaura, 2000). Methodological limitations, however, have prevented these researchers from testing dynamic models of relapse. Recent innovations in computing technology afford researchers the opportunity to develop testable theories of relapse as a dynamic system. For example, Piasecki and colleagues (2000) have provided interesting findings on the withdrawal dynamics of smoking cessation, demonstrating that relapse vulnerability is indexed by the severity, trajectory, and variability of withdrawal symptoms. Boker and Graham (1998) investigated dynamic instability and self-regulation in the development of adolescent substance abuse, demonstrating that relatively small changes feed back into the system and lead to large changes in substance abuse over a relatively short period of time. Warren, Hawkins, and Sprott (2003) used nonlinear time series analysis to successfully model an individual's daily alcohol intake; this method provided a fit to the data that was superior to that of a comparable linear model and more accurately described the idiosyncrasies of drinking dynamics. R. C. Hawkins and Hawkins (1998) also presented a case study of an individual's alcohol intake over a six-year period. Based on more than 2,000 data points, their analyses revealed a periodic cycle in which sudden shifts in drinking behavior were observed after periods of stability.

The utility of nonlinear dynamical systems, such as models based on chaos and/or catastrophe theory,² in the prediction and explanation of substance abuse has been described by several authors (Ehlers, 1992; R. C. Hawkins & Hawkins, 1998; H. A. Skinner, 1989; Warren et al., 2003). In general, many of the tenets of these theories are consistent with the hypotheses of the reconceptualized dynamic model of relapse (e.g., feedback loops, rapid changes in behavior, self-organization). Hufford, Witkiewitz,

Shields, Kodya, and Caruso (2003) evaluated a catastrophe model of six-month posttreatment alcohol consumption, incorporating alcohol dependence, self-efficacy, depression, family history, and stress as predictors. The results demonstrated that a catastrophe model provided a better fit to the data than a linear model. Witkiewitz, Hufford, Caruso, and Shields (2002) replicated these findings with data from Project MATCH (Project MATCH Research Group, 1997), showing that negative affect, self-efficacy, and distal risks were predictors of relapse in a catastrophe model but not in a comparable linear model.

Catastrophe models are just one class of nonlinear models, and many alternative nonlinear and dynamic models may also provide a good fit to the data (Davidian & Giltinan, 1995). Furthermore, a variety of modeling techniques can provide valuable information about the unique contributions of risk factors at various time points (van der Maas & Molenaar, 1992). Currently we are using parameter estimates from catastrophe models to examine the relationship between relapse risk factors and drinking outcomes in the Relapse Replication and Extension Project (RREP), described previously.

Assessing Relapse

Progress in the area of quantitative modeling procedures will only inform an understanding of the relapse process to the extent that operational definitions of relapse are improved. Advancements in the assessment of lapses may provide the impetus for a more comprehensive definition of relapse and exhaustive understanding of this complex process (Haynes, 1995). A few of the recent developments that may increase the ability to accurately measure addictive behavior include EMA (Stone & Shiffman, 1994), interactive voice response technology (Mundt, Bohn, Drebus, & Hartley, 2001), physiological measures (Niaura, Shadel, Britt, & Abrams, 2002), and brain imaging techniques (Bauer, 2001).

Although certain hypothesized precipitants of relapse cannot be ethically demonstrated in an experimental setting, investigations have demonstrated that some aspects of stress, cue reactivity, and craving have been shown to predict "relapse" in animals (Littleton, 2000; Shaham, Erb, & Stewart, 2000). Shaham and colleagues reported that foot shock stress causes reinstatement of heroin and cocaine seeking in rats, and several researchers have demonstrated environment-dependent tolerance and place preferences for cages previously associated with alcohol administration (e.g., Kalant, 1998).

Leri and Stewart (2002) tested whether a group of rats that self-administered heroin experienced different relapse rates than did rats that received an investigator-adminis-

² Catastrophe and chaos theories are special cases of dynamical systems theory, an area of mathematics in which differential and difference equations are used to describe the behavior of complex systems. Catastrophe theory applies to the modeling of abrupt changes in the behavior of a system, determined by small changes in system parameters; chaos theory refers to the modeling of unstable, nonrepeating (aperiodic) behavior in deterministic systems.

tered lapse (called “priming”). The results demonstrated that self-initiated heroin use paired with heroin-related stimuli led to heroin seeking during the relapse test. Exposure to a priming dose of heroin and heroin-related stimuli had little or no effect on subsequent heroin-seeking behavior, suggesting a dynamic interplay between internal system processes, cues, and positive reinforcement.

Relapse Prevention Treatment in the 21st Century

We view RP as having an important role in the continuous development of brief interventions for alcohol and drug problems, such as motivational interviewing (Miller & Rollnick, 2002), brief physician advice (Fleming, Barry, Manwell, Johnson, & London, 1997), and brief assessment and feedback (Dimeff, Baer, Kivlahan, & Marlatt, 1999; Monti, Colby, & O’Leary, 2001). Incorporating the cognitive-behavioral model of relapse and RP techniques, either within the brief intervention or as a booster session, will provide additional help for individuals who are attempting to abstain or moderate their use following treatment. Relapse prevention techniques may also be supplemented by other treatments for addictive behaviors, such as pharmacotherapy (Schmitz, Stotts, Rhoades, & Grabowski, 2001) or mindfulness meditation (Marlatt 2002). Currently a treatment is being developed that will integrate RP techniques with mindfulness training into a cohesive treatment package for addictive behaviors (for an introduction to this treatment, see Witkiewitz, Marlatt, & Walker, in press).

Medication and meditation have already been used successfully as adjuncts to RP (Schmitz et al., 2001; Taub, Steiner, Weingarten, & Walton, 1994), but in some ways researchers may be getting ahead of the data. Relapse prevention techniques need to be studied in more diverse samples of individuals, including ethnic minority groups (De La Rosa, Segal, & Lopez, 1999) and adolescents who receive formal treatment (McCarthy, Tomlinson, Anderson, Marlatt, & Brown, 2003). The dynamic model of relapse presented in this article needs to be empirically tested and replicated across drug classes and with a variety of distinct substance-using populations (e.g., individuals with co-occurring disorders, polydrug users).

Conclusions

Relapse is a formidable challenge in the treatment of all behavior disorders. Individuals engaging in behavior change are confronted with urges, cues, and automatic thoughts regarding the maladaptive behaviors they are attempting to modify. Several authors have described relapse as complex, dynamic, and unpredictable (Buhringer, 2000; Donovan, 1996; Marlatt, 1996; Shiffman, 1989), but previous conceptualizations have proposed static models of relapse risk factors (e.g., Marlatt & Gordon, 1985; Stout et al., 1996). The reconceptualization of relapse proposed in this article acknowledges the complexity and unpredictable nature of substance use behavior following the commitment to abstinence or a moderation goal. Future research should continue to focus on refining measurement devices

and developing better data analytic strategies for assessing behavior change. Empirical testing of the proposed dynamic model of relapse and further refinements of this new model will add to the understanding of relapse and how to prevent it.

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