

An Information-Processing Analysis of Mindfulness: Implications for Relapse Prevention in the Treatment of Substance Abuse

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This article provides a cognitive framework for integrating mindfulness meditation into substance abuse treatment. We review recent developments in cognitive theory and treatment research that point toward mindfulness meditation as a useful additional strategy for reducing relapse. Although the idea of using meditation to reduce substance use is not new, there are several reasons for further exploring the relevance of mindfulness for addiction treatment. This article reviews the cognitive-behavioral formulation of relapse, evaluations of mindfulness meditation as a component of the treatment of psychopathology, and the role of information processes in relapse. We also present an information-processing analysis of how mindfulness can help prevent relapse and discuss its utility and clinical implications.

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Reducing the rate of relapse is a central challenge in the treatment of substance use disorders. Early studies of generic inpatient programs found that 80 to 90% of alcoholics relapsed in the first year after treatment, when relapse was defined as a single drink (Polich, Armor, & Braiker, 1981). Similar rates of relapse occur for other addictive disorders such as opiate and nicotine addiction (Hunt, Barnett, & Branch, 1971). In recent years, cognitive-behavioral theory and research have provided clinicians with new ideas and interventions to help reduce relapse rates (Bien, Miller, & Tonigan, 1993; Miller et al.,

1995). Despite these advances, however, relapse remains a concern for many clients.

The primary purpose of this article is to provide a framework for integrating mindfulness meditation into substance abuse treatment. We will review recent developments in cognitive theory and treatment research that point toward mindfulness meditation as a useful additional strategy for reducing relapse. Although the idea of using meditation to reduce substance use is not new (Marlatt & Marques, 1977), three reasons warrant a further exploration of the relevance of mindfulness for addiction treatment. First, previous clinical studies on meditation and alcoholism were few and methodologically problematic. Second, recent controlled studies on mindfulness meditation and treatment of other forms of psychopathology (e.g., depression) raise the possibility that similar benefits may be realized for substance use disorders. Finally, our understanding of how substance abusers process information and how mindfulness influences affect and cognition suggests that mindfulness, with its acceptance-based techniques, would complement the active strategies provided in cognitive-behavioral treatment (CBT).

This article is organized into four sections. In the first section, we outline the cognitive-behavioral formulation of relapse and review evidence pertaining to two types of treatments, traditional CBT and cue-exposure treatment. The second section consists of a comparison of two types of meditation, relaxation meditation and mindfulness. In addition, evaluations of mindfulness meditation as a component of the treatment of psychopathology are reviewed. In the third section, we review the role of information processes in relapse and present an information-processing analysis of how mindfulness can help prevent relapse. Finally, we examine the utility and clinical implications of this information-processing analysis of mindfulness.

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Although we include data on other addictive substances when available, we primarily rely on the alcohol literature because it has the greatest number of relevant studies. However, there is evidence that similar kinds of processes and treatment effects apply to other drugs of abuse (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996).

COGNITIVE BEHAVIORAL MODELS OF RELAPSE

One of the cardinal features of substance abuse and dependence is the vulnerability to relapse (Institute of Medicine, 1990). Even though early treatments for addiction were sometimes effective in the short term, they showed high rates of relapse after treatment. Using a simple dichotomous criterion, such as complete abstinence across the entire follow-up period, yields a dismal picture regarding treatment outcome (Miller, 1996; Sobell, Sobell, & Gavin, 1995). When relapse has been defined as consuming a single drink, relapse rates of 80 to 90% have been observed (Helzer, Robins, & Taylor, 1985; Hunt et al., 1971; Polich et al., 1981). These high relapse rates in early treatment studies may be due to the unselected samples of alcohol clients and to the generic nature of the treatment programs, which consisted of education and group counseling. Another issue is the definition of relapse. The dichotomous classification of relapse fails to take into account the portion of clients who have had "slips." A slip is a brief occasion of substance use that does not necessarily lead to negative consequences and is followed by a return to abstinence. Even when relapse has been defined as returning to pretreatment drinking levels, however, follow-up studies of unselected alcohol clients who participated in residential treatment report relapse episodes in about 50% of the sample 12 months after treatment (Armor, Polich, & Stambul, 1976).

Over the last 20 years, a cognitive-behavioral model has been articulated that provides important details about what leads one to relapse (Marlatt & Gordon, 1985). According to this CBT model, lack of appropriate skills (e.g., assertiveness) and dysfunctional beliefs when encountering stressful or "high-risk" situations precipitate relapse. Based on learning theory, cue exposure therapy (CET) holds that the conditioned associations between previous drinking situations and alcohol have disruptive effects on coping posttreatment (Monti & Rohsenow, 1999). This section reviews the conceptual bases of CBT and CET and also summarizes the results of outcome studies using these approaches.

Marlatt's CBT Relapse Prevention Model

Even after successful treatment, certain demands, stressors, or stimuli lead to relapse (Cummings, Gordon, & Marlatt, 1980). Cummings et al. interviewed 311 individuals who had relapsed after treatment for addictive disorders such as alcohol problems, heroin addiction, gambling, and smoking. All clients described the environmental factors and internal states that precipitated their relapse. This study and other work (e.g., Annis & Davis, 1988) has led to the identification of eight types of relapse situations for addictive behaviors: (1) negative emotional states, (2) negative physical states, (3) positive emotional states, (4) testing personal control, (5) urges and temptations, (6) interpersonal conflict, (7) social pressure to drink, and (8) pleasant times with others. According to several factor analytic studies, these eight high-risk situations fall into three general categories: (1) negative affect situations consisting of unpleasant emotions, physical discomfort, conflict with others; (2) positive affect situations consisting of pleasant times with others, pleasant emotions, and social pressure to drink; and (3) urges and testing control (Breslin, Sobell, Sobell, & Agrawal, 2000; Sandahl, Lindberg, & Ronnenberg, 1990).

High-risk situations do not always result in relapse because relapse is mediated by a client's expectancies about substances and abilities to cope with the situation. Expectancies about the effect of drinking appear to predict treatment outcome among alcohol clients (Brown, 1985). Brown found an inverse relationship between strength of alcohol reinforcement expectancies, in particular the belief in tension reduction, and treatment outcome. These expectancies are thought to influence the relative "attractiveness" of drinking in a high-risk situation relative to alternative responses.

A client's level of confidence in coping with a high-risk situation also determines the likelihood of relapse (Marlatt & Gordon, 1985). Drawn from social cognitive theory (Bandura, 1986), self-efficacy in this context refers to an individual's confidence in his or her ability to perform a behavior that will deal effectively with the high-risk situation. A client's confidence in maintaining his or her treatment gains increases the longer these changes are maintained (Larimer, Palmer, & Marlatt, 1999). However, if an individual feels that he or she is unable to respond effectively in a high-risk situation, vulnerability to relapse increases. Slips or lapses further decrease the client's confidence in his or her coping repertoire and can precipitate

a full relapse. Confirming the importance of self-efficacy, clients' confidence ratings for dealing with high-risk situations positively predicted posttreatment outcome (Annis & Davis, 1991).

The client's ability to cope effectively with a high-risk situation is crucial to modifying clients' substance use expectancies and self-efficacy (Marlatt & Gordon, 1985). Coping can be defined as a response to reduce a threat, solve a problem, or modulate one's emotions (Lazarus & Folkman, 1984). Litman, Stapleton, Oppenheim, and Peleg (1983) constructed a coping behavior inventory for alcohol clients and found that four types of coping emerged: positive thinking, negative thinking, avoidance/distraction, and social support. In the prospective part of the study, Litman et al. found that those clients still abstinent 6 weeks after treatment had decreased their use of avoidance as a coping behavior. Conversely, relapsers tended to increase their use of avoidance. Thus, even though avoidance strategies may be useful or necessary in the short term, this type of coping response does not appear to facilitate the maintenance of treatment gains.

Two studies have reported that use of positive thinking as a coping behavior is predictive of good posttreatment outcome (Litman, 1986; Miller, Westerberg, Harris, & Tonigan, 1996). However, the label for this factor is somewhat misleading. Although one item clearly refers to thinking positively, many more items refer to engagement with and exposure to difficult situations. This factor includes items such as "trying to face life instead of avoiding it" and "stopping to examine my motives and eliminating false ones." Thus, confronting difficult situations and increased awareness are associated with positive treatment outcome. As we will discuss later, these elements of confronting difficult situations and emotions and sensitization to previously automatic thoughts and feelings are processes found in mindfulness meditation.

According to the CBT model, changing dysfunctional thoughts and coping responses reduces relapse (Marlatt & Gordon, 1985). In a review of treatment outcome studies, Miller et al. (1995) found that 11 studies of CBT showed evidence for a specific positive effect compared to either no treatment or general counseling. In one of the first evaluations of CBT, Chaney, O'Leary, and Marlatt (1978) found that inpatient alcoholics receiving CBT skill training reported shorter and less severe relapse episodes than those who received only the standard inpatient treatment where clients received small group therapy and

educational lectures. A recent study showed that clients receiving 12 weeks of CBT increased their percentage of days abstinent from about 20% before treatment to over 90% across the 15 months after treatment (Project Match, 1997).

In sum, the CBT model holds that clients encounter situations after treatment in which they are vulnerable to relapse. Although there are several types of high-risk situations, negative affect seems to be a common antecedent to relapse. Individual differences in alcohol expectancies, self-efficacy, and coping repertoire appear to be key determinants of successfully negotiating high-risk situations. Studies of CBT show significant reductions in relapse, supporting the validity of this model. We will discuss later the specific techniques taught in CBT to address high-risk situations and how these techniques influence information processing.

Cue Exposure Therapy

Cognitive-behavioral principles also are consistent with the notion that cue exposure treatment may help prevent relapse. Drawing from traditional learning theory, one would expect that repeated exposure to triggers (without being allowed to drink) would reduce the conditioned withdrawal and appetitive responses. Both social learning theory and the information-processing analysis to be discussed hold that cue exposure effects are mediated by cognitive processes (Niaura et al., 1988; Stacy, 1997).

Most cue exposure studies use the sight and smell of alcohol as an exposure cue (Pickens, Bigelow, & Griffiths, 1973; Rankin, Hodgson, & Stockwell, 1983). An advantage of using alcohol cues is the amount of control over exposure one has in a treatment environment. The primary disadvantage is that antecedents of relapse such as negative affect are not necessarily part of the exposure procedure. To address the concern, a recent cue exposure treatment also included imaginal exposure to high-risk situations selected by the client (Monti et al., 1993).

Two controlled studies of cue exposure suggest that such procedures improve treatment outcome. Monti et al. (1993) randomly assigned inpatient alcoholics to either a cue exposure procedure (i.e., alcohol cues and individualized imaginal exposure) or to a condition involving an assessment and daily contact only in addition to what the authors describe as standard inpatient treatment. CET clients also received CBT skills training. Three to 6 months after treatment, CET clients reported more days abstinent

and fewer drinks when they drank. In another study on inpatient alcohol clients (Drummond & Glautier, 1994), CET with alcohol cues was compared to a control condition involving relaxation training. At the 6-month follow-up, CET clients reported more abstinent days than those receiving just inpatient treatment. Cue exposure may improve treatment through not only extinction of conditioned responses but also changing alcohol expectancies and increasing confidence in high-risk situations (Monti et al., 1993). These possible changes due to exposure may ultimately reduce the disruptive effect of alcohol cues on coping with high-risk situations. The evidence for exposure-based treatment on relapse is relevant because, as we discuss later, one important aspect of mindfulness is its ability to desensitize clients to an important trigger, negative affect.

Why Negative Affect Is an Important Trigger in Relapse

Negative affect appears to be an especially important trigger for several reasons. First, the majority of clients attribute their relapse to interpersonal stress or negative emotions (Lowman, Allen, & Stout, 1996; Marlatt & Gordon, 1985). Confirming these retrospective reports, prospective clinical studies indicate that the level of post-treatment life stress is positively associated with alcohol relapse (Brown, 1990). Second, when alcohol clients relapse, the more intense negative affect was prior to relapse, the longer the duration of the relapse (Zywiak et al., 1996). Finally, negative affect appears to elicit a conditioned response (e.g., desire to drink) that increases the risk for relapse (Ludwig, 1986).

Cue Reactivity and Relapse. Through repeated pairings of negative affect and drinking, negative affect can elicit a conditioned desire to drink that increases the risk for relapse. In laboratory paradigms examining cue reactivity, several studies have demonstrated the influence of negative affect on desire to use an addictive substance (Greeley, Swift, & Heather, 1992; Payne, Schare, Levis, & Colletti, 1991). Greeley et al. found that, among heavy drinkers, self-reported negative mood before being exposed to alcohol cues predicted degree of reactivity. Payne et al. reported that negative affect induction followed by smoking cues increased desire to smoke and the number of cigarettes smoked in the laboratory. However, these experimental studies have only limited relevance to issues of relapse because the people in both studies were not in treatment and were not trying to change their substance use.

Providing more direct evidence of a cue reactivity-relapse link, Cooney, Litt, Morse, Bauer, and Gaupp (1997) completed a controlled cue exposure procedure on 50 alcohol clients and then conducted a posttreatment follow-up. Before leaving treatment, the clients went through a negative mood induction procedure and were then exposed to spring water or their favorite alcoholic beverage. Clients served as their own controls and conditions were counterbalanced. As expected, negative mood in the presence of alcohol resulted in increased desire to drink in the laboratory. In addition, self-reported urge to drink in this condition predicted time to relapse posttreatment. Similar associations between cue reactivity and relapse have been reported for smoking cessation (Shiffman et al., 1997). These results provide support for the notion that high-risk situations involving negative affect lead to relapse at least partly because of the conditioned associations that arise from the repeated pairing of drinking and unpleasant emotions.

Drinking and Negative Affect as Emotional Avoidance. The conditioned association between negative affect and drinking may derive from the use of alcohol and drugs as a way of avoiding negative affect. Emotional, or more broadly, experiential avoidance is defined as the attempt to alter the form or frequency of unpleasant states by ignoring or distorting bodily sensations, emotions, thoughts, or memories (Hayes et al., 1996). Foa, Steketee, and Young (1984) have pointed out that emotional avoidance is a common occurrence among people with psychiatric disorders. For example, coping styles typified by thought suppression (e.g., “I try to put thoughts out of my mind”) and emotional avoidance (e.g., “When I start feeling sad, I try to get rid of the feelings as quickly as I can”) are positively associated with depressive symptomatology (Wegner & Zanakos, 1994; Zanakos & Wegner, 1993). Attempts at avoiding negative emotions are so common, according to Hayes et al., because the short-term effects of distraction or thought suppression are reinforcing. In addition, the frequent modeling of emotional avoidance strategies by others encourages its use. Unfortunately, these avoidance strategies are often ineffective in the long term. Often these strategies prolong the very thoughts and emotions one is trying to avoid (Wegner & Zanakos, 1994). We will say more about this paradoxical effect of trying to avoid thoughts and emotions later.

What evidence is there that substance abusers are trying to avoid negative affect? The fact that virtually all

drugs of abuse alter one's subjective state, and that substance abusers believe in these transforming effects more than others, certainly makes this an intuitive hypothesis. Three lines of research also support the notion that drinking is an attempt to cope with negative affect. First, studies of self-reported drinking motives in community samples show that drinking to cope with negative affect is associated with alcohol problems such as increased tolerance and continued use in possible harmful circumstances (Carpenter & Hasin, 1999; Cooper, Russell, & George, 1988; Cooper, Russell, Skinner, Frone, & Mudar, 1992). These cross-sectional studies have been confirmed by a prospective analysis that shows that drinking to cope with negative affect predicted the risk of becoming alcohol-dependent over 1 year in a community sample of adults who had no previous alcohol disorders (Carpenter & Hasin, 1998).

Second, one etiologic pathway in the development of alcohol and drug problems among adolescents involves negative affect and its regulation (Sher, 1991). Negative affectivity, a tendency to experience anxiety and depression, appears to be a temperamental trait that is relatively stable across developmental stages (Tarter & Edwards, 1987; Tarter & Vanyukov, 1994). Negative affectivity is posited to exacerbate reactions to life stress in two ways. First, temperament can influence how easily or intensely aroused an individual becomes in the face of stress. Second, temperament can influence the ability to cope with stressors. Consistent with this model, young adults with a family history of alcoholism, who are at high risk to develop alcohol problems themselves, report higher scores on measures of neuroticism (a construct similar to negative affectivity) than offspring of nonalcoholics (Benson & Heller, 1987; Clair & Genest, 1987). Of course, cross-sectional research provides ambiguous evidence of the causal role of negative affect on alcohol problems. More support for this etiological pathway comes from prospective studies (Caspi et al., 1997; Chassin, Curran, Hussong, & Colder, 1996; Labouvie, Pandina, White, & Johnson, 1990). In these studies, trait measures of negative affect predicted later alcohol and drug use. Negative affect may also affect use indirectly through affiliation with substance-using peers (Chassin et al., 1996). Together, these findings provide suggestive evidence of the etiologic role of negative affectivity in substance abuse.

Finally, clinical studies point to the relevance of emotional avoidance for relapse. Although epidemiologic studies are correlational, the high incidence of substance

abuse among people with anxiety and mood disorder may reflect attempts at avoiding negative thoughts and emotions (Kushner, Sher, & Beitman, 1990). Also, problem drinkers contacted after an outpatient alcohol treatment reported that nearly 80% of drinking episodes involved drinking aimed at manipulating various thoughts or emotions (Sanchez-Craig, Annis, Bornet, & MacDonald, 1984). Cooney et al. (1997) found that alcohol clients who reported drinking in situations associated with unpleasant emotions before treatment were particularly reactive to alcohol cues while experiencing negative mood in the cue reactivity assessment during treatment. Cooney et al. suggest that a way to explain this finding is that people who have a history of frequently self-medicating the negative affect with alcohol would display these particularly strong conditioned reactions.

In sum, the desire to avoid unpleasant states and the inevitability of experiencing negative affect can lead to repeated pairings of negative affect and substance use. Frequent pairing of events may give rise to conditioned responses in the form of urges to use and automatic cognitions when faced with similar emotional cues. Thus, a fundamental problem in preventing relapse is how to deal with these conditioned associations, given the ubiquity of negative affect. Decoupling negative affect and substance use would appear to be a general strategy to modify the conditioned associations. To achieve these aims, some strategies not included in traditional cognitive behavior therapies have drawn increasing attention. Recognizing and dealing with emotional avoidance has been explicitly incorporated into therapies such as dialectical behavior therapy (DBT; Linehan, 1993), acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 1999), and mindfulness-based cognitive therapy (MBCT; Teasdale et al., 2000). These therapies all share the view that awareness and acceptance of negative affect can be a useful strategy to alleviate psychopathology such as borderline personality disorder (BPD) and depression. As we discuss in the next section, the promising results of these therapeutic approaches that explicitly include mindfulness suggest further efforts to evaluate such interventions for addictive behaviors.

MINDFULNESS MEDITATION: DEFINITIONS AND RESEARCH

There have been many explanations for the beneficial effects of meditation. Marlatt and Kristeller (1999) suggest that meditation may function as a relaxation intervention, a

spirituality pursuit, a “positive addiction,” or as a cognitive-affective intervention. We acknowledge that many accounts try to explain the therapeutic effects of meditation, but here we focus on two, meditation as relaxation and mindfulness meditation as a cognitive-affective intervention. More data exist on these two explanations than on the others. We suggest that while some types of meditation primarily help reduce stress, mindfulness meditation has additional effects on cognition and affect.

Relaxation Meditation

Until recently, the primary goal of meditation practice in clinical settings has been to reduce stress (Klajner, Hartman, & Sobell, 1984). In relaxation meditation, the individual sits in a comfortable position, preferably in a quiet place. Fundamental to this and other forms of meditation is an object of attention. A common object of attention is moment-to-moment awareness of breathing, though visual objects (e.g., candle flame) and auditory objects (repeated words or mantras) can also be used (Marlatt & Kristeller, 1999). One attempts to eliminate or ignore any distractions, including distracting thoughts (Benson & Proctor, 1984). Relaxation meditation has been shown to decrease heart rate, blood pressure and respiration, and changes in EEG, all of which are consistent with lowered sympathetic arousal (Marlatt & Kristeller, 1999). Consequently, relaxation meditation has been included in interventions for psychological and medical conditions caused or exacerbated by tension or anxiety (Salmon, Santorelli, & Kabat-Zinn, 1998). The belief that relaxation would help alcoholics deal with stress has led to including meditation in some addiction treatment programs (e.g., Marlatt & Gordon, 1985).

Evaluations of relaxation meditation as an adjunct for addiction treatment have been limited (Klajner et al., 1984). Brautigam (1977) randomly assigned substance abusers in inpatient treatment to either a supplemental meditation program or a control condition. The meditation program consisted of transcendental meditation, which includes the key elements of relaxation meditation. In transcendental meditation, clients typically practice for 20 minutes twice daily, and the object of concentration is a repeated vocal sound, often called a mantra. Although the 3-month follow-up showed improved outcomes compared to controls, the 2-year follow-up found that 8 of 10 clients in the meditation group had had a periodic relapse and that 40% had stopped meditating after treat-

ment. Klajner et al. concluded that more research was needed because of the limited evidence available. This study also highlights the importance of finding meditation techniques that would be utilized posttreatment.

Two other studies have evaluated transcendental meditation as an adjunct to inpatient alcohol treatment. Wong, Brochin, and Gendron (1981) randomly assigned 200 male alcoholics in an inpatient treatment to one of two supplemental interventions, progressive muscle relaxation or a daily meditation program. At the 6-month follow-up, substance use and a composite index of relapse (e.g., detoxification admission, alcohol-related arrests) were significantly lower in the meditation condition. However, the results do not provide strong evidence because of the relatively short follow-up interval and the low response rate at follow-up (64%). Taub, Steiner, Weingarten, and Walton (1994) randomly assigned 250 male alcoholics in an inpatient alcohol treatment program to one of four treatment adjuncts: daily practice of transcendental meditation, biofeedback, “neurotherapy” (daily application of a low intensity electric pulse through a head band), and a no-adjunct control. All adjuncts were designed to occur daily during the 3-week residential stay. Up to 18 months after treatment, patients in the meditation and biofeedback conditions reported significantly fewer drinking days than those in the other two conditions. However, of the 250 participants who volunteered for the study and completed the first week of treatment, follow-up data were reported only on 69 subjects. In sum, the practice of transcendental meditation, a form of relaxation meditation, appears to lead to improved outcomes in the short term. However, the short follow-up intervals and the high attrition rate over the follow-up seriously compromise these conclusions. Further, relaxation meditation may not provide unique benefits beyond other relaxation strategies (e.g., biofeedback).

Mindfulness Meditation

Mindfulness meditation differs from relaxation meditation in an important way. As in relaxation meditation, one attends to the breath or body sensations. In contrast to relaxation meditation, mindfulness meditation has a different attitude toward “distracting” mental events. One brings an attitude of acceptance to the inevitable distractions that occur when one sits still. Even when experiencing an unpleasant emotion or distracting thought, one observes or investigates the experience rather than avoid-

ing or suppressing it. These principles of mindfulness have also been incorporated into yoga, another type of practice included in some mindfulness interventions (Kabat-Zinn, 1990).

This attitude of acceptance does not refer to passivity or resignation in the face of strong affective states. Rather, it refers to being fully present with, but not preoccupied with, these states as they happen. Through this interplay of focusing on an object, acknowledging and accepting distractions, and gently returning the attention to the breath, one learns not to take emotions and thoughts literally as facts, but simply as mental events. In other words, mindfulness meditation can change how one relates to dysfunctional thoughts and negative affect rather than changing or eliminating the states themselves. Relating to thoughts and emotions this way has been referred to as taking a “decentered perspective” or “cognitive distancing” (Hayes et al., 1999; Teasdale, Segal, & Williams, 1995). This ability to take a decentered perspective is thought to be a key skill in preventing escalation of dysfunctional thoughts and reducing emotional avoidance (Teasdale et al., 2000). Given our later emphasis on the role of mindfulness as a process of desensitization, we view taking a decentered perspective as a phenomenological correlate of this process.

Mindfulness interventions have demonstrated benefits for psychiatric disorders such as depression and BPD, where emotional avoidance is a factor and dysfunctional modes of processing are a feature. The potential benefits of mindfulness for treating addictive behaviors has been recognized (Marlatt & Kristeller, 1999), and DBT has recently been evaluated for substance abusers (Linehan et al., 1999). Consequently, it is important to review the empirical evidence for the notion that mindfulness is useful in the treatment of clinical disorders. DBT and ACT are both empirically supported, multicomponent therapies that include a mindfulness component. These two therapies can be differentiated from mindfulness-based stress reduction (MBSR) and MBCT, in which intensive training in mindfulness practices is the primary component.

Acceptance and Commitment Therapy. ACT holds that many types of psychopathology are associated with attempts to change or avoid negative thoughts or emotions (Hayes et al., 1999). This emotional avoidance is partly due to the tendency to confuse thoughts with facts, that

is, taking too literally one’s beliefs about oneself and the world. In ACT, the clients learn mindfulness and other skills that increase their willingness to “make room” for unwanted reactions to difficult situations. Mindfulness helps increase this willingness by building greater awareness of an observing self and helping distinguish between evaluative thoughts, thoughts that tend to distort or manipulate direct experience, and descriptive thoughts regarding direct experience (Hayes et al., 1999). Reductions in emotional avoidance are achieved through a variety of in-session experiential exercises and use of metaphors to “deliteralize” thoughts and beliefs. Although homework is part of ACT, it is individualized for the client and there are no invariant mindfulness practices that clients are expected to do daily.

To date, empirical support for ACT is limited. A small randomized clinical trial comparing ACT to CBT among 18 depressed women showed ACT producing greater reductions in symptoms of depression than CBT (Zettle & Hayes, 1986). However, a subsequent controlled trial comparing ACT and CBT for depression showed similar reductions across all treatment groups (Zettle & Raines, 1989). The use of individual therapy in the former and a group format in the latter study may account for the mixed findings. Also, a preliminary outcome study on ACT with 12 anxiety disorder clients found that all clients reported reductions in anxiety of at least 50% over the course of treatment (Hayes, 1987). With the limited evidence of the effectiveness of ACT, no firm conclusions can be drawn. The equivalent outcomes of the Zettle and Raines study on depression suggest that an approach that includes features such as mindfulness and acceptance is comparable to the more empirically established CBT for depression. However, Zettle and Raines also found that clients receiving ACT reported greater reductions in the believability of dysfunctional thoughts, suggesting that a combination of ACT and CBT skills may have additive effects if an integrative conceptual structure could be found.

Dialectical Behavior Therapy. DBT is a comprehensive approach developed for borderline personality disordered (BPD) clients in which mindfulness is a core component (Koerner & Linehan, 2000). DBT combines elements of traditional cognitive-behavioral approaches with Zen philosophy. DBT is premised on a biosocial theory that views dysfunctional behavior as a consequence of an underlying dysfunction of the emotion regulation system.

Emotion dysregulation is associated with a vulnerability to negative affect and an inability to modulate that affect (Linehan, 1993). Dysfunctional behavior can function to soothe intense negative emotions. For example, dysfunctional behaviors such as emotional numbing and parasuicidal acts serve to block emotionally valenced stimuli. One implication of this formulation is that individuals with BPD need to learn more adaptive strategies to modulate the reactivity, intensity, and duration of their emotional responses.

Dialectics in DBT refers to apparently contradictory strategies or approaches the therapist takes with the clients. In DBT, a central dialectic is that of change in the context of acceptance (Linehan, 1993). DBT therapists focus on helping individuals decrease substance use behavior through two simultaneous strategies. First, therapists may teach clients to engage in new behaviors (e.g., increasing activities) or may seek to modify dysfunctional thinking associated with substance use. Second, therapists facilitate self-acceptance. For example, the individual who has strong urges to use may be encouraged to observe these urges or may be encouraged to accept the pain associated with withdrawal. Both strategies are viewed as essential to the therapeutic process. Thus, enhancing modulation of emotions involves the balancing of two apparently opposite strategies: increasing acceptance of emotions and changing emotional experience. Mindfulness is a central strategy used in DBT to increase acceptance. The effectiveness of mindfulness is believed to function as an exposure strategy that works by helping to extinguish automatic avoidance of emotions and fear responses (Linehan, 1993).

In terms of empirical support, Linehan, Armstrong, Suarez, Allman, and Heard (1991) randomly assigned women diagnosed with BPD to either DBT or referral to individual psychotherapy in the community (i.e., treatment as usual [TAU]). During the 12-month treatment, patients in the DBT condition, compared to those in the TAU condition, exhibited fewer parasuicidal behaviors, less medically severe parasuicidal behavior, reduced hospitalization days, and better retention in treatment. After a 1-year follow-up, DBT patients continued to have significantly fewer parasuicidal behaviors and psychiatric inpatient days. Six-month clinical trials of DBT have also suggested that patients with BPD can derive significant benefit, with reductions in parasuicidal behavior, suicidal ideation, anger, and dissociation (Koons et al., 1998).

DBT has also been implemented in the outpatient treatment of suicidal adolescents (Miller, Rathus, Leigh, & Landsman, 1996). Again, better retention rates and fewer hospitalizations were observed among patients receiving DBT than among those in the treatment-as-usual condition (i.e., community referral). However, this study found no between-groups differences in parasuicidal behaviors.

DBT skills are also being applied to other psychiatric disorders. For example, Telch, Agras, and Linehan (2000) reported that a 20-session group program of DBT skills, including mindfulness, brought about a significant reduction in the number of binge episodes and increased weight among bulimics. Recently, DBT has been applied to substance abuse treatment (Linehan et al., 1999). Twenty-eight women diagnosed with BPD and substance dependence were randomly assigned to a 1-year treatment of DBT or a TAU condition. The TAU condition was a naturalistic control in which participants received referrals to mental health or addiction counselors in the community or continued with their individual therapists if they were already in therapy. Findings indicated that those receiving DBT had significantly greater reductions in their substance use. In addition, DBT patients were more effectively retained in treatment, with 64% retention compared to 27% retention in the TAU condition. DBT patients had made better social and global adjustment after 1 year of treatment and at the 16-month follow-up. Taken together, these data suggest that DBT is effective in treating several disorders where emotional regulation is an issue. However, because DBT teaches a number of skills, the unique contribution of mindfulness to outcomes remains to be determined.

MBSR/MBCT. Mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT) are interventions in which mindfulness meditation is the primary part of the intervention, unlike DBT or ACT, in which mindfulness is one component in a multicomponent treatment. These mindfulness-based interventions have been evaluated with anxiety and mood disorders.

The 8-week MBSR program provides intensive training in mindfulness practice through weekly group sessions and daily mindfulness “homework.” The core mindfulness practices consist of sitting meditation and light yoga stretches (Kabat-Zinn, 1990). Kabat-Zinn and his colleagues have reported significant symptom reduction for participants with anxiety disorders who completed the

program, reductions that were largely maintained up to 4 years after the program (Kabat-Zinn & Chapman-Waldrop, 1988). The MBSR program has also been adapted and applied to the treatment of binge eating disorder. A treatment outcome study examining binge frequency and mood up to 6 weeks after the program showed significant gains compared to pretreatment assessment (Kristeller & Hallett, 1999). However, conclusions regarding efficacy must be tentative because both of these studies lacked a comparison group.

Mindfulness has also been used to prevent relapse for depression in an intervention called MBCT. Cognitive models of depression suggest that after recovery from a depressive episode, events that elicit transient dysphoric mood can increase the risk of a recurrence of depression (Segal, Gemar, & Williams, 1999). This increased vulnerability occurs because dysphoric mood activates dysfunctional modes of processing, where the resulting meanings and experiences can escalate into clinical states of depression (Teasdale, 1999). To help prevent relapse, therefore, psychological interventions for depression need to reduce the likelihood of dysfunctional modes of processing and facilitate disengagement of attentional processes that support depressive processing of information (Teasdale et al., 1995). To these ends, MBCT provides intensive training in mindfulness similar to MBSR (with relevant techniques from cognitive therapy) that fosters a nonliteral, decentered relationship to negative thoughts and feelings.

Teasdale et al. (2000) evaluated MBCT by randomly assigning 145 recovered recurrently depressed clients to either MBCT or treatment as usual. Over the 60-week follow-up, those clients with three or more previous depressive episodes who also received MBCT had significantly fewer relapses. The follow-up was completed on 95% of the clients who started treatment, so this study does not suffer from the attrition problems of early meditation studies in addictions.

Summary. The empirical support on the integration of mindfulness into the treatment of a range of disorders is still in its early stages. Nevertheless, several of the studies are of high quality and show mindfulness to be beneficial across a diverse set of disorders. Given the number of approaches that include mindfulness in multicomponent treatments, there is a clear need for dismantling studies that can provide evidence for the level of contribution of mindfulness in treatment clinical disorders.

Even though the terms across models may differ, interventions that include mindfulness appear to have some commonalities. For example, these interventions all emphasize the notion that awareness of the present moment and acceptance of it are important aspects of mindfulness meditation. This can be distinguished from forms of meditation that emphasize relaxation. There are also similarities around the mechanisms operating in mindfulness. ACT holds that the deliteralization and decentering of cognition that arises through mindfulness practices is one of the ways that mindfulness aids in reducing emotional avoidance. MBCT highlights the utility of mindfulness for training attention and disengaging from depressogenic modes of processing. Linehan (1993) views mindfulness as a form of exposure to negative affect that progressively increases BPD clients' ability to regulate affect. These explanations of mindfulness are not mutually exclusive, and we believe that an information-processing model of mindfulness in addictions is a useful place to integrate some of these explanations of how mindfulness works.

AN INFORMATION-PROCESSING ANALYSIS OF RELAPSE IN ADDICTIVE DISORDERS

In this section, we outline the role of memory and attentional processes in substance use and relapse. This information processing analysis holds that mindfulness practices help prevent relapse through increased awareness of overlearned patterns of thoughts and emotions that potentially lead to relapse and exposure and desensitization to triggers, especially negative affect (Teasdale, 1999).

Memory and attentional processes have been implicated in many forms of psychopathology, including anxiety disorders (Foa & Kozak, 1996; Lang, 1979) and mood disorders (Gotlib & McCann, 1984). For example, depressed people and people experiencing transient dysphoric states find it easier to recall unpleasant events than pleasant ones (Teasdale & Barnard, 1993). Moreover, vulnerability to relapse in depression is related to the reactivation of depressive schemas and associated memories that existed during episodes of depression (Segal et al., 1999). Reactivation of depressogenic memories and related cognitive structures can, in turn, intensify dysphoria, a circle that may end in relapse.

Conceptual Overview

A number of theories have been advanced to explain the role of information processing in drug and alcohol use

and relapse to these behaviors. Baker, Morse, and Sherman (1986) argued that conditioned motivations were encoded in a memory network containing propositional information about drug-relevant and affective stimuli and responses to these stimuli. They posited two mutually inhibitory “urge” systems: a positive affect system that mediates desire for reward or positive reinforcement and a negative affect system that mediates desire for negative reinforcement or relief from emotional distress or withdrawal. Subsequent empirical research has supported Baker et al.’s dichotomy, showing that desire to smoke can be activated or primed by mental imagery scripts describing positive or negative affective situations (Tiffany & Drobes, 1991).

Some information processing advocates have questioned the importance of urges in actual substance use and relapse. The fact that cue-induced urges only moderately predict relapse (Hodgson, Rankin, & Stockwell, 1979; Kaplan, Meyer, & Stroebel, 1983; Rickard-Figueroa & Zeichner, 1985), and that many substance abusers do not spontaneously cite these factors as motives for relapse in retrospective accounts (e.g., Cummings et al., 1980), has contributed to this skepticism. In light of this evidence, Tiffany (1990) advanced a theory in which urges play a relatively minor role in drug use and relapse. Instead, most drug and alcohol use is presumed to be governed by memory-based, drug-use action plans established by repetitive, stereotyped drug use and operate automatically, that is, with little conscious awareness or effort. Following Langer (1978), who proposed that much of our day-to-day behavior is “mindless,” and general theories of automatic information processing (e.g., Fisk, Ackerman, & Schneider, 1987), Tiffany argued that both ongoing drug use and relapse are often automatic or scripted. In contrast, urges are said to be associated with conscious efforts to inhibit the operation of the drug-use action plan (i.e., to prevent relapse). When abstinence is a goal, urges involve nonautomatic (i.e., conscious, effortful) cognitions that compete with automatic (i.e., unconscious, effortless) drug-use action plans. Thus, relapse can occur under two circumstances: when the action plan operates autonomously and when conscious processes invoked to inhibit the action plan are unsuccessful.

In each of the scenarios described by Baker et al. (1986) and Tiffany (1990), the putative cause of drug use is activation of an integrated network of information

contained in long-term memory. Therefore, any factor that promotes activation of this network should promote drug use. Similarly, any factor that impedes the operation of processes that reduce activation (e.g., coping strategies) will indirectly promote drug use.

Process models of memory universally recognize the role of attention as a gateway to memory; nothing is encoded into or retrieved from memory unless a modicum of attention is allocated to a target stimulus (Craik & Lockhart, 1972; Norman, 1968; Triesman, 1960). Therefore, factors that influence attention should also influence activation of memory. For example, benzodiazepines, which reduce the amount of attention or cognitive resources allocated to a stimulus (e.g., Semlitsch, Anderer, & Saletu, 1995; Urata et al., 1996) also impair encoding of that stimulus into long-term memory (Danion, Zimmermann, Willard-Schroeder, Grange, & Singer, 1989). Further, memory tasks that are more sensitive to the attention devoted to a stimulus are more disturbed by benzodiazepines than tasks that are less sensitive to attentional demands (Weingartner, Hommer, Lister, Thompson, & Wolkowitz, 1992).

Memory also has reciprocal effects on attention: more attention is devoted to stimuli with learned significance (i.e., whose representations are encoded in long-term memory) than to stimuli without such significance. This is the presumed source of the well-known “cocktail-party effect,” in which attention is differentially and involuntarily allocated to the mention of one’s own name in a context of diffuse background noise (Cherry, 1953). This phenomenon has implications for substance use in that drug- and alcohol-related stimuli can acquire the ability to differentially and involuntarily recruit attention in individuals with a history of exposure to these stimuli. Thus, alcoholics have difficulty not attending to alcohol-related color-words (e.g., *beer*) on a modified Stroop task (Stetter, Ackermann, Bizer, & Straube, 1995). Similarly, pathological gamblers have difficulties with respect to gambling-related words (e.g., *wager*; McCusker & Gettings, 1997).

Figure 1 outlines the memory and attentional processes believed to be involved in substance abuse and relapse. The figure shows two cognitive loops, an attention/sensory loop and a memory loop, which are reciprocally related. The attention/sensory loop processes stimuli that can instigate drug and alcohol use. As shown, environmental stimuli can activate memory directly with no con-

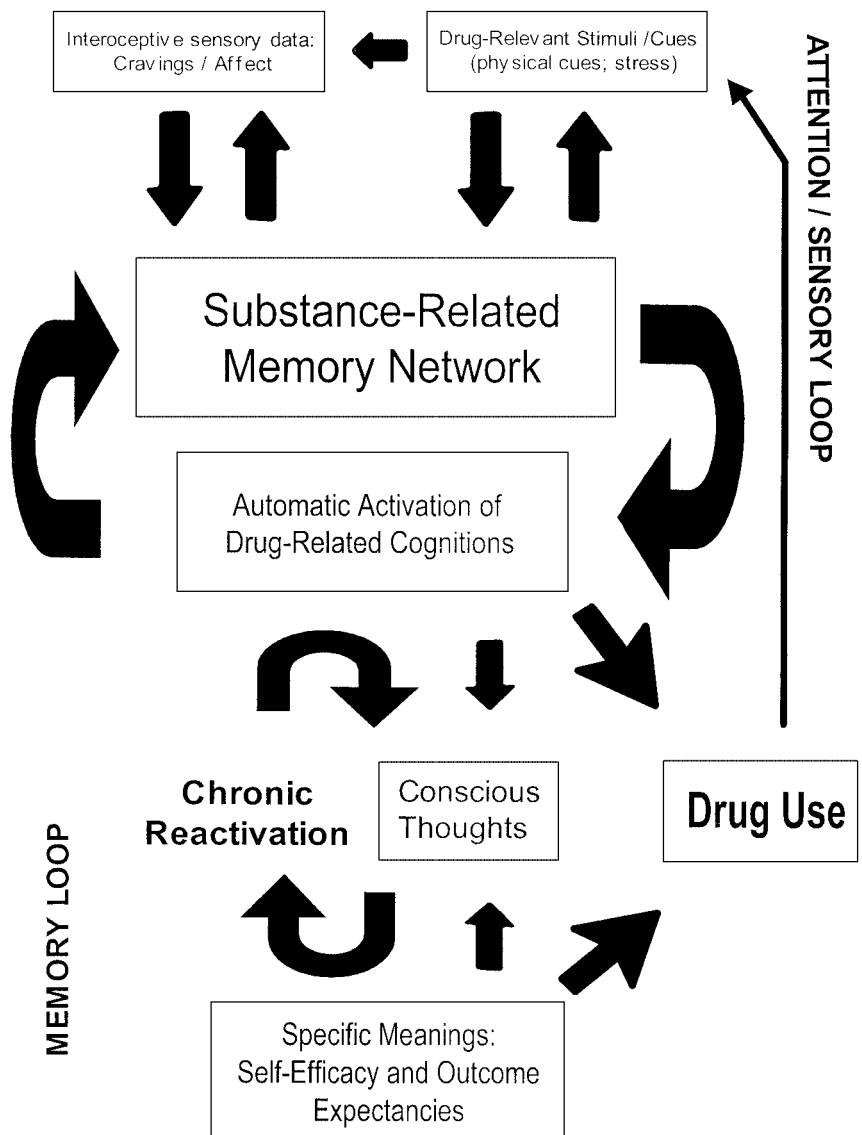


Figure 1. A diagram representing the relationship between components of an information-processing analysis of substance use.

comitant experience of urges/cravings or negative affect. This circumstance corresponds to Tiffany’s “automatic” processing scenario in which the memory-based action plan affects drug use in the absence of conscious awareness of a motivation to use or voluntary steps to do so. Physical stimuli can also activate memory indirectly by promoting urges or negative affect that are the proximal cause of substance use. This corresponds to Tiffany’s “nonautomatic” processing scenario. In this case, Tiffany suggests that cognitive resources are consciously devoted to disrupt the operation of the action plan. However,

from a straight conditioning standpoint, prior experience of those affective states in the context of drug or alcohol use could also activate drug- and alcohol-related memories (Bradizza, Stasiewicz, & Maisto, 1994). By this reasoning, the “exhausting and effortful” effects of urges in abstinent addicts (Tiffany, 1990, p. 158) may reflect the activation by emotional aspects of these states of automatized action plans that the addict is consciously trying to inhibit. Whereas the action plans are firmly established and require few resources to operate, the “abstinence plan” is poorly established and demands vigilance (i.e., at-

tion) and effort to maintain. Therefore, it is not surprising that many addicts eventually take the path of least resistance and revert to substance use.

Attention, Memory, and Relapse

Relatively little empirical research has demonstrated the direct relationship between attentional biases and relapse to drug or alcohol use. However, one study found that attention to alcohol stimuli during cue exposure among treated alcoholics significantly predicted the percentage of abstinent days during a 3-month posttreatment period. Individuals who reported greater attention to the sight and smell of, and greater thoughts about, the alcoholic beverage during the exposure phase had more abstinent days at follow-up than those who reported less attention to these stimuli (Rohsenow et al., 1994). The authors concluded that this relation indicated greater conscious processing of a high-risk situation, which in turn may promote (1) development of coping responses, (2) greater awareness of risks inherent in these situations, or (3) greater extinction of conditioned reactions. They further suggested that “alcoholics who try to avoid dealing with a high-risk situation (i.e., deliberately do not attend to alcohol stimuli) or deny its impact on them may be less able to cope with the high-risk situation and may, therefore, be at higher risk for drinking” (p. 624).

Rohsenow et al. (1994) and Tiffany (1990) focused on the conscious allocation of attention in their analyses of the relapse process. Their formulation reflects the finding that conscious attention to substance-related stimuli and urge are correlated (Rohsenow et al., 1994) and the assumption that urges involve conscious, nonautomatic information processing rather than preconscious, automatic processing. However, it is also possible that automatic attentional processes are recruited by substance-related stimuli and that these processes are also important for relapse. This is consistent with the notion that drug-use action plans contain information about eliciting stimuli that is activated automatically by exposure to those stimuli.

To determine the role of automatic attentional processes in urge to use, one must measure the relation between urge and attention to drug-relevant stimuli when the addict is explicitly instructed to ignore those stimuli. Zack, Belsito, Scher, Eissenberg, and Corrigan (2001) recently found that Stroop interference to smoking-related words (e.g., *cigarette*) significantly predicted the desire to smoke in overnight-abstinent smokers. This correlation

was not mediated by interference to neutral words (e.g., *conductor*) or by the number of cigarettes smoked per day. Zack et al. concluded that the incentive value of a drug stimulus (i.e., urge to use) predicts how much attention is automatically allocated to it. Taken together, the evidence from the Stroop task is consistent with Rohsenow et al.'s (1994) proposal that deliberate inattention to drug-relevant stimuli may characterize addicts at heightened risk for relapse. It also shows that conscious drug use motivation (i.e., self-reported urge) may not be dissociated from automatic attentional processing. It further suggests that involuntary attention to drug stimuli, despite efforts to ignore them, may partly mediate between cue exposure and relapse.

Memory processes are also implicated in relapse. One way negative affect may promote relapse is by automatically activating drug-relevant cognitions linked to negative affect in the memory network. This notion is supported by the finding that negative affective cues activated alcohol cognitions in sober problem drinkers (Zack, Toneatto, & MacLeod, 1999b). The activating effect of negative affective cues on alcohol cognitions depends both on temperament and drinking history. Problem drinkers high in negative affect (anxious, depressed) display significantly more activation than problem drinkers low in negative affect, and the relative frequency of drinking in negative as opposed to positive affective states directly predicted the degree of activation displayed. The degree of activation in turn predicted the subjective confidence to abstain from drinking in negative affective states (i.e., self-efficacy). These results indicate an association in memory between negative affect and alcohol in certain problem drinkers and suggest that the strength of these associations (as reflected by the degree of activation) is related to the drinker's conscious appraisal of his or her ability to abstain.

Memory processes are also implicated through involuntary retrieval of drug-related thoughts, a hallmark of addicted populations. Indeed, obsessive thoughts about procuring a substance are now recognized as a criterion of drug and alcohol dependence (American Psychiatric Association, 1994; World Health Organization, 1992). A recent study found that the intensity of obsessive thoughts about alcohol as measured by the Obsessive Compulsive Drinking Scale predicted the number of prior detoxifications from alcohol (i.e., relapse rate), and that this relationship persisted when depressive symptoms and

pretreatment drinking frequency were controlled for statistically (Malcolm, Herron, Anton, Roberts, & Moore, 2000). As shown in Figure 1, this finding suggests that chronic reactivation of drug-related thoughts, whereby initial activation leads to conscious thoughts about the drug which, in turn, activate related nodes in memory, is an important correlate of actual drug use and, more specifically, of relapse to drug use.

Teasdale (1999) noted that relapse to depression is often characterized by chronic reactivation of negative affective memories. He described this situation as “depressive interlock” and characterized the individual’s subjective state as “mindless emoting.” Mindfulness can break this interlock by restoring an active mode of processing such that a negative thought that would otherwise activate the network is observed and appraised. This can interrupt the continuous cycle of reactivation (i.e., obsession) or spreading activation (i.e., globalization) that leads to an escalation in negative affect (i.e., depressive relapse). Figure 1 depicts this chronic reactivation process with respect to addictive behavior. To the extent that mindfulness disrupts this cyclic process, the individual may experience less escalation in drug-related cognitions and thereby gain increased self-efficacy to abstain in high-risk situations that previously instigated this escalation. A beneficial effect of mindfulness on self-efficacy would be especially important inasmuch as this variable has been consistently linked with decreased risk of relapse (Greenfield et al., 2000; Miller et al., 1996).

One implication of chronic reactivation is that the individual may be motivated to use a drug to “silence” the obsessive thoughts (Zack et al., 1999b). Consistent with this possibility, Zack, Toneatto, and MacLeod (1999a) found that clinical use of benzodiazepines coincided with decreased activation of alcohol cognitions by negative affective cues (e.g., tense-drink) in anxious alcoholics. The fact that patients taking benzodiazepines displayed no decrease in activation of neutral cognitions by related neutral stimuli (e.g., dog-cat) indicated that the medication had a selective dampening effect on addiction-related cognitions. Given the similar pharmacological profile of benzodiazepines and alcohol, it is possible that benzodiazepines deactivated the alcohol memory network in alcoholics by substituting for alcohol itself. In other words, the decrease in network activation under benzodiazepines may be a cognitive manifestation of satiety. Zack et al. (2001) observed a similar decline in cigarette-related cog-

nitions when nicotine-deprived smokers were allowed to smoke a cigarette.

With reference to Figure 1, decreased activation of the substance-related network after use may reflect a reduction in the downward pointing arrows between the eliciting stimuli shown at the top (appraisal disruption), a reduction in the upward pointing arrows from the substance-related memory network (retrieval disruption), or a reduction in the curved arrow leading from the substance-related memory network to the activation of drug-related thoughts (i.e., decreased spreading activation across nodes within the network). Although the precise locus of these pharmacological effects remains to be determined, the interconnected nature of the network implies that disturbance of appraisal, retrieval, or propagation across nodes should each have the same result: decreased activation of the drug use memory network and hence a decreased likelihood of actual drug use.

Mindfulness as a Sensitizing Process

Mindfulness encourages conscious attention to one’s current experience. The mindful deployment of attention, what Tiffany calls nonautomatic or effortful processing, contrasts directly with the mindless or automatic allocation of attention driven by substance use memory networks. In contrast to Tiffany’s formulation, however, mindfulness (i.e., nonautomatic processing) is not used to inhibit drug use action plans, but to observe the mental and emotional output from the memory network. Paying attention in a nonjudgmental way to these mental events represents a shift to observing experience (i.e., a decentered perspective). The shift in perspective from actor or subject to observer may reduce the urgency inherent in an urge or emotion. In this way, mindfulness may attenuate the valence or subjective “pull” exerted by eliciting stimuli, thereby reducing their ability to initiate a relapse. Ludwig (1986) noted that the number one drinking trigger reported by alcoholics is “tension.” Although tension may reflect a chronic level of arousal, as a self-described relapse trigger, it may well denote the subjective pull to seek and consume alcohol.

From an information-processing standpoint, the ability to take a mindful, decentered perspective may also deter relapse by increasing conscious awareness of automatic responses to relapse triggers. With time, the deliberate adoption of the observer mode may also alter the contents of the drug-use script, in particular, self-efficacy

expectations. For example, repeated experience of observing rather than reacting to one's urges or emotional responses to eliciting stimuli may engender a greater sense of control over the actual decision to use. Just as decreased chronic reactivation may foster confidence to abstain in high-risk situations, so too might the psychological distance afforded by the observer perspective translate into increased self-efficacy. Therefore, two key benefits of mindfulness may be its ability to progressively replace automatic processing of drug-relevant stimuli with controlled, nonautomatic processing and to replace mindless emoting (the proximal cause of chronic reactivation) with detached observing. It should be emphasized that the nonautomatic processes of mindfulness are not employed to suppress the automatic processes, but instead to monitor them. As we suggest later, this difference may mean that mindfulness should be used initially with triggers of moderate intensity and progress to more difficult triggers. This would be akin to hierarchies constructed for behavioral treatment of phobias.

Mindfulness as a Desensitizing Process

In the previous section, we noted how mindfulness can increase awareness of dysfunctional cognitions, that is, to sensitize the individual to mental processes that promote drug use. This is the awareness function of mindfulness. In this section, we explore the converse (but complementary) relationship between mindfulness and substance-related cognition, that is, how mindfulness can desensitize the individual to adverse states that might otherwise trigger drug use. This is the emotional tolerance function of mindfulness.

A key feature of mindfulness is conscious attention to one's thoughts and feelings. In the context of addiction, this process may apply to eliciting stimuli for drug use such as negative affect. From a conditioning standpoint, conscious attention to such stimuli may act as a form of covert exposure. In addition, mindfulness practice involves being "with" one's thoughts or feelings rather than reacting to them, what might be described as a form of response substitution. This is not response prevention or inhibition. Moreover, this response and the automatic maladaptive response are not mutually exclusive. The automatic maladaptive response in this case refers to the bias in thoughts, feelings, and behavior that results from activation of the drug use network. For example, upon hearing a dog bark in a nearby yard, a dog phobic may cross to the

other side of the street. This illustrates how, in a very brief interval, activation of a memory network by a cue represented in the network, can trigger thoughts ("Danger is near"), feelings (fear), and behavior (avoidance). Moreover, these reactions can proceed with little reflection or awareness. The initial response is Pavlovian: dog barking (CS) evokes the cognition, "Danger is near" (CR). However, this Pavlovian response itself acts as a discriminative stimulus (S_d) for avoidance behavior (R_c), an instrumental response. Mindfulness is presumed to train a new CR (i.e., conscious attention) to Pavlovian cues for drug use. At the same time, mindfulness substitutes a new behavioral response, such as deep breathing, in lieu of drug-seeking or active avoidance, so that exposure to the eliciting stimulus is not preempted. Thus, an abstinent drug user who encounters a former dealer could avoid this trigger and thereby prevent extinction. Alternatively, she may engage this individual in a mindful way, allowing herself to experience the attendant thoughts and feelings with full awareness. If the trigger were an interoceptive cue, such as anxiety, the individual could actively avoid this stimulus by engaging in drug use. Alternatively, he could observe the emotional trigger in a mindful way, moving toward it psychologically and examining its features (e.g., intensity, physical location) from an objective standpoint. In sum, mindfulness practice involves both Pavlovian and instrumental responses, applied in tandem to promote extinction of maladaptive responses that stem from activation of the memory network.

The parallel operation of multiple processing systems has been conceptualized in cognitive theory for some time as well as empirically validated (Cohen, Servan-Schreiber, & McClelland, 1992). Therefore, mindful attention to drug-relevant cues or triggers coupled with a conscious, nonavoidant behavioral response may desensitize the individual to the impelling effects of emotional states even as it promotes awareness of those states. With practice, mindful attention to thoughts and emotions may even become the new default manner of processing emotional and drug-related events.

Attention and Extinction of Maladaptive Responses

Consistent with the basic principles of Pavlovian conditioning, a conditional stimulus must be perceived before a new contingency can be established (Pavlov, 1927). Because extinction involves the acquisition of a new contingency—a stimulus that previously predicted reinforce-

ment now predicts its absence—the effectiveness of extinction would appear to hinge on adequate perception of the stimulus. Accordingly, the extinction of anxiety in spider phobics is significantly more effective if the patient actively attends to the phobic stimuli during cue exposure than if he or she is distracted at this time (Hay & Dickerson, 1998).

Attention is not only critical to therapeutic effects; it also may be involved in the detrimental response to drug relevant stimuli. Specifically, deliberate efforts to ignore these stimuli may heighten risk for relapse. For example, heavy drinkers instructed to deliberately suppress their urge to drink during alcohol cue exposure have been found to endorse more positive alcohol outcome expectancies than heavy drinkers not so instructed (Palfai, Monti, Colby, & Rohsenow, 1997). Positive outcome expectancies also increase (Cooney, Gillespie, Baker, & Kaplan, 1987) and can emerge automatically (Weingardt, Stacy, & Leigh, 1996) following exposure to physical or verbal alcohol-related stimuli. Therefore, suppression of an urge would appear to lead to a paradoxical increase in the expected reinforcing effect of a drug in high-risk situations. The finding that these expectancies can arise automatically suggests that activation of memory plays a role in this process.

Tiffany (1990) suggested that successful abstinence should result from deliberate inhibition of the automatic drug-use action plan, an intensely effortful process. In particular, he notes, “the most effective means of inhibiting cognitive processing that is initiated by particular stimulus configurations is to disrupt the stimuli driving the cognitive activity” (p. 158). This approach assumes that cognitive inhibition will ultimately prevent drug use. However, the paradoxical effects of inhibition mentioned above suggest that abstinence may be more likely to result from conscious attention to such stimuli. This assertion is entirely consistent with the tenets of mindfulness training, but not entirely consistent with treatment modalities such as CBT. CBT aims to alter the features of the trigger through direct action on the trigger (e.g., avoidance) or reinterpretation (e.g., to make it less appetizing or more aversive; Beck, Wright, Newman, & Liese, 1993). Avoidance entails an active response when the eliciting stimulus is cognitive and motivates approach behavior. This reflects the immediacy of cognition as opposed to environmental cues (e.g., a drug dealer), which may be avoided passively (e.g., staying home). Certain cognitions also motivate

approach behavior. For example, thoughts about drug use can motivate drug seeking. This creates an approach-avoidance conflict for the drug user who is trying to abstain. Avoidance of cognitive triggers thus involves transforming these triggers or reducing their salience, perhaps through distraction.

In contrast to an avoidance strategy, mindfulness training does not seek to inhibit or alter cognitive triggers. Instead of responding overtly or obsessing about drug-related thoughts or emotions, mindfulness training promotes active observation of these thoughts and feelings. Instead of suppressing attention to the stimulus, one refocuses attention on it from the perspective of a dispassionate observer. In some cases, the mindful observer may even label these thoughts and feelings, further enhancing their salience while at the same time promoting objectivity. Thus, mindfulness practice could be characterized as an approach-based rather than an avoidance-based strategy, where the eliciting stimulus is held in awareness but is not permitted to consume the observer. Repeated practice of this behavior can establish a new pattern of highly conscious, deliberate information processing to replace the relatively unconscious, involuntary pattern of processing that arises from activation of the drug-use memory network.

In summary, an information-processing analysis recognizes two basic pathways to drug use: one that is preconscious (activation of drug-related thoughts) and one that is conscious (self-efficacy and outcome expectancies; see Figure 1). Mindfulness practice promotes attention to one’s own cognitive and affective responses, including subtle ones (e.g., misattributions). This may sensitize the individual to linkages between emotional distress and drug use that he or she was not previously aware of, an effect that should reduce preconscious processes in drug use. At the same time, by reducing avoidance of negative affect, mindfulness may desensitize the individual to the aversive aspects of these states, obviating the need to escape them by using drugs. Thus, sensitization to preconscious processes and tolerance of negative affect and cognition are two ways in which mindfulness can help to restore voluntary control of cognition and affect. These in turn may reduce the likelihood of mindless or affect-induced relapse to drug use.

The notion that mindfulness can both sensitize and desensitize an individual to negative affect seems initially contradictory. However, the nature of the response varies

for these two effects. Specifically, we have proposed that mindfulness can sensitize attentional responses to negative affective stimuli so that automatic, potentially maladaptive responses, like memory network activation, do not proceed unchecked. At the same time, we have asserted that mindfulness can desensitize emotional responses to negative affective stimuli that are conscious but can also activate the drug-use memory network. Sensitization of attention and desensitization of emotion together increase the ability to respond flexibly and with heightened awareness to the challenge of negative affect. Mindfulness thus enables individuals to fully engage negative affective stimuli while neutralizing their ability to recruit drug-related responses. Given the overlearned nature of the drug use script, it is reasonable that mindfulness must be practiced extensively to be effective. Once established, a new action plan is recruited, a response that can operate in parallel with the automatic drug action plan.

HOW MINDFULNESS MAY COMPLEMENT CBT IN PREVENTING RELAPSE

An Information-Processing Perspective on CBT Prevents Relapse

From this information-processing perspective, CBT is thought to alter attention and memory in ways that would prevent relapse. In CBT, clients use daily monitoring logs to keep track of any substance use during the week, the type of high-risk situations encountered, and moods and thoughts related to these situations. This systematic recording of situations, moods, and thoughts helps the client increase his or her awareness of antecedents and consequences of substance use. Through increasing awareness of thoughts and emotions (i.e., sensitization), especially around high-risk situations, daily monitoring helps disrupt the automatic engagement of modes of processing usually triggered in high-risk situations.

Alteration of attention and memory processes may also underlie the three primary relapse prevention strategies in CBT. One strategy is to avoid triggers, the “people, places, and things” associated with drinking. Alternative activities such as reading, going to a movie, or exercising are encouraged, especially early in the change process (Annis & Davis, 1991). Indeed, clients tend to generate many avoidant coping strategies when completing CBT homework (Breslin, Sobell, Sobell, Sdao-Jarvie, & Sagorsky, 1996). Although this may be a useful and necessary strategy for concrete triggers such as bars, this strategy may leave the conditioned associations unmodi-

fied. Further, affect-related triggers, what appear to be the majority of relapse antecedents, cannot be completely avoided.

Another set of CBT strategies consists of active behavioral strategies such as drink refusal skills, communication skills, problem-solving skills, and building social support (Kadden et al., 1994). Clients are trained to use these skills in an effort to increase their confidence in their ability to cope with high-risk situations. Modifying one’s confidence in handling a particular high-risk situation may also modify the meaning of encountering a high-risk situation. This increased awareness of alternate responses to high-risk situations, rather than reacting to one’s urges or emotional responses, leads to a greater sense of control over use.

A final relapse prevention strategy is cognitive restructuring. Clients learn to dispute the content of the dysfunctional thoughts with various strategies (e.g., rational disputation). For example, if a client had the thought “My relapse means that I am a failure,” a CBT therapist would help the client dispute and change the content of the thought. This might include assisting him or her in identifying the type of cognitive distortion and by exploring the events in the past that would refute this overgeneralization (e.g., “My relapse is a temporary mistake I can learn from”). Beck et al. (1993) also emphasize the role of beliefs about the self in general that may trigger substance use. Core beliefs such as “I am helpless” or “I am unlovable” are thought to produce excessive emotional reactions, especially in high-risk situations. Identifying assumptions and core beliefs would be a form of sensitization and disruption of automatic processing. Challenging the assumptions behind these beliefs would lead to different meanings that again would alter the eliciting stimuli themselves. In addition, this type of cognitive challenge renders the decision-making process conscious and deliberate rather than preconscious and automatic. Thus, cognitive restructuring can attenuate affective reactions to, for example, interpersonal conflict, thereby increasing the likelihood that negative mood will remain transient and not serve to increase risk for relapse.

These relapse prevention strategies have demonstrated their utility in evaluations of CBT (Miller et al., 1995). However, behavioral strategies are most applicable to tangible triggers that are proximal to use (e.g., bars, friends who drink). An exception is cognitive restructuring that attempts to reduce affective reactions in high-risk situa-

tions. Given CBT's emphasis on change strategies, one potential method of enhancing relapse prevention may be to provide useful strategies for situations such as negative affect that are less under the client's control and less amenable to change strategies.

How CET Prevents Relapse

Cue exposure treatments have been shown to reduce relapse rates after treatment (e.g., Monti et al., 1993). As mentioned previously, CET is thought to reduce relapse by disrupting the effects of triggers on attention and desensitizing substance-related memory networks. Thus, the same mechanisms hypothesized for mindfulness are thought to operate in other exposure-based procedures.

Cue exposure is potentially more congruent with mindfulness interventions and with the notion of accepting rather than avoiding or changing negative affect. However, CET focuses on different aspects of the relapse process than mindfulness interventions. For example, all but one cue exposure study (for an exception, see Monti et al., 1993) used alcohol smell and sight as a cue. This is problematic because the most common relapse antecedent according to clients is negative affect. As a client of the first author succinctly stated when asked how he would cope if he found himself in a liquor store, "If I am in a liquor store, I have already relapsed." This statement speaks to the importance of addressing antecedents far enough "upstream" that a client can more easily prevent a relapse. This restrictive focus on environmental stimuli in CET was partly addressed by Monti et al. through the inclusion of imaginal high-risk situations. This procedure allows for exposure to triggers that include negative affect. However, the imaginal procedures may be less useful for some clients because of individual differences in the ability to generate images (Cook, Melamed, Cuthbert, & McNeil, 1988; McNeil, Vrana, Melamed, & Cuthbert, 1993). In addition, high-risk situations may involve negative affect that is too intense for some clients, suggesting that mild dysphoric states might be an appropriate starting point. Thus, mindfulness intervention's focus on real-life negative affect, as it comes up in formal and informal practice, provides exposure to stimuli not found in CET procedures.

CET also differs from mindfulness interventions because in mindfulness *how* the behavioral response (i.e., drinking) is avoided is salient, whereas in CET not engaging in drinking behavior is necessary and sufficient for ex-

tingtion to occur. As noted in the section on the information-processing model, attention during exposure and disruption of other emotional avoidance responses (e.g., distraction) through mindfulness are also necessary. As noted above, strategies to avoid negative affect such as distraction or suppression appear to have paradoxical effects on attention and memory (Wegner, Schneider, Carter, & White, 1987) and are associated with increased symptomatology (Wegner & Zanakos, 1994). Therefore, it is important how one is coping with the thoughts and feelings arising during exposure to triggers. Monti et al. (1993) addressed this issue in their study by teaching coping skills to use during exposure sessions. Although some are congruent with notions of acceptance (e.g., urge surfing; Marlatt et al., 1999), some strategies that emphasized avoidance were also recommended. Overall, while there is overlap between CET and mindfulness interventions, the potential flexibility of mindfulness in providing exposure to negative affect, and its attention to cognitive processes during exposure, distinguishes it from CET.

Mindfulness and Preventing Relapse

Mindfulness could complement CBT because it provides different skills for relating to triggers, especially negative affect. There are several similarities and difference between mindfulness interventions and CBT. An important similarity between CBT and mindfulness is the role of observation of thought, mood, and behavior (Marlatt & Kristeller, 1999). Monitoring logs are included in both MBSR and MBCT, though the emphasis is on mentally noting one's thoughts and emotions during meditation instead of writing them down. By promoting awareness of current mental events, mindfulness may increase the ability to recognize and respond to temptations or urges to use alcohol or drugs.

A fundamental difference is the use of active behavioral change strategies. Instead of seeking to alter the eliciting stimuli and automatic responses as in CBT, mindfulness seeks to enhance tolerance to triggers such as negative affect, and we posit that this represents a form of covert desensitization. In contrast to cognitive restructuring, a mindfulness approach would seek to change one's relationship to the thought rather than to change the thought itself (Teasdale, 1999). Rather than overidentifying with the thought "I am a failure," or attempting to refute it ("I can learn"), one notices it as a thought and returns to the object of meditation. This process of not disputing nega-

tive thoughts, but instead acknowledging them, not taking them personally, and noting their transient nature is a process that distinguishes mindfulness from traditional CBT strategies (Marlatt & Kristeller, 1999). This ability to maintain an accepting attitude in the face of triggers such as negative affect is thought to be the phenomenological correlate of a deconditioning process. Just as psychological or behavioral avoidance contribute to the maintenance of phobias (Hayes et al., 1999; Linehan, 1993), attempts to avoid drug stimuli and mood states that trigger urges maintain the association between triggers and use.

This analysis of mindfulness also implies that practicing acceptance of negative affect in situations not necessarily categorized as high-risk situations is worthwhile. Such practice would increase the chances that one can experience negative affect in a high-risk situation in a way that would not lead to relapse. Behavioral treatment for phobias includes formulating a fear hierarchy, starting with less intense or aversive emotional states, and progressing systematically through the hierarchy. Formal mindfulness practices assigned in MBCT or MBSR may be viewed as starting to deal with relatively mild negative affective states and practicing skills so that they will be useful when more intense affective states arise in high-risk situations. Further, the focus of mindfulness being attention and acceptance rather than relaxation (though often a byproduct) makes it possible to practice mindfulness informally in one's daily activities. For example, bringing mindfulness to routine activities such as eating provides a way of experiencing the present moment in a non-high-risk situation. The applicability of mindfulness to a range of situations and emotions increases the likelihood that the mindfulness practice and the attitude of acceptance will eventually generalize to high-risk situations.

Mindfulness would allow those affect-related triggers that automatically recruit attention anyway to be recognized in the field of attention, what Marlatt and Kristeller (1999) have referred to as "urge surfing." By maintaining attentional focus already directed toward triggers, rather than attempting to divert attention, mindfulness enables the individual to be exposed to a trigger without reacting to it behaviorally. Although the initial attentional response is automatic, the behavioral response (i.e., to use the substance) is under more volitional control. In learning to maintain attention on substance use triggers rather than fleeing them psychologically (i.e., suppression, distract-

tion) or behaviorally (i.e., drug use), mindfulness restores a measure of control to attentional processes that were previously out of control. In this sense, mindfulness is like "psychological Aikido," flowing with the force exerted by the opponent (drug stimuli/thoughts) to reduce the destabilizing impact and regain control.

In sum, CBT and CET for addictions are thought to prevent relapse by altering the conditioned associations between high-risk situations and drinking through an alternation in attention and memory processes related to use. CBT accomplishes this through a variety of strategies aimed at changing the precipitating conditions, either by avoiding or reinterpreting them or by training alternative responses to them. These active change strategies are easiest to apply around the more tangible and proximal triggers such as people, places, and things associated with drinking. CBT also addresses emotional triggers through social skill training and cognitive restructuring. Again, however, the emphasis tends to be on reducing or changing the emotional triggers so that relapse will not occur.

In contrast, mindfulness, with its emphasis on acceptance of experience, provides a supplemental skill set for dealing with triggers, especially emotional triggers. These skills that allow one to desensitize to high-risk situations that one may not be able to avoid or change. The notion of covert desensitization being useful in preventing relapse is certainly consistent within a CBT framework. The primary novelty with mindfulness in the context of addictions is the focusing on affective triggers instead of cues directly related to alcohol and drugs. Although tangible, proximal triggers are an important clinical issue and are addressed in CBT and CET, emotional triggers are much more pervasive and subtle. Accordingly, mindfulness and its emphasis on increasing awareness of automatic processes and desensitizing affect-related triggers can therefore add to the strategies provided by other cognitive behavioral approaches.

APPLICATIONS OF MINDFULNESS IN ADDICTION TREATMENT

Integrating CBT and Mindfulness

In speaking of a potential complementarity between CBT and mindfulness, an issue that arises is how to integrate the two treatment approaches, given their potentially contradictory aims. As we have discussed, CBT focuses on changing the cues or redirecting attention from stimuli associated with alcohol or drug use. Con-

versely, mindfulness meditation encourages individuals to experience and accept the present moment. The notion of dialectics, synthesizing apparent polarities of change and acceptance, is taught to clinicians using DBT. As mentioned before, DBT helps individuals to regulate negative affect and injurious behavior through providing change skills in the context of increasing tolerance to negative affect. Drawing on DBT, the implications of dialectics for addiction treatment are that people need to learn both acceptance and control of negative affect. This enhanced repertoire of ways of responding to negative affect may be better than either one in isolation.

If and when to introduce intensive mindfulness training during treatment is another important issue. By intensive mindfulness training, we are referring to interventions like MBCT where clients are given homework and expected to engage in formal mindfulness practices up to an hour a day. In the evaluation of MBCT, the mindfulness training was provided to depressed clients who had already been treated for depression and were euthymic. This would be akin to using mindfulness as an aftercare program to prevent relapse after behavior change had occurred with another approach like CBT.

Another option is to incorporate mindfulness in the initial stages of treatment in the context of a multicomponent program. In DBT, mindfulness skills are taught and reviewed throughout the 1-year treatment. DBT provides many in-session opportunities to practice but does not require a commitment to daily practice. Support for the DBT approach for the integration of mindfulness comes from preliminary findings suggesting that DBT does reduce substance use among clients with borderline personality disorder and substance use disorder (Linehan et al., 1999). Given the potential benefits of mindfulness in terms of emotional regulation, the notion of introducing mindfulness early in treatment is attractive. However, given the multifaceted nature of DBT, it is unclear what specific contribution the early, less intensive mindfulness intervention makes to treatment outcome. Dismantling studies that examine DBT with and without the mindfulness component would be useful for determining the utility and unique contribution of mindfulness in treatment outcome.

A blending of the DBT and MBCT formats for mindfulness might be fruitful to consider. Linehan's mindfulness approach, in which there is no structured daily mindfulness homework, may be best suited for introduc-

ing mindfulness in the initial stages of outpatient treatment. When behavior change has been initiated and maintenance strategies become more salient, then the intensive and structured practices used in MBSR and MBCT would be appropriate. However, the possible option of intensely teaching mindfulness as the sole initial intervention appears to hold the least promise. In the initial stages of treatment, alcohol and drug use are difficult for the client to control. Consequently, asking the client to meditate daily may lead to meditation occurring when the client is intoxicated. Given the likelihood of the situation in the initial stages of treatment before the initiation of behavior change, we question the utility of mindfulness as a stand alone, "front line" treatment for addictive behaviors.

Mindfulness and Concurrent Disorders

There is evidence that the comorbidity of mood and affective disorders and substance use presents special challenges in treatment. A review of the empirical literature reveals that individuals with concurrent psychopathology have poorer treatment outcomes compared to those without co-existing mental health disorders (Kranzler & Liebowitz, 1988; McLellan, 1986). Once recovery from substance abuse has been achieved, the presence of an emotional disorder increases an individual's vulnerability to relapse to substance use. Alcohol relapse has been shown to be elevated in individuals with an anxiety disorder (LaBounty, Hatsukami, Morgan, & Nelson, 1992) or with dysphoria (Glenn & Parsons, 1991).

Increased awareness of the unique needs of this population has fueled interest in the development of integrated treatments that offer a consistent explanation of the problem and a coherent approach to treatment. The theory that emotion dysregulation is a core underlying pathology figures centrally in explanations of substance abuse and mental illness (Foa & Kozak, 1996; Foa et al., 1984; Greenberg & Paivio, 1997). Some speculate that emotion dysregulation is a common correlate of comorbid substance disorders and mental health disorders (Linehan & Dimeff, 1997). Since mindfulness interventions can help in the regulation of emotions, they may hold promise for the treatment of comorbid populations. However, the literature on comorbidity and its implications for treatment is quite complex. Consequently, research is needed to evaluate whether the integration of mindfulness strategies has clinical utility in the treatment of concurrent disorders.

CONCLUSION

An information-processing analysis of relapse complements the cognitive-behavioral model developed over the past few decades. The observation that negative affect triggers relapse has been confirmed by research and clinical lore. The notion that substance use is an attempt to temporarily escape from negative affect also has a long theoretical and empirical history. An information-processing analysis contributes to these insights by specifying the attentional and memory processes underpinning the relationship between substance use and negative affect. The drive to avoid negative affect through substance use leads to a conditioned association where attention is more easily recruited by transient dysphoric states and negative affect is more tightly linked in memory with substance-related cognition and drug use scripts. Studies of drug craving suggest that active attempts to suppress substance-related thoughts, especially when in a state of depression, leads to a paradoxical "rebound" effect of increased drug-related thoughts and memory activation. This suggests that one reason why traditional CBT is not completely effective at preventing relapse is because it relies primarily on cognitive and behavior control strategies, strategies that might be much less effective in high-risk situations where the client has little control.

The information-processing analysis suggests that disrupting automaticity (i.e., sensitization) and desensitizing attention and memory to substance-related triggers such as negative affect may be a beneficial complement to control strategies. Mindfulness interventions attempt to alter the relationship an individual has to emotions and cognitions rather than modifying their frequency or intensity. Consistent with the information-processing analysis, this acceptance-based approach may allow for a desensitization of attention and memory responses to triggers and a sensitization to formerly automatic processes.

The few controlled studies that do exist indicate that mindfulness interventions are a promising approach and should be further investigated. The study of MBCT and depression demonstrated that an aftercare treatment primarily focused on mindfulness practices can reduce relapse. However, MBCT was provided after clients had already received pharmacotherapy and were euthymic. It is unclear whether MBCT can be used as an initial treatment with clients currently experiencing depression. DBT, on the other hand, is a multicomponent intervention and introduces mindfulness in the initial stages of

treatment for BPD. The potential utility of mindfulness in the early stages of treatment and in aftercare for addictions suggests that mindfulness (as operationalized in DBT) be part of a multicomponent treatment initially. When a change in drinking has been accomplished, however, more intensive daily mindfulness practice than is found in MBCT can be introduced. The past few decades have seen important advances in effective treatment approaches for alcohol problems. As promising approaches such as mindfulness are integrated into existing treatments, further progress can be made in reducing the risk of relapse.

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