

Published in final edited form as:

Addict Behav. 2008 May ; 33(5): 675–688. doi:10.1016/j.addbeh.2007.12.001.

Self-Efficacy for Cocaine Abstinence: Pretreatment Correlates and Relationship to Outcomes

Sara L. Dolan, Ph.D.^{a,b}, Rosemarie A. Martin, Ph.D.^b, and Damaris J. Rohsenow, Ph.D.^{a,b}

^a Providence Veterans Affairs Medical Center, Providence, RI 02908

^b Center for Alcohol and Addiction Studies, Brown University, Providence, RI 02912

Abstract

Little research has been conducted on the relationship of self-efficacy at treatment entry to individual differences or to treatment outcome for patients with cocaine dependence. Those relationships were examined in 163 cocaine dependent patients in a residential treatment program using two measures of self-efficacy administered in the first week of treatment: beliefs about success in quitting in general and confidence about not using in 11 cocaine-specific high-risk situations. The most robust correlates of self-efficacy were greater desire to stop using and lower urge to use in high-risk situations. Age, depressive symptoms, cognitive functioning, recent substance use, and past success with quitting also correlated with self-efficacy. Both measures of self-efficacy predicted quantity and frequency of cocaine use and abstinence at 3 but not 6 months after treatment after controlling pretreatment cocaine use. Results suggest that treatments should target self-efficacy in cocaine-dependent patients.

Keywords

Self-efficacy; cocaine; correlates; treatment outcome

1. Introduction

Self-efficacy can be defined as a person's confidence in his/her capability to behave in a certain manner in order to accomplish a goal (Bandura, 1989). It is thought to affect utilization of effective coping skills in a variety of contexts, including for relapse prevention in substance abusers (Abrams & Niaura, 1987; Marlatt & Gordon, 1985).

1.1 Abstinence Self-efficacy and Treatment Outcome

Abstinence self-efficacy has been found to be a predictor of treatment outcome among alcohol abusers (Burling et al., 1989; Demmel & Rist, 2005; Kavanaugh et al., 1996; Monti et al., 1993b; Solomon & Annis, 1990); opioid dependent patients (Reilly et al., 1995); smokers (Baer et al., 1986; Gulliver et al., 1995; McIntyre, Lichtenstein, & Mermelstein, 1983); and problem gamblers (Hodgins et al., 2004). In cocaine-dependent outpatients, higher self-efficacy measured at treatment entry predicted significantly more abstinence within treatment (McKay et al., 1997; Wong et al., 2004). Posttreatment self-efficacy among cocaine users who

Correspondence concerning this article should be addressed to: Sara L. Dolan, Ph.D., Department of Psychology and Neuroscience, Baylor University, One Bear Place #97334, Waco, TX 76798, (254) 757-0193 – office, (254) 757-0627 - fax, sara_dolan@baylor.edu.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

completed treatment was correlated with cocaine use during their first three months of that treatment after controlling the effects of demographic variables and pretreatment cocaine use (Rounds-Bryant et al., 1997). Among cocaine users who completed treatment, those who were abstinent 1-month after treatment had higher self-efficacy at the same time, but the pre- and posttreatment self-efficacy scores were not used to predict abstinence (Coon, Pena & Illich, 1998). Self-efficacy at 6 to 36 months follow ups correlated with less cocaine and alcohol use during the preceding follow-up window (McKay et al., 2004). However, there have been very few studies using self-efficacy measured at the beginning of treatment to predict drug use during follow up after treatment discharge; these studies have consistently found higher self-efficacy to predict less cocaine use (McKay, Foltz, Stephens, et al., 2005; McKay, Merikle, Mulvaney, Weiss, & Koppenhaver, 2001; Warren, Stein, & Grella, 2007).

1.2. Predictors of Abstinence Self-Efficacy

Predictors of cocaine abstinence self-efficacy also need further investigation. According to social learning theory, self-efficacy to engage in a specific behavior develops in the context of learning (Bandura, 1977). Self-efficacy to abstain from drug use could result from having or observing a series of positive success experiences resulting from abstaining, or being persuaded about the positive effects of abstaining. Past success with abstinence has been found to prospectively predict pretreatment drug abstinence self-efficacy (Majer, Jason, & Olson, 2004) and smoking abstinence self-efficacy (Martin, Rohsenow, MacKinnon, Abrams, & Monti, 2006). Cocaine abstinence early in treatment or soon after treatment predicted later levels of abstinence self-efficacy (Coon et al. 1998; Rounds-Bryant et al., 1997; Wong et al., 2004).

Coping skills training with guided practice and feedback can also increase self-efficacy about using such skills effectively to maintain abstinence (Monti et al., 2002). Coping style (emotion-focused versus problem-focused) measured early in treatment was found to be related to abstinence self-efficacy in drug abusers (Demmel & Rist, 2005; Majer, Jason, Ferrari, Olson, & North, 2003), with emotion-focused coping being positively related to self-efficacy. Self-efficacy ratings increased over the course of coping skills based treatment (Rohsenow et al., 2004), and change in self-efficacy correlated with post-treatment use (Burling et al., 1989).

Past successes in life in general could also increase self-efficacy for drug abstinence in particular ways. Years of education can reflect more successes with learning. Age can be a rough indicator of exposure to handling a variety of experiences leading to greater confidence across behaviors. In addition, fewer years of drug use, less substance dependence, and lower quantity/frequency of recent use could lead to the perception that it would be easier to be successful at abstinence. Therefore, self-efficacy would be expected to be greater with age, increased education, and less intense or lengthy past substance use. In one study, age and pretreatment cocaine use were unrelated to self-efficacy using a measure derived from people with alcohol use disorders (Warren et al., 2007), but no other reports of correlations of demographic variables or pretreatment substance use severity variables with self-efficacy for cocaine abstinence were found.

Motivational variables such as desire to quit or readiness to change may correlate with self-efficacy during treatment by increasing one's motivation and focus on benefiting from treatment. Readiness to change correlated positively with self-efficacy in alcohol-dependent inpatients in one study (Demmel, Beck, Richter, & Reker, 2004), but no study was found investigating desire to quit as a predictor of self-efficacy. Among alcoholics, smoking abstinence self-efficacy was related to greater motivation to quit smoking and the length of longest abstinence (Martin et al., 2006). Cocaine-dependent patients with better coping self-efficacy were found to be in a more highly motivated stage of change (Miller, 1991; Sklar, Annis, & Turner, 1999; Sklar & Turner, 1999). Another indicator of motivation is desire or

urge to use¹, as it may be an indicator of motivation not to abstain. Niaura et al. (1988) postulate that a patient's state of arousal can be increased by urge to use in high-risk situations, and this can affect abstinence self-efficacy by overwhelming coping resources. Indeed, among individuals who have recently quit smoking, abstinence self-efficacy was consistently negatively correlated with urge across a variety of urge manipulations (Niaura et al., 1998). In three samples of abstinent alcoholics in treatment, the correlations of urge with abstinence self-efficacy in high-risk situations ranged from $-.68$ to $-.77$ (Monti et al., 1993a). To date, self-efficacy in cocaine-specific high-risk/high-urge situations has not been measured in cocaine abusers, nor has self-efficacy been investigated as a correlate of urge to use cocaine.

Although pretreatment depressive symptoms are not necessarily predictors of poorer treatment outcome in cocaine abusers unless they remain elevated during treatment (Brown et al., 1998), depressive symptoms may include hopelessness about engaging in effective behaviors to combat addiction or may overwhelm a substance abuser's coping resources (Abrams & Niaura, 1987). Thus, depressive symptoms may be negatively related to self-efficacy for abstinence (Majer et al., 2004), especially in high-risk relapse situations. This needs to be investigated in cocaine dependent patients.

Poor cognitive functioning among cocaine dependent patients can affect ability to learn from treatment and lead to poorer treatment outcomes (Jovanovski, Erb, & Zakzanis, 2005; Verdejo-Garcia & Perez-Garcia, 2007). Cognitive function measured at treatment entry positively correlated with recency of cocaine use (O'Malley et al., 1992) and negatively correlated with treatment retention (Aharonovich, Nunes, & Hasin, 2003). While this has not been studied for cocaine dependent patients, compliance (Smith & McCrady, 1991), learning new material or skills (Alterman et al., 1989; Smith & McCrady, 1991), and poorer outcomes (e.g., Abbott & Gregson, 1980); have been found in alcohol dependent patients with poorer pre-treatment cognitive functioning. Poor cognitive functioning may result in either high or low self-efficacy for abstinence. Patients with poor cognitive function often lack insight into their conditions (Lezak, 1995), which could lead to lack of understanding of the severity of their substance abuse problem (Bechara et al., 2001) and possibly an inappropriately high level of confidence in their level to remain abstinent. Conversely, awareness of difficulties with learning new behaviors and of difficulties with past abstinence attempts may result in a negative correlation between impairment and self-efficacy.

1.3 Assessment of Abstinence Self-Efficacy

Self-efficacy is often assessed by asking patients to rate their confidence about (or anticipated difficulty in) abstaining from substances in a series of standardized high-risk situations after role-playing handling the situation (e.g., Monti et al., 1990) or via a questionnaire (e.g., Situational Confidence Questionnaire, Annis, 1982; or Drink Refusal Self-Efficacy Questionnaire, Young & Oei, 1996). It can also be assessed via a single, Likert-rated scale about a patient's confidence in his/her ability to remain abstinent in the future (Rohsenow et al., 2004), and among alcoholics, these latter two methods are correlated with each other, with r 's from $.35$ – $.56$ (Demmel, Nicolai, & Jenko, 2006). High-risk situations may lead to a greater deal of perceived difficulty in remaining abstinent compared to self-efficacy assessed outside this context (Haaga, 1990; Monti et al., 1990). Since relapse often occurs in high-risk situations (Marlatt & Gordon, 1985), assessment of self-efficacy within this context may lead to better prediction of relapse compared to a global rating (Annis & Graham, 1988; Haaga, 1990; Sklar & Turner, 1999), especially when using cocaine-specific high-risk situations (Rohsenow et al., 2000, 2004) rather than ones associated with relapse in general or of alcoholics or smokers.

¹Following the recommendations of Kozlowski et al. (1989), we will use the term "urge" or "desire" rather than "craving" (except when referring to someone else's measure) because urge is less ambiguous and covers a broader continuum of degree of desire to use.

1.4 The Present Study

The present study had two primary aims and a secondary aim. First, we examined the relationship between abstinence self-efficacy measured at treatment entry and participant characteristics predicted to correlate with self-efficacy. Second, we investigated abstinence self-efficacy at treatment entry as a predictor of 3- and 6-month cocaine use outcomes in follow-up assessments after completing residential treatment. It was hypothesized that self-efficacy would be higher for older, more educated individuals, those with a shorter, less severe substance use history, with more previous success with abstinence, stronger motivation to quit, lower urge to use, lower levels of state depression at treatment entry, and better cognitive function. It was also hypothesized that pretreatment self-efficacy would be positively correlated with better treatment outcome, after controlling for variance due to pretreatment cocaine use. A secondary aim was to examine the relative value of two different methods for the measurement of self-efficacy, hypothesizing that patients' self-efficacy in high-risk cocaine situations would be more highly related to treatment outcome than would a global rating of general self-efficacy for abstinence.

2.0 Method

2.1 Participants

Cocaine-dependent outpatients ($n = 163$, 52% female) who were part of a larger assessment study focused on measures of craving (Rohsenow, Martin, Eaton & Monti, 2007), were recruited from an inner-city, state-funded residential substance abuse treatment program if they met DSM-IV criteria for cocaine dependence and were not actively psychotic. Participants were informed that this study investigated predictors of treatment outcome with a focus on craving measures. The treatment site had a state-wide catchment area. The program's 1–2 month treatment approach was abstinence-oriented, with groups focused on the 12-steps, education, and relapse prevention without coping skills training (discussion situations, general education), and optional family therapy groups and aftercare.

2.2 Procedures

All procedures were approved by the Institutional Review Boards at Brown University, the Providence Veterans Affairs Medical Center, and the Providence Center (clinical site). Informed consent was obtained at recruitment on the second day of treatment whenever possible. Assessments were completed by the end of the first week of treatment during free time, as part of a 4-hour battery. Follow-up assessments were completed offsite at 3 and 6 months following residential treatment discharge. All assessments were conducted by university-employed, trained research staff, confidentiality was assured, and no information was disclosed to clinical staff.

2.3 Measures

Self-efficacy—The general abstinence self-efficacy rating (SE-General) is the patient's rating at the current time of how successful s/he expects to be at quitting using cocaine, rated on a Likert scale from 1 ("not at all successful at quitting") to 10 ("very successful at quitting"). The high-risk abstinence self-efficacy score (SE-High Risk) was derived from the Cocaine Related Assessment of Coping Skills (CRACS) which (among other variables) assessed the patient's self-efficacy in 11 situations that pose a high risk for cocaine use (Rohsenow et al. 2004). Examples of these high-risk relapse situations include a pleasant social event, boredom, interpersonal conflict, and having a lousy day. The CRACS self-report measures are reliable and valid (Rohsenow et al., 2004). Patients were asked to vividly imagine being in each high-risk situation, to describe a coping response, then to rate how confident s/he would be to refrain from substance use in that particular situation on a 7-point Likert scale, ranging from 1 ("not

at all confident”) to 7 (“extremely confident”). The mean of these 11 ratings was used as a composite self-efficacy score with high internal consistency reliability (Cronbach’s alpha = 0.88).

Substance use—Timeline Followback interviews (TLFB; Sobell & Sobell, 1980; Ehrman & Robbins, 1994) were conducted following the recommendations of Sobell and Sobell (1986) for increasing the validity of such interviews, including creating an environment and set of confidentiality, even from clinical staff, and ensuring a negative breath-alcohol level. TLFBs were administered at baseline for the 6 months prior to treatment entry and at 3- and 6-month follow-ups for the 6 months following discharge for number of days of cocaine use and dollars spent on cocaine. Dollars spent on cocaine was used as an index of quantity of use. Participants who reported abstinence during the follow-up period were asked to give urine samples for biological confirmation using ON TRAK[®] test cups for screening, with positive results confirmed with EMIT, gas chromatography and mass spectrometry for the cocaine metabolite benzoylecgonine and four other drugs of abuse. Of the participants who reported abstinence at follow up, 6 (7%) had positive urines at 3 months and 7 (9%) at 6 months; they were coded as having used during that follow-up time period.

Current substance abuse and dependence and number of cocaine dependence symptoms were determined by a trained, university-employed research assistant using the criteria of the Structured Clinical Interview for DSM-IV - Patient Version (First et al., 1995). A History and Patterns of Cocaine Use interview (Rohsenow et al., 2000) asked age of onset of weekly cocaine use, current routes of administration, number of previous cocaine quit attempts lasting at least a week, longest period of cocaine abstinence, length of the most recent abstinence from cocaine in days, the number of months ago that this abstinence occurred, number of drugs used in the last 30 days and number of formal treatment attempts for cocaine abuse.

Motivation to quit and to use—Patients were asked to rate their desire to stop using cocaine at this time on a Likert scale from 1 (“no desire to stop using”) to 10 (“very strong desire to stop using”). Urge to use cocaine was rated after each CRACS situation by answering “Right now, if you weren’t in the hospital, how strong would your urge to use cocaine be?” on a 7-point Likert scale from 1 (“no urge”) to 7 (“very high urge”). Urge was averaged across the 11 situations with high internal consistency reliability (Cronbach’s alpha = 0.90).

Depressive symptoms and cognitive functioning—The 21-item Beck Depression Inventory, 2nd Edition (BDI-II; Beck, Steer, & Brown, 1996) assessed current depressive symptomatology. The Trailmaking Test-Part B (Reitan & Wolfson, 1986) tests speed of visual search, attention, mental flexibility, and motor function, scored for time to complete the task in seconds. Higher scores indicate poorer functioning.

2.4 Data Analyses

Data were checked for distributional assumptions. Amount spent on cocaine was log-transformed to correct skewness, but untransformed values will be displayed for ease of interpretation. There were two outliers for number of previous quit attempts, and they were each set to a value one unit greater than the next highest value according to recommendations of Tabachnick and Fidell (1989). Other variables were normally distributed.

Univariate correlations were computed between the self-efficacy variables and pretreatment correlates because we were not interested in the linear contribution of predictors. Due to the number of correlations, alpha was set at .01 (since Bonferroni corrections are known to overcorrect). Partial correlations of education with self-efficacy (*pr*, controlling the effects of age) were also reported because age and education were significantly correlated, and partial

correlations of self-efficacy with scores on Trailmaking Test-B were reported because age could affect cognitive functioning independently (Lezak, 1995).

The eight hierarchical multiple regressions to predict 3- and 6-month continuous treatment outcomes and the four regressions predicting length of stay in treatment each entered the pretreatment value of the same cocaine use variable on the first step and SE-High Risk or SE-General separately on the second step. The continuous outcome variables entered were frequency (number of cocaine use days in the interval) and quantity (dollars spent on cocaine during the interval, log transformed). The four logistic regressions predicting 3- and 6-month use of any cocaine entered pretreatment number of cocaine use days as the covariate on the first step and the SE variable as the predictor on the second step.

3.0 Results

3.1 Participant Characteristics

Of 207 patients approached for participation, 185 were recruited, 20 (11%) dropped out before completing baseline, 2 had no self-efficacy data, leaving 163 with baseline data. See Table 1 for pretreatment characteristics. Follow-up data were available for 129 (79%) at 3 months and 125 (77%) at 6 months. The numbers of participants in follow-up analyses at 3 months were 129 for cocaine frequency, 120 for amount spent on cocaine, and 126 for urine-verified abstinence, and at 6 months were 124 for cocaine frequency, 112 for amount spent on cocaine, and 125 for urine-verified abstinence.

3.2 Preliminary Analyses

During the first 3 months of follow-up, 62.0 % were cocaine abstinent and during the second 3 months 57.3% used no cocaine. Number of cocaine use days was $M = 8.9 \pm 19.63$ during the first 3 months and $M = 7.6 \pm 15.4$ during the second 3 months. Amount spent on cocaine was $M = \$689.3 \pm 2956.3$ during the first 3 months and $M = \$1414.2 \pm 4840.9$ during the second 3 months. SE-High Risk correlated with SE-General ($r = .30, p < .001$) indicating that they share only 9% common variance. Quantity and frequency of cocaine use correlated $r = .19$ ($p < .05$) at baseline, $r = .74$ ($p < .001$) at 3-months, and $r = .65$ ($p < .001$) at 6-month outcome. Age and education were significantly correlated ($r = .13, p < .05$), with 2% shared variance.

3.3 Pretreatment Correlates of Self-Efficacy

The relationships between the two self-efficacy measures and demographic, substance-related, abstinence-related, motivation for change, and other psychological variables are shown in Table 2. Higher SE-General was related to less frequent pretreatment cocaine use but not to quantity of use, while SE-High Risk correlated significantly with quantity but not frequency. The longer a participant had been using cocaine weekly, the more SE-General s/he reported while the older s/he was when starting weekly cocaine use, the higher his/her SE-High Risk. Length of the most recent abstinence from cocaine was significantly related to SE-High Risk but not to SE-General. Desire to stop using was positively correlated with SE-General and urge to use in high-risk situations was negatively correlated with SE-High Risk and SE-General. Self-reported depressive symptoms (BDI) were negatively related to both SE-High Risk and SE-General. Poorer Trailmaking Test-B scores were related to increased SE-High Risk.

3.4 Self-Efficacy and Treatment Outcome

To investigate other possible variables to control for, the correlations of the other pretreatment variables to the four continuous outcomes variables were investigated, again using $p < .01$ as the criterion for significance due to the number of analyses. None were significantly related to more than one of the four outcome variables so were not entered into the regressions. The

exception, urge to use cocaine, was previously published (Rohsenow et al., 2007) so is not reported. Since variance in urge may be an inherent part of variance in self-efficacy, it should not be covaried (Miller & Chapman, 2001). In all regressions, pre-treatment cocaine use was non-significant, accounting for <1% of variance, so Table 3 presents just the second step. Both SE-High Risk and SE-General significantly predict 3-month but not 6-month quantity and frequency of cocaine use, accounting for 4 to 8% of the variance in 3-month outcomes.

3.5 Cognitive Function and Treatment Outcome

Because of the direction of the relationship between Trailmaking Test-B scores and SE-High Risk needed interpreting, the relationship of Trailmaking Test-B to outcome was investigated. While controlling for the pretreatment value of the same outcome variable, partial correlations of Trailmaking Test-B scores were run separately with 3 and 6 month quantity and frequency of cocaine use. Higher Trailmaking Test-B scores (poorer cognitive functioning) predicted lower quantity of cocaine use ($pr = -.21, p < .02$) at 3 months, but not at 6 months, and had no significant correlation ($pr \geq -.13$) with frequency of cocaine use.

The regressions were repeated entering both Trailmaking Test-B scores and the two self-efficacy measures on the second step after controlling for the pretreatment cocaine use variable. In these regressions, Trailmaking Test-B scores were no longer significant predictors while the step and beta weight for self-efficacy remained a significant predictor at 3 months for SE-General (cocaine frequency: $\beta = -.22$, predictor $F(1,118) = 5.56, p < .02$; quantity: $\beta = -.19$, $F(1,109) = 4.52, p < .04$) and for 3-month quantity for SE-High Risk ($\beta = -.23$, $F(1,109) = 5.74, p < .02$). Thus, the variance in outcome due to cognitive function appeared to be due to variance in self-efficacy.

3.6 Self-Efficacy and Length of Stay in Treatment

The self-efficacy measures were not significantly correlated with length of stay (p 's $> .28$), and length of stay did not predict outcome in four regressions covarying the pretreatment value of the outcome variable (0–2% of variance accounted for).

4.0 Discussion

Cocaine abstinence self-efficacy in the first week of treatment, both in general and assessed in the context of high-risk situations, predicted short-term (3-month) cocaine use outcomes while controlling for variance due to pretreatment cocaine use, accounting for 4 to 8% of variance in cocaine use outcomes. That these results are consistent with the few other studies of self-efficacy at treatment entry predicting cocaine use outcomes (McKay et al., 2005 McKay et al., 2007; Warren et al., 2007) lends support to the validity of the present findings. Pretreatment self-efficacy predicted outcome despite preceding any possible treatment effects on self-efficacy, possibly because the program did not include treatment approaches known to increase self-efficacy, such as coping skills training. Given that higher self-efficacy predicts lower drug use, treatments for cocaine dependence would do well to focus on methods of increasing abstinence self-efficacy. While pretreatment levels of self-efficacy only predicted outcomes in the short-term, not at 6 months, it is possible that post-treatment levels of self-efficacy after a treatment approach that raises self-efficacy for abstinence (not assessed in this study) could predict outcomes over a longer term as was found for alcoholics (Monti et al., 1993b).

In the first week of treatment, self-efficacy to abstain from cocaine use is most strongly correlated with two motivational variables not previously investigated as correlates. Less urge to use in high-risk cocaine situations accounted for 19% of variance in general abstinence self-efficacy and 28% of variance in self-efficacy in high-risk situations. While not studied previously with cocaine dependence, the results are consistent with the studies reviewed for

alcoholics and smokers. Urges may undermine self-efficacy (Abrams & Niaura, 1987) or high abstinence self-efficacy might result in better ability to handle urges. Stronger desire to stop using cocaine accounted for 19% of variance in general abstinence self-efficacy, suggesting one mechanism by which people who are more motivated to change might have better outcomes. Methods to decrease urge to use as a way to increase self-efficacy include cue exposure treatment (e.g., Childress et al., 1993; Monti et al., 2002) or cocaine-specific coping skills training which has been found both to decrease urge to use cocaine and increase abstinence self-efficacy (Monti et al., 1997; Rohsenow et al., 2004). Ways to increase desire to stop using could include motivational enhancement (e.g., Rohsenow et al., 2004).

Self-efficacy was significantly higher with older age and longer success with recent abstinence, consistent with social learning theory ideas that past successful experiences lead to more confidence in ability to cope in the future (Bandura, 1997). Longer success with abstinence was a better predictor than number of abstinence attempts or how long ago the last abstinence period was, consistent with Bandura's (1997) hypothesis that "perseverant effort" (i.e., sustained effort) is important to self-efficacy.

Abstinence self-efficacy was higher for people with a lower quantity and frequency of pretreatment cocaine use, with fewer years of cocaine use and with an older age of onset of regular cocaine use, although self-efficacy was unrelated to number of cocaine dependence symptoms (i.e., number of problems caused by cocaine). These relationships have largely not been studied before. Thus, patients who see themselves as less involved with cocaine use expect it to be easier to stay abstinent.

That self-efficacy was lower for people with more depressive symptoms is consistent with literature for other disorders and supports the idea that depressed states can make it harder for people to marshal their coping resources or at least harder for them to believe that they can cope effectively. The fact that depressive symptoms among cocaine abusers were related to stronger urges to use cocaine and short treatment length (Brown et al., 1998) could indicate two mechanisms by which depressed state can lower self-efficacy.

Self-efficacy was higher for those with lower cognitive functioning. The patients with lower cognitive functioning had better 3-month substance use outcomes, so they actually had realistic estimates of their ability to stay abstinent. In fact, the variance in outcome was due only to self-efficacy when variance in cognitive function was controlled. Thus, even among people with low cognitive function, increasing their self-efficacy may be a key to success.

Neither self-efficacy assessment method appeared clearly preferable to the other. The modest intercorrelation between the two methods suggests that clients may not be thinking just of high-risk situations when giving a general estimate of their ability to stay abstinent but may include other lifestyle changes (e.g., Rohsenow et al., 2005) or a strong desire to quit as factors contributing to this estimate. Given that both methods correlated equivalently well with treatment outcome and urge to use, the simpler method (the general item) could be used simply to indicate a possible need for additional treatment. While the general measure looked like it could have a ceiling effect based on the high mean score, its strong correlations with urge, desire and outcomes indicates that there was sufficient range, possibly with low scorers driving the relationships. However, assessing self-efficacy in a series of high-risk situations is probably preferable for treatment planning so as to target specific situations needing more relapse prevention training. (Annis & Graham, 1988; Sklar & Turner, 1999; Monti et al., 2002).

The results suggest that cocaine dependence treatment should attempt to increase abstinence self-efficacy. Ways to do this include reminding patients of their previous successes with abstinence, teaching coping skills for high-risk situations associated with lower self-efficacy or greater urge to use (Monti et al., 2002), and/or increasing motivation by reminding patients

of their reasons to stay abstinent or via motivational interviewing (e.g., Rohsenow et al., 2004). Pharmacological agents or cue-exposure treatment (Childress et al., 1993) may be used to decrease urges to use cocaine. Finally, minimizing depressive symptoms via cognitive behavioral techniques and/or medications may enhance a patient's self-efficacy and subsequent treatment success.

Limitations of this study include assessing abstinence self-efficacy only at the start of treatment and including patients only from one inner-city residential treatment program. Future work could include more varied programs and include assessment at both the start and end of the intensive phase of treatment. However, given the few studies available on self-efficacy for cocaine dependent patients and the consistency with results for other disorders, these results can provide some guidelines to clinical approaches.

Acknowledgments

This work was supported in part by a grant from the National Institute on Drug Abuse (1 RO1 DA11071), by a postdoctoral training grant (T32 AA07459) from the National Institute on Alcoholism and Alcohol Abuse, and by a Career Scientist Award from the Department of Veterans Affairs. An earlier draft of part of the results was presented at the Annual Meeting of the Research Society on Alcoholism in June 2005. Dr. Dolan is now at the Department of Psychology and Neuroscience, Baylor University, Waco TX, 76798.

References

- Abbott MW, Gregson RAM. Cognitive dysfunction in the prediction of relapse in alcoholism. *Journal of Studies on Alcohol* 1981;43:230–243. [PubMed: 7306259]
- Abrams, DB.; Niaura, RS. Social learning theory. In: Blane, HT.; Leonard, KE., editors. *Psychological theories of drinking and alcoholism*. New York: Guilford; 1987. p. 131-178.
- Aharonovich E, Nunes E, Hasin D. Cognitive impairment, retention, and abstinence among cocaine abusers in cognitive-behavioral treatment. *Drug and Alcohol Dependence* 2003;71:207–211. [PubMed: 12927659]
- Alterman AI, Holahan JM, Baughman TG, Michels S. Predictors of alcoholics' acquisition of treatment-related knowledge. *Journal of Substance Abuse Treatment* 1989;6:49–53. [PubMed: 2709474]
- Annis, HM. *Situational Confidence Questionnaire*. Addiction Research Foundation; Toronto, Ontario, Canada: 1982.
- Annis, HM.; Graham, JM. *The Situational Confidence Questionnaire (SCQ-39) User's Guide*. Toronto, Ontario, Canada: Addiction Research Foundation of Ontario; 1988.
- Baer JS, Holt CS, Lichtenstein E. Self-efficacy and smoking reexamined: Construct validity and clinical utility. *Journal of Consulting and Clinical Psychology* 1986;54:846–852. [PubMed: 3794032]
- Bandura A. Self-efficacy: Toward a unifying theory of behavior change. *Psychological Review* 1977;84:199–215.
- Bandura A. Regulation of cognitive processes through perceived self-efficacy. *Developmental Psychology* 1989;25:729–735.
- Bandura A. A sociocognitive analysis of substance abuse: An agentic perspective. *Psychological Science* 1999;10:214–217.
- Bandura, A. *Self-Efficacy: The exercise of Control*. New York: Freeman.; 1997.
- Bates ME, Barry D, Labouvie EW, Fals-Stewart W, Voelbel G, Buckman JF. Risk factors and neuropsychological recovery in clients with alcohol use disorders who were exposed to different treatments. *Journal of Consulting and Clinical Psychology* 2004;72:1073–1080. [PubMed: 15612853]
- Bechara A, Dolan SL, Denburg NL, Hindes A, Anderson SW, Nathan PE. Decision-making deficits, linked to a dysfunctional orbitofrontal cortex, revealed in alcohol and stimulant abusers. *Neuropsychologia* 2001;39:376–89. [PubMed: 11164876]
- Beck, AT.; Steer, RA.; Brown, GK. *Manual for the Beck Depression Inventory*. 2. San Antonio, TX: The Psychological Corporation; 1996.

- Brown RA, Monti PM, Myers MG, Martin RA, Rivinus T, Dubreuil ME, Rohsenow DJ. Depression among cocaine abusers in treatment: Relation to cocaine and alcohol use and treatment outcome. *American Journal of Psychiatry* 1998;155:220 – 225. [PubMed: 9464201]
- Burling TA, Reilly PM, Moltzen JO, Ziff DC. Self-efficacy and relapse among inpatient drug and alcohol abusers: A predictor of outcome. *Journal of Studies on Alcohol* 1989;50:354–360. [PubMed: 2787877]
- Childress, AR.; Hole, AV.; Ehrman, RN.; Robbins, SJ.; McLellan, AT.; O'Brien, CF. Cue reactivity and cue reactivity interventions in drug dependence. In: Onken, LS.; Blaine, JD.; Boren, JJ., editors. *National Institute on Drug Abuse Research Monograph Series 137: Behavioral Treatments for Drug Abuse and Dependence*. Rockville, MD: National Institutes of Health.; 1993. p. 73-95.
- Coon GM, Pena D, Illich PA. Self-efficacy and substance abuse: Assessment using a brief phone interview. *Journal of Substance Abuse Treatment* 1998;15:385–391. [PubMed: 9750996]
- Cooney NL, Litt MD, Morse PA, Bauer LO, et al. Alcohol cue reactivity, negative-mood reactivity, and relapse in treated alcoholic men. *Journal of Abnormal Psychology* 1997;106:243–250. [PubMed: 9131844]
- Demmel R, Beck B, Richter D, Reker T. Readiness to change in a clinical sample of problem drinkers: Relation to alcohol use, self-efficacy, and treatment outcome. *European Addiction Research* 2004;10:133–138. [PubMed: 15258444]
- Demmel R, Nicolai J, Jenko MDM. Self-efficacy and alcohol relapse: Concurrent validity of confidence measures, self-other discrepancies, and prediction of treatment outcome. *Journal of Studies on Alcohol* 2006;67:637–641. [PubMed: 16736085]
- Demmel R, Rist F. Prediction of treatment outcome in a clinical sample of problem drinkers: self-efficacy and coping style. *Addictive Disorders and Their Treatment* 2005;4:5–10.
- Ehrman RN, Robbins SJ. Reliability and validity of six-month timeline reports of cocaine and heroin use in a methadone population. *Journal of Consulting and Clinical Psychology* 1994;62:843–850. [PubMed: 7962889]
- First, MB.; Spitzer, RL.; Gibbon, M.; Williams, J. *Structured Clinical Interview for DSM-IV Axis I Disorders – Patient Edition*. Biometrics Research Department, Psychiatric Institute; New York: 1995.
- Goldbeck R, Myatt P, Aitchison T. End-of-treatment self-efficacy: A predictor of abstinence. *Addiction* 1997;92:313–324. [PubMed: 9219393]
- Gulliver SB, Hughes JR, Solomon LJ, Dey AN. An investigation of self-efficacy, partner support and daily stresses as predictors of relapse to smoking in self-quitters. *Addiction* 1995;90:767–772. [PubMed: 7633293]
- Haaga DAF. Issues in relating self-efficacy to smoking relapse: Importance of an “Achilles’ Heel” situation and of prior quitting experience. *Journal of Substance Abuse* 1990;2:191–200. [PubMed: 2136109]
- Hodgins DC, Peden N, Makarchuk K. Self-efficacy in pathological gambling treatment outcome: Development of a gambling abstinence self-efficacy scale (GASS). *International Gambling Studies* 2004;4:99–108.
- Jovanovski D, Erb S, Zakzanis KK. Neurocognitive deficits in cocaine users: A quantitative review of the evidence. *Journal of Clinical and Experimental Neuropsychology* 2005;27:189–204. [PubMed: 15903150]
- Kavanaugh DJ, Sitharthan T, Sayer GP. Prediction of results from correspondence treatment for controlled drinking. *Addiction* 1996;91:1539–1545. [PubMed: 8917921]
- Kozlowski LT, Mann RE, Wilkinson DA, Poulos CX. “Cravings” are ambiguous: Ask about urges or desires. *Addictive Behaviors* 1989;14:443–445. [PubMed: 2782125]
- Lezak, MD. *Neuropsychological Assessment*. Oxford: Oxford University Press.; 1995.
- Majer JM, Jason LA, Ferrari JR, Olson BD, North CS. Is self-mastery always a helpful resource? Coping with paradoxical findings in relation to optimism and abstinence self-efficacy. *The American Journal of Drug and Alcohol Abuse* 2003;29:385–399. [PubMed: 12765212]
- Majer LM, Jason LM, Olson BD. Optimism, abstinence self-efficacy, and self-mastery: A comparative analysis of cognitive resources. *Assessment* 2004;11:57–63. [PubMed: 14994954]
- Marlatt, GA.; Gordon, JR., editors. *Relapse prevention: Maintenance strategies in the treatment of addictive behaviors*. New York: Guilford.; 1985.

- Martin RA, Rohsenow DJ, MacKinnon SV, Abrams DA, Monti PM. Pretreatment predictors of motivation to quit smoking among alcohol dependent patients in residential treatment. *Drug and Alcohol Dependence* 2006;83:73–78. [PubMed: 16314049]
- McIntyre KO, Lichtenstein E, Mermelstein RJ. Self-efficacy and relapse to smoking cessation: A replication and extension. *Journal of Consulting and Clinical Psychology* 1983;51:632–633. [PubMed: 6619375]
- McKay JR, Alterman AI, Cacciola JS, Rutherford MJ, O'Brien CP, Koppenhaver J. Group counseling versus individualized relapse prevention aftercare following outpatient treatment for cocaine dependence: Initial results. *Journal of Consulting and Clinical Psychology* 1997;65:778–788. [PubMed: 9337497]
- McKay JR, Merikle E, Mulvaney FD, Weiss RV, Koppenhaver JM. Factors accounting for cocaine use two years following initiation of continuing care. *Addiction* 2001;96:213–225. [PubMed: 11182866]
- McKay JR, Foltz C, Stephens RC, Leahy PJ, Crowley EM, Kissin W. Predictors of alcohol and crack cocaine use outcomes over a 3-year follow-up in treatment seekers. *Journal of Substance Abuse Treatment* 2005;28(Supplement 1):573–582.
- McKay JR, Foltz C, Leahy PJ, Stephens RC, Orwin RG, Crowley EM. Step down continuing care in the treatment of substance abuse: Correlates of participation and outcome effects. *Evaluation and Program Planning* 2004;27:321–331.
- Miller GA, Chapman JP. Misunderstanding analysis of covariance. *Journal of Abnormal Psychology* 2001;110:40–48. [PubMed: 11261398]
- Miller, WR. The Stages of Change Readiness and Treatment Eagerness Scale. Albuquerque, NM: University of New Mexico.; 1991.
- Monti PM, Abrams DB, Binkoff JA, Zwick WR, Liepman MR, Nirenberg TD, Rohsenow DR. Communication skills training, communication skills training with family, and cognitive behavioral mood management training for alcoholics. *Journal of Studies on Alcohol* 1990;51:263–270. [PubMed: 2342366]
- Monti, PM.; Kadden, R.; Rohsenow, DJ.; Cooney, N.; Abrams, DB. Treating alcohol dependence: A coping skills training guide. 2. New York: Guilford.; 2002.
- Monti PM, Rohsenow DJ, Abrams DB, Zwick WR, Binkoff JA, Munroe SM, Fingeret AL, Nirenberg TD, Liepman MR, Pedraza M, Kadden RM, Cooney NL. Development of a behavior analytically derived alcohol-specific role-play assessment instrument. *Journal of Studies on Alcohol* 1993a; 54:710–721. [PubMed: 8271807]
- Monti PM, Rohsenow DJ, Michalec E, Martin RA, Abrams DB. Brief coping skills treatment for cocaine abuse: Substance use outcomes at 3 months. *Addiction* 1997;92:1717–1728. [PubMed: 9581004]
- Monti PM, Rohsenow DJ, Rubonis A, Niaura R, Sirota A, Colby S, Goddard P, Abrams DB. Cue exposure with coping skills treatment for male alcoholics: A preliminary investigation. *Journal of Consulting and Clinical Psychology* 1993b;61:1011–1019. [PubMed: 7906700]
- Morgenstern J, Bates ME. Effects of executive function impairment on change processes and substance use outcomes in 12-step treatment. *Journal of Studies on Alcoholism* 1999;60:846–855.
- Niaura RS, Rohsenow DJ, Binkoff JA, Monti PM, Abrams DB, Pedraza M. The relevance of cue reactivity to understanding alcohol and smoking relapse. *Journal of Abnormal Psychology* 1988;97:133–152. [PubMed: 3290304]
- Niaura RS, Shadel WG, Abrams DB, Monti PM, Rohsenow DJ, Sirota AD. Individual differences in cue reactivity among smokers trying to quit: Effects of gender and cue type. *Addictive Behaviors* 1998;23:209–224. [PubMed: 9573425]
- O'Malley S, Adamse M, Heaton RK, Gawin FH. Neuropsychological impairment in chronic cocaine abusers. *American Journal of Drug and Alcohol Abuse* 1992;18:131–144. [PubMed: 1562011]
- Reilly PM, Sees KL, Shopshire MS, Hall SM, Delucchi KL, Tusek DJ, et al. Self-efficacy and illicit opioid use in a 180-day methadone detoxification treatment. *Journal of Consulting and Clinical Psychology* 1995;63:158–162. [PubMed: 7896984]
- Reitan, RM.; Wolfson, D. The Halstead-Reitan Neuropsychological Test Battery. In: Wedding, D.; Horton, AM., editors. *The Neuropsychology Handbook: Behavioral and Clinical Perspectives*. 1986. p. 134-160.

- Rohsenow DJ, Martin RA, Eaton CA, Monti PM. Cocaine craving as predictor of treatment attrition and outcomes after residential treatment for cocaine dependence. *Journal of Studies on Alcohol and Drugs* 2007;68:641–648. [PubMed: 17690796]
- Rohsenow DJ, Monti PM, Martin RA, Colby SM, Myers MG, Gulliver SB, Brown RA, Mueller TI, Gordon A, Abrams DB. Motivational enhancement and coping skills training for cocaine abusers: Effects on substance use outcomes. *Addiction* 2004;99:862–874. [PubMed: 15200582]
- Rohsenow DJ, Monti PM, Martin RA, Michalec E, Abrams DB. Brief coping skills treatment for cocaine abuse: 12-month substance use outcomes. *Journal of Consulting and Clinical Psychology* 2000;68:515–520. [PubMed: 10883569]
- Rounds-Bryant JL, Flynn PM, Craighead LW. Relationship between self-efficacy perceptions and in-treatment drug use among regular cocaine users. *American Journal of Drug and Alcohol Abuse* 1997;23:383–395. [PubMed: 9261487]
- Sklar WSM, Annis HM, Turner NE. Group comparisons of coping self-efficacy between alcohol and cocaine abusers seeking treatment. *Psychology of Addictive Behaviors* 1999;13:123–133.
- Sklar SM, Turner NE. A brief measure for the assessment of coping self-efficacy among alcohol and other drug users. *Addiction* 1999;94:723–729. [PubMed: 10563037]
- Smith DE, McCrady BS. Cognitive impairment among alcoholics: Impact on drink refusal skill acquisition and treatment outcome. *Addictive Behaviors* 1991;16:265–274. [PubMed: 1663696]
- Sobell LC, Sobell MB. Convergent validity: An approach to increasing confidence in treatment outcome conclusions in drug abusers. In: Sobell, LC.; Sobell, MB.; Ward, E., editors. *Evaluating Alcohol and Drug Abuse Treatment Effectiveness: Recent Advances*. New York: Pergamon Press.; 1980. p. 177-183.
- Sobell LC, Sobell MB. Can we do without alcohol abusers' self reports? *Behavior Therapist* 1986;7:141–146.
- Solomon KE, Annis HM. Outcome and efficacy expectancy in the prediction of posttreatment drinking behavior. *British Journal of Addiction* 1990;85:659–665. [PubMed: 2354283]
- Tabachnick, BG.; Fidell, LS. *Using multivariate statistics*. 2. New York: Harper Collins.; 1989.
- Verdejo-Garcia A, Perex-Garcia M. Profile of executive deficits in cocaine and heroin polysubstance users: Common and differential effects on separate executive components. *Psychopharmacology* 2007;190:517–530. [PubMed: 17136401]
- Warren JI, Stein JA, Grella CE. Role of social support and self-efficacy in treatment outcomes among clients with co-occurring disorders. *Drug and Alcohol Dependence* 2007;89:267–274. [PubMed: 17329040]
- Wong CJ, Anthony S, Sigmon SC, Mongeon JA, Badger GJ, Higgins ST. Examining interrelationships between abstinence and coping self-efficacy in cocaine-dependent outpatients. *Experimental and Clinical Psychopharmacology* 2004;12:190–199. [PubMed: 15301636]
- Young, RM.; Wei, TPS. *Drinking Expectancy Profile: Test Manual*. Behavior Research and Therapy Centre, University of Queensland; Australia: 1996.

Table 1

Sample Characteristics

Variable	Mean (S.D.) or percentage
<u>Demographics</u>	
Age	32.3 ± 7.2
Education	12.0 ± 2.0
Ethnicity	
Caucasian	63%
Black	27%
Hispanic	6%
Native American	4%
Married or cohabiting	11%
Employed full- or part-time	17%
In a controlled environment pretreatment	12%
<u>Mean length of treatment</u> (days)	36.3 ± 23.0
<u>Substance Use History</u>	
Routes of administration used	
Smoke (crack or freebase)	72%
Intranasal	54%
Inject	4%
Dollars spent on cocaine last 6 mos.	\$8,481 ± 1,067
Days of cocaine use last 6 mos.	64.9 ± 40.7
Age of onset of weekly cocaine use	23.1 ± 6.5
Number of quit attempts	25.8 ± 110.0
Number of substance abuse treatment episodes	3.6 ± 4.8
<u>Self-efficacy Measures</u>	
Self-efficacy: general rating	8.8 ± 1.9
Self-efficacy in high-risk situations	5.4 ± 1.2
<u>Depression and Cognitive Function</u>	
Beck Depression Inventory –II	11.7 ± 6.9
Trailmaking Test- Part B (in seconds)	87.7 ± 34.8

Table 2Correlations of Pretreatment Variables and Self-Efficacy Measures (*r* except where indicated)

Variable	Self-Efficacy-General	Self-Efficacy-High Risk
<u>Demographics</u>		
Age	.15	.32***
Education	-.11	-.18
<u>Substance Use History</u>		
Dollars spent on cocaine last 6 mos.	-.10	-.23***
Days of cocaine use last 6 mos.	-.19**	-.06
Number of drugs used	.06	-.15
Number of cocaine dependence symptoms	-.07	-.05
Years since began weekly cocaine use	.15**	.11
Age of onset of weekly cocaine use	.09	.27***
<u>Indicators of Past Treatment Success</u>		
Length of last abstinence	.12	.19**
Months since last abstinence	.00	.01
Number of previous cocaine quit attempts	.03	-.07
<u>Desire to stop using</u>	.44***	.17
<u>Urge to use in high-risk situations</u>	-.27***	-.53***
<u>Other Psychological Variables</u>		
Beck Depression Inventory	-.25**	-.32***
Trailmaking Test-B (<i>pr</i> controlling for age)	.13	.24***

**
Note. $p \leq .005$;***
 $p \leq .001$

Self-efficacy Predicting Cocaine Use Quantity and Frequency During Treatment Outcome, Covarying 6-month Pretreatment Value of the Cocaine Use Variable

Table 3

Variable	Step entering self-efficacy					Total Equation	
	β	Wald	β	R ² change	F change	X ² (2) ^a	R F (df)
Self-Efficacy – General							
3-month quantity	-.26	.07			8.82***		.37 9.27 (2,113)***
3-month frequency	-.25	.06			8.30**		.28 5.04 (2,123)**
3-month abstinence	.36	8.74**				10.33	
6-month quantity	.01	.00			0.02		.19 2.10 (2,110)
6-month frequency	-.04	.02			2.05		.14 1.20 (2,118)
6-month abstinence	.13	1.18				3.46	
Self-Efficacy – High Risk							
3-month quantity	-.29	.08			10.71***		.39 10.29 (2,113)***
3-month frequency	-.10	.04			4.69*		.22 3.21 (2,123)*
3-month abstinence	.36	5.25				5.48	
6-month quantity	-.23	.03			3.50		.26 3.91 (2,110)*
6-month frequency	-.05	.01			1.00		.11 0.68 (2,118)
6-month abstinence	.11	0.47				2.15	

* $p < .05$,

** $p < .01$,

*** $p < .005$