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## Cognitive-Behavioral Therapy for Substance Use Disorders

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### Abstract

Cognitive behavioral therapy (CBT) for substance use disorders has demonstrated efficacy as both a monotherapy and as part of combination treatment strategies. This article provides a review of the evidence supporting the use of CBT, clinical elements of its application, novel treatment strategies for improving treatment response, and dissemination efforts. Although CBT for substance abuse is characterized by heterogeneous treatment elements—such as operant learning strategies, cognitive and motivational elements, and skills building interventions—across protocols several core elements emerge that focus on overcoming the powerfully reinforcing effects of psychoactive substances. These elements, and support for their efficacy, are discussed.

### Keywords

Substance Use Disorders; Cognitive Behavioral Therapy; Contingency Management; Relapse Prevention; Motivational Interviewing

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Substance use disorders (SUDs) are heterogeneous conditions characterized by recurrent maladaptive use of a psychoactive substance associated with significant distress and disability. These disorders are highly common, with lifetime rates of substance abuse or dependence estimated at over 30% for alcohol and over 10% for other drugs, and past year point prevalence rates of 8.5% for alcohol and 2% for other drugs. [1,2] As understanding of the nature of substance use patterns has improved, a greater specificity of both psychosocial and pharmacologic treatments has followed, with evidence for the efficacy and cost effectiveness of these approaches. This article will provide an overview of the evidence for and clinical application of cognitive behavioral therapy (CBT) for substance use disorders. For the purposes of this article, we will broadly define CBT to include both behavioral and cognitive behavioral interventions. Given the scope of the literature, this review will focus on the treatment of alcohol and drug use disorders not including nicotine. For review of the literature on CBT for smoking cessation see Vidrine et al.[3]

To clarify key terms used in this manuscript, the term substance use is defined as taking any illicit psychoactive substance or improper use of any prescribed or over the counter medication. Substance use disorders as used here will refer to substance abuse and substance dependence. Symptoms of substance abuse reflect the external consequences of problematic

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use such as failure to fulfill role obligations, legal problems, physically hazardous use, and interpersonal difficulty resulting from use. Symptoms of substance dependence reflect more internal consequences of use such as physical withdrawal upon discontinuation of a substance and difficulty with cutting down or controlling use of a substance.

## Efficacy of CBT for SUDs

Evidence from numerous large scale trials and quantitative reviews supports the efficacy of CBT for alcohol and drug use disorders.[4,5] For example, our group conducted a meta-analytic review of CBT for drug abuse and dependence including 34 randomized controlled trials (with 2,340 patients treated) and found an overall effect size in the moderate range ( $d = 0.45$ ), with effect sizes ranging from small ( $d = 0.24$ ) to large ( $d$  depending on the substance targeted). Larger treatment effect sizes were found for treatment of cannabis, followed by treatments for cocaine, opioids, and, with the smallest effect sizes, poly-substance dependence. Of individual treatment types, there was some evidence for greater effect sizes for contingency management approaches (see below) relative to relapse prevention or other cognitive behavioral treatments. In all cases, these advantages were computed relative to control conditions, most frequently general drug counseling or treatment-as-usual. Similar results for both alcohol and illicit drugs were reported in a meta-analytic review of CBT trials by Magill and Ray.[5] Evidence also supports the durability of treatment effects over time.[6] For example, in a study of psychosocial treatment for cocaine dependence, Rawson and colleagues [7] reported that 60% of patients in the CBT condition provided clean toxicology screens at 52-week follow-up.

CBT for substance use disorders includes several distinct interventions, either combined or used in isolation, many of which can be administered in both individual and group formats. Specific behavioral and cognitive-behavioral interventions administered to individuals are reviewed below, followed by a review of family-based treatments. The evaluation of CBT for SUDs in special populations such as those diagnosed with other Axis I disorders (i.e., dual diagnosis), pregnant women, and incarcerated individuals is beyond the scope of the current review, and thus the descriptions provided below focus on SUD treatment specifically.

## Individual and Group Treatments

CBT for SUDs encompasses a variety of interventions that emphasize different targets. Below we review individual and group treatments including motivational interventions, contingency management strategies, and Relapse Prevention and related interventions with a focus on functional analysis.

**Motivational interventions**—At the outset of considering treatment, motivation for treatment and the likelihood of treatment adherence needs to be considered. To address motivational barriers to change motivational enhancement techniques have been created and tested. Motivational Interviewing (MI)[8] is an approach based on targeting ambivalence toward behavior change relative to drug and alcohol use, with subsequent application to motivation and adherence to a wide variety of other disorders and behaviors, including increasing adherence to CBT for anxiety disorders [9-11]. Treatments based on the MI model are utilized as both stand-alone interventions and in combination with other treatment strategies for SUDs. A meta-analytic review of interventions based on MI found effect sizes across studies in the small to moderate range for alcohol and the moderate range for drug use when compared to a placebo or no-treatment control group, and similar efficacy to active treatment comparisons.[12] Most typically, MI is offered in an individual format (although group formats are also utilized) often consisting of a relatively brief treatment episode. Greater efficacy may be achieved when a higher dose of treatment is used.[12]

**Contingency management**—As treatment is initiated, a primary challenge is countering the robust reinforcing effects of the drug. Contingency management (CM) approaches are grounded in operant learning theory and involve the administration of a non-drug reinforcer (e.g., vouchers for goods) following demonstration of abstinence from substances. A large number of clinical trials have supported the efficacy of CM for various substances such as alcohol,[13] cocaine,[14] and opioids.[15] Meta-analytic reviews indicate that effect sizes for the efficacy of CM across studies are in the moderate range, with greater efficacy for some substances (opioids, cocaine) relative to others (tobacco, polydrug use).[4,16] To allow for greater cost efficacy of CM approaches, researchers have investigated the role of lottery-type strategies for distribution of reinforcers. For example, the punchbowl method rewards negative screens for drug use with the opportunity to draw a prize from a “punchbowl.” Most prizes have low monetary value (e.g., \$1), but the inclusion of rarer large prizes (e.g., \$50) both saves money while offering a successful inducement for abstinence.[17] CM procedures may use either stable or escalating reinforcement schedules, in which reinforcer value increases as duration of abstinence increases. [18] In addition to contingencies linked to negative drug screens (e.g., from swab or urine toxicology screens), adaptive behaviors ranging from attendance at prenatal visits to medication adherence have been successfully modified with CM approaches.[19,20]

A relative limitation of CM is the availability of funds for providing the reinforcers in clinical settings. The establishment of job-based reinforcements have been introduced as alternatives to aid the clinical adoption of these methods.[21,22]Also, contingency management strategies have also been incorporated into couple's interactions (utilizing the reinforcers available to the couple) to aid the reduction of drug use (see below).

**Relapse Prevention and other treatments**—Another well-researched cognitive-behavioral approach to drug abuse has emphasized a functional analysis of cues for drug use and the systematic training of alternative responses to these cues. This approach, termed Relapse Prevention (RP) focuses on the identification and prevention of high-risk situations (e.g., favorite bars, friends who also use) in which a patient may be more likely to engage in substance use.[23] Techniques of RP include challenging the patient's expectation of perceived positive effects of use and providing psychoeducation to help the patient make a more informed choice in the threatening situation. A meta-analysis reviewing the efficacy of RP across 26 studies examining alcohol and drug use disorders as well as smoking found a relatively small effect ( $r=.14$ ) for RP actually reducing substance use but a large effect ( $r=.48$ ) for improvement in overall psychosocial adjustment.[24]

Similar CBT strategies have also been developed that in addition to attending to the functional cues for drug use may include a broader range of psychoeducation, cognitive reappraisal, skills training, and other behavioral strategies. Individual CBT packages vary in the degree to which each of these components is used. For example, a cognitive behavioral intervention for cocaine dependence developed by Carroll and colleagues includes components of functional analysis, behavioral strategies to avoid triggers, and building problem-solving, drug refusal and coping skills.[25] Evidence for the efficacy of CBT for SUDs is supported in meta-analytic reviews, with effect size estimations in the low moderate range using heterogeneous comparison conditions [4] and large effect sizes compared to no-treatment control groups.[5]

### Couples and Family Treatments

Although substance abuse treatment often occurs in an individual or group format, the disorder itself has strong ties to the patient's social environment. Accordingly, several promising treatments have been developed, which utilize the support of the partner, family, and community to aid the patient in achieving abstinence. The Community Reinforcement

Approach (CRA)[26] similar to CM, focuses on altering contingencies within the environment (e.g., inclusion of favorable non-alcohol related activities in the patient's daily schedule) to make sober behavior more rewarding than substance use. The efficacy of the CRA approach for alcohol dependence has been supported through several meta-analyses [27-29] with utility also demonstrated in drug dependent populations, such as cocaine [30] and opioid dependent patients.[31]

Another treatment which utilizes the support of a significant other is Behavioral Couples Therapy (BCT). In this treatment it is assumed that there is reciprocal relationship between relationship functioning and substance abuse, whereby substance use can have a detrimental effect on the relationship and this relationship distress can lead to increased substance use. [32] Therefore, the focus of this treatment involves improving a partner's coping with substance-related situations as well as improving overall relationship functioning. Interventions commonly include psychoeducation, training in withdrawal of relationship contact contingent on drug use, and the application of reinforcement (e.g., enhanced recognition of positive qualities and behaviors) contingent on drug free days, and including the scheduling of mutually pleasurable non-drug activities to decrease opportunities for drug use and to reward abstinence.[33]

A recent meta-analysis has shown considerable support for the use of BCT over individually based counseling treatments (not including CBT) in alcohol use disorders [34] such that those in the BCT condition demonstrated reduced frequency of use, and consequences of use as well as greater relationship satisfaction at follow-up. In addition, a meta-analysis conducted by Stanton & Shadish [35] found that BCT was associated with strong treatment retention, perhaps due to successful incorporation of the patient's home environment and desired support system in treatment.

### Combination Treatment Strategies

There has been the hope that combination treatment strategies (e.g., CBT plus pharmacotherapy) will lead to especially enhanced drug treatment outcomes. However, much like the results for mood and anxiety disorders,[36] this approach has frequently met with equivocal outcomes. For example, some studies have supported the combination of naltrexone and CBT for alcohol dependence.[37-39] In contrast, the COMBINE study evaluated combinations of naltrexone, acamprosate, and behavioral interventions for alcohol dependence in 1383 patients and found that naltrexone, behavioral interventions, and their combination resulted in the best drinking outcomes; however, combination treatment did not exhibit additive efficacy relative to monotherapy.[40] The addition of behavioral strategies, such as CM has been shown to enhance the efficacy of opioid agonist therapies, such as methadone (e.g., Rawson et al., 2002). Other strategies have demonstrated success, such as the addition of disulfiram to CBT (Carroll et al., 2004) and citalopram to CBT or CM for cocaine dependence. [41]

The combination of psychosocial approaches has also yielded mixed results. For example, the combination of CBT and CM yielded the highest effect sizes (in the large range) relative to other interventions alone in a meta-analysis of treatments for drug dependence, but only two studies contributed to these effect sizes, leaving confidence in this approach limited.[4] In contrast, several studies have not demonstrated behavioral therapies, such as cue exposure and CBT [42] and CM and CBT.[7] At this time, more studies of the combination of efficacious monotherapies are needed to determine the strongest treatment strategies for alcohol and drug use disorders.

## Relative Efficacy across Treatments

Studies evaluating the relative efficacy of different cognitive-behavioral approaches for SUDs have yielded equivocal results with regard to the relative benefits of these approaches for drug use outcomes. For example, in a comparison of BCT to individual CBT for alcohol dependence, similar efficacy was noted with some cost advantages of individual CBT relative to BCT. [43] In a study comparing CM to CBT for stimulant dependence, CM demonstrated better acute efficacy; however, at follow-up, efficacy was similar for both treatments.[44] Similar results have been found comparing CM and CBT for opioid dependent patients in methadone maintenance treatment.[7] In the Project MATCH trial of the treatment of alcohol dependence, three evidence-based psychosocial treatment strategies (including CBT and an MI-based treatment) evidenced similar overall outcomes across treatment conditions at post-treatment [45] and 3-year follow-up.[46] Moreover, attempts to match patients to treatments based on baseline characteristics has yet to yield a clear sense of the front-line treatments based on the individual.[45] However, results of effect size analysis across treatment trials provide support for the most robust treatment effects for contingency management for drug use [4] and combined psychosocial treatments (e.g., CBT + cue exposure) for alcohol use.[5]

## Effectiveness of CBT for SUDs

Although empirical support for these interventions is promising, it is most often garnered through efficacy studies in which the treatment is carried out under optimal conditions. However, most SUD treatments occur in service provision settings under conditions that are far from optimal. A limited body of effectiveness research has been conducted examining these treatments without the stringent controls afforded by efficacy trials.

Several studies examined the effectiveness of CM as a supplement to traditional drug counseling. The studies initially provided relatively high rewards (as high as \$1,000) for sustained abstinence from substance use [47-49], but recently, effectiveness studies have focused on providing low-cost CM as a more feasible addition to traditional counseling programs. Petry and Martin [15] examined the addition of CM to standard community based treatment (methadone maintenance and monthly individual counseling) for cocaine and opioid dependent patients. CM in this study was delivered through a raffle format using a fixed ratio schedule in which drug-free urine samples afforded patients the opportunity to draw from a fish bowl for prizes valued between \$1 and \$100; patients in the CM condition achieved longer durations of abstinence through a 6-month follow up period relative to those who did not receive CM.

The study of effectiveness of motivational enhancement strategies has yielded mixed results. For example, in a large effectiveness trial of motivational enhancement therapy for Spanish-speaking patients seeking treatment for substance use, Carroll et al [50] found small advantages for this treatment relative to TAU only among those in the sample seeking treatment for alcohol problems. This finding of an advantage for motivational enhancement in alcohol and not drug using samples was consistent with prior investigations.[51] Similarly, a study conducted by Gray, McCambridge, and Strang [52] examined the effects of single-session MI delivered by youth workers for alcohol, nicotine, and cannabis use among young people. Upon 3-month follow-up those who received MI reported significantly fewer days of alcohol use than those who did not receive MI; however, significant differences were not found for cigarette or cannabis use indicating that the extent of benefit of MI is more modest than that identified by efficacy research studies. Results for the improvement of retention with motivational enhancement in effectiveness studies have been more promising.[53] effectiveness research to better understand the application of CBT outside of controlled research settings.

## Clinical Elements of CBT for SUDs

As implied above, CBT for substance use disorders varies according to the particular protocol used and—given the variability in the nature and effects of different psychoactive substances—substance targeted. However, across protocols a number of core elements emerge. Consistent across interventions is the use of learning-based approaches to target maladaptive behavioral patterns, motivational and cognitive barriers to change, and skills deficits.

One of the core principles underlying CBT for SUDs is that substances of abuse serve as powerful reinforcers of behavior. Over time, these positive (e.g., enhancing social experiences) and negative (e.g., reducing negative affect) reinforcing effects become associated with a wide variety of both internal and external stimuli. The core elements of CBT aim to mitigate the strongly reinforcing effects of substances of abuse by either increasing the contingency associated with non-use (e.g., vouchers for abstinence) or by building skills to facilitate reduction of use and maintenance of abstinence, and facilitating opportunities for rewarding non-drug activities.

Despite these commonalities, as the aforementioned studies demonstrate, length of treatment can vary greatly even within the rubric of CBT for SUD's (e.g. single session MI, 12-session BCT, etc.). Research on duration and intensity of treatment is mixed with some correlational studies indicating a positive relationship between longer duration and positive outcome and others indicating no differential effects of treatment duration. [45,54,55]

## Case Conceptualization and Functional Analysis

During assessment and early treatment sessions, case conceptualization requires consideration of the heterogeneity of substance use disorders. For example, the relative contribution of affective and social/environmental factors can vary widely across patients. A patient with co-occurring panic disorder and alcohol dependence may be experiencing cycles of withdrawal, alcohol use, and panic symptoms that serve as a barrier to both reduction of alcohol consumption and amelioration of panic symptoms. [56] Alternatively, patients without co-occurring psychological disorders may face different barriers and skills deficits, such as difficulty refusing offers for substances or a perceived need for substances in social situations. Therefore, all of these factors must be considered before embarking upon treatment.

Consistent with general CBT models, treatment for SUDs benefits from the use of a regular structure, including agenda-setting, identification of goals, and the assignment and review of homework. This is particularly important for sub-groups for whom cognitive deficits, difficulty concentrating, or organizational and problem-solving skills deficits are present, as it can help such patients to more easily remember and apply treatment techniques outside of the treatment session. Functional analysis is an important component of treatment from the earliest stages. The identification of antecedents or triggers for use is critical to determining the appropriate situations and behaviors to target. For example, identifying high risk situations for use such as liquor stores or areas where drugs are commonly sold and encouraging the patient to avoid such situations (particularly in the early stages of recovery) can be used in this stage. Such stimulus control strategies may serve as an important precursor to building skills for resilience in these settings as it facilitates initial achievement of abstinence. These analyses will also help clarify for the clinician whether drugs are used as part of social repertoires, used to enhance positive activities, and/or are used to cope with difficult situations or emotions. Independent assessment of drug use motives can also aid this aspect of the functional analysis. For example, the use of the Revised Drinking Motives Questionnaire [57] may provide important information about the nature of drinking motives and its association to particular triggers, such as mood disturbance. [58]

## Cognitive and Motivational Strategies

Once high risk situations and events are identified (including people and places, as well as the internal cues such as changes in affect), cognitive behavior therapy can be directed to altering the likelihood that these events are encountered (providing alternative non-drug activities, or activities with non-drug using individuals) as well as rehearsing non-drug alternatives to these cues. Motivational and cognitive interventions can be provided to enhance motivation for these alternative activities as behavior, while also working to decrease cognitions that enhance the likelihood of drug use. In addition to the elements of motivational interviewing (i.e., assessment, dispassionate presentation of information, and elucidation and discussion of ambivalence about drug abstinence), broader cognitive strategies can target the cognitive distortions specific to substance abuse, including, rationalizing use (e.g., “I will just use this once,” “One drink won't hurt me,” “It has been a bad day; I deserve to use”) and giving up (e.g., “Why even try,” “I will always be an addict”). In such circumstances, eliciting evidence from the patient regarding the accuracy of these thoughts can help to identify alternative appraisals that may be more adaptive and better reflect the patient's experience. Similarly, providing psychoeducation on the nature of such thoughts and the role that they may play in recovery can help the patient to gain awareness about how such thinking patterns contribute to the maintenance of the disorder. As with other disorders, rehearsal of cognitive restructuring in the context of drug cues may enhance the availability of these skills outside the treatment setting.[59]

As part of cognitive restructuring, expectancies, or beliefs about the consequences of use, are another important target for intervention. It is not uncommon to find that patients maintain a belief that use of a particular substance will help some problematic aspect of their life or given situations. For example, a patient may believe that a family holiday would not be enjoyable without alcohol use. Similar to cognitive restructuring techniques, evaluating evidence for expectancies and designing behavioral experiments can be used to target this issue. In this instance the patient would be encouraged to refrain from drinking at the holiday party and assess the degree to which the event was enjoyable. In addition, the patient could evaluate evidence from past holidays to compare the consequences and benefits of alcohol use in these settings.

## Shifting Contingencies

As noted, a variety of CM procedures have shown success in helping patients reduce drug use. As such, the cognitive behavioral therapist needs to consider how abstinence is to be rewarded as part of treatment. In addition to consideration of traditional CM rewards—monetary prizes, vouchers for goods, or treatment “privileges” (e.g., take-home doses of methadone)—the arrangement of social contingencies, such as is evident in BCT approaches, should be considered. The question to be addressed in treatment is how contingencies can be arranged to encourage initial experiences of abstinence and entry into non-drug activities. When this goal is achieved, treatment becomes concerned with identification of more naturally-occurring rewards for abstinence (e.g., greater employment, relationship, and social success). As such, problem solving strategies and programming and rehearsal of steps to broader goal attainment may need to be provided, depending on the skills available to the patient.

A number of approaches to the treatment of drug use patterns have emphasized exposure to the cues for drug use. Research has shown moderate success for exposure to external cues for use such as drug paraphernalia or drugs themselves.[60,61] Accordingly, attention has also shifted to exposure to internal cues for drug use. Pilot studies in both illicit drug use [62,63] and smoking cessation [64,65] have provided early support for this approach. For these approaches in smoking cessation, attention has been placed on reduction of fears of anxiety sensations that may amplify the aversiveness of both withdrawal and affective consequences

of nicotine cessation. By pre-exposing individuals to some of these sensations in interoceptive exposure procedures, the aversiveness of these sensations can be reduced with resulting reduction in smoking behavior.[64,65]

### Skills Training

Skills building can be broadly conceptualized as targeting interpersonal, emotion regulation, and organizational/problem-solving deficits. Clinical trials examining the addition of coping and communication skills training have demonstrated positive outcomes and are common components of CBT for substance abuse.[60,61] The use of strategies should be based on case conceptualization, building from patient report and behavioral observation of such deficits. Interpersonal skills building exercises may target repairing relationship difficulties, increasing the ability to use social support, and effective communication. For patients with strong support from a family member or significant other, the use of this social support in treatment may benefit both goals for abstinence and relationship functioning. In addition, the ability to reject offers for substances can be a limitation and serves a challenge to recovery. Rehearsal in session of socially-acceptable responses to offers for alcohol or drugs provides the patient with a stronger skill set for applying these refusals outside of the session. Where relevant, this rehearsal can be supplemented by imaginal exposure or emotional induction to increase the degree to which the rehearsal is similar to the patient's high risk situations for drug use.

Emotion regulation skills can include distress tolerance and coping skills. Through the use of problem-solving exercises and the development of a repertoire for emotion regulation, the patient can begin to both determine and utilize non-drug use alternatives to distress. Strategies for coping with negative affect, such as using social supports, engaging in pleasurable activities, and exercise can be introduced and rehearsed in the session. The development of pleasurable sober activities is of particular importance given the amount of time and energy that is often taken for substance use activities (i.e., obtaining, using, and feeling the effects of substances). When reducing substance use, patients can be left with a sense of absence where time was dedicated to use, which can serve as an impediment to abstinence. Thus, concurrently increasing pleasant and goal-directed activities while reducing use can be crucial for facilitating initial and maintained abstinence.

Finally, goal-setting deficits can be targeted within the session as part of treatment. Guiding patients in setting treatment goals can serve as a first practice of this skill building. Also assisting patients in setting smaller goals in the service of longer term goals is an important exercise. The inability to delay long-term pleasure for short-term pleasure is a characteristic feature of substance use disorders, and thus the ability to set long-term goals may be compromised.[66] Particularly for patients with more severe substance dependence, skills building may require shifting the patient's relevant skills and goals from that of an illicit lifestyle to that of a more normative lifestyle. Thus, the skills that may have been adaptive while actively using—interpersonal skills needed to obtain drugs and to connect with other substance users, the ability to manipulate those around you, to do things without being caught—may translate poorly to reconnecting with family and sober friends, obtaining and maintaining a job, and building healthy life activities.

### Clinical Challenges

There are many challenges that may arise in the treatment of substance use disorders that can serve as barriers to successful treatment. These include acute or chronic cognitive deficits, medical problems, social stressors, and lack of social resources. In addition, certain populations, such as pregnant women and incarcerated patients, may present particular challenges. In each of these circumstances, the use of functional analysis to arrive at strong case conceptualization and the flexible utilization of treatment components is important. For

example, among individuals with low levels of literacy, the use of written homework forms may need to be replaced by alternative means of monitoring home practice (e.g., using simplified forms or having the patient call to leave a phone message regarding completion of an assignment).

One particular challenge can be the shift in the social and environmental contexts associated with use relative to non-use lifestyles. For example, among individuals who have long histories of substance misuse, there are often significant life consequences, such as unemployment, family difficulties, reduced social networks, etc. In such groups, their fit to society is within the context of others with similar misuse problems. The illicit drug use culture, characterized at times by other illicit behaviors (e.g., drug dealing, theft, prostitution) and the valuation of particular skills (e.g., the ability to make a drug deal at 2:00AM), varies dramatically from a more mainstream culture. Thus, in treatment, the patient not only is being asked to transition to a culture in which he or she may have few skills and resources, but also to relinquish the parts of his or her life in which there is a sense of effectiveness and belonging. The sense of belonging to the substance use culture can increase ambivalence for change, particularly when measurable life changes occur at slow pace. In such cases, it is critical to establish alternatives for achieving a sense of belonging, including both social connection and effectiveness. Depending on the resources available to the patient, this may include joining some type of social group (e.g., a sports club), volunteer work, or other activity-based social opportunities.

## Novel Treatment Strategies

Despite the success of the strategies described above, much work remains to be done in order to improve rates of treatment response. In addition to the treatment techniques previously described, several novel approaches are being studied to enhance behavioral treatments for substance use disorders. One new approach has been the use of computer-assisted delivery of treatment. A recent study conducted by Carroll and colleagues [67] compared the addition of biweekly computer-based CBT to a standard drug counseling treatment. Results indicated that those who received the computer-based treatment had significantly higher numbers of drug free urine tests and longer periods of abstinence with benefits continuing through a 6 month follow-up.[68]

Another novel approach has been the use of a medication, d-cycloserine (DCS), to augment exposure based treatments. DCS works as a partial agonist targeting NMDA receptors which enhances glutamate neurotransmission, thereby, facilitating extinction.[69] DCS has been applied successfully in augmenting exposure-based treatments for anxiety disorders.[70] To date, several animal studies have shown that administration of DCS coupled with an extinction paradigm have both deterred reacquisition of cocaine and alcohol seeking behavior [71,72] as well as facilitated extinction of withdrawal-associated place aversion in morphine-dependent rats.[73] Such promising findings in the animal literature suggest that further application with human populations is warranted. Our group is currently evaluating the addition of DCS to an exposure-based CBT protocol from treatment-resistant opioid dependence. In this treatment, DCS, when administered prior to exposure sessions is hypothesized to facilitate extinction learning to achieve more rapid and more robust treatment response.

## Dissemination of CBT for SUDs

As this paper has reviewed, many effective behavioral techniques for the treatment of substance use have been identified; however, use of such techniques is often scarce or non-existent in service provision settings. Several reasons cited for this limitation in technology transfer include a continually held belief among many that addiction is a moral failing rather than a brain disease thus preventing the adoption of a medical model, availability of resources to implement new treatments, and the resistance to change demonstrated by many organizations

and individual clinicians.[74] In response to the lack of effective diffusion of evidence-based treatments, there has been a recent increase in resource allocation for targeting dissemination and implementation efforts. For example, the National Institute on Drug Abuse (NIDA) in conjunction with the Addiction Technology Transfer Center (ATTC) and Substance Abuse and Mental Health Services Administration (SAMHSA) instituted a Blending Initiative in 2001 to help combine the knowledge and skill of researchers, clinicians, policymakers and dissemination programs to help develop and implement evidence-based treatments which could be used in community settings.

One outcome of the Blending Initiative was the inception of the Clinical Trials Network (CTN), a 17 site regional research and training center which collaborates with many community treatment programs to study the effectiveness of specific interventions in diverse community settings and patient populations. Other efforts to increase access to CBT and other evidence-based treatments for SUDs are also underway.[75-77] Future research focusing on methods to bridge the gap between theory and practice in a way that supports community clinicians so that systemic change can truly be effective is of particular importance.

## Summary

CBT for substance use disorders captures a broad range of behavioral treatments including those targeting operant learning processes, motivational barriers to improvement, and traditional variety of other cognitive-behavioral interventions. Overall, these interventions have demonstrated efficacy in controlled trials and may be combined with each other or with pharmacotherapy to provide more robust outcomes. Despite this heterogeneity, core elements emerge based in a conceptual model of SUDs as disorders characterized by learning processes and driven by the strongly reinforcing effects of substances of abuse. Particular challenges to the field include the determination of the most effective combination treatment strategies and improving the dissemination of CBT to service provision settings. Novel treatment strategies including more scalable modalities (such as computer-based programs) and combination strategies to improve rates or speed of treatment response (such as DCS) may aid in the transportability of treatments outside of research settings.

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