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BRIEF REPORTS

Abstinence Self-Efficacy and Abstinence 1 Year After Substance Use Disorder Treatment

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To better understand the relationship between abstinence self-efficacy and treatment outcomes in substance use disorder patients, experts in the field need more information about the levels of abstinence self-efficacy most predictive of treatment outcomes. Participants (N = 2,967) from 15 residential substance use disorder treatment programs were assessed at treatment entry, discharge, and 1-year follow-up. A signal detection analysis compared the ability of different measures of self-efficacy to predict 1-year abstinence and identified the optimal cutoffs for significant predictors. The maximal level of abstinence self-efficacy (i.e., 100% confident) measured at discharge was the strongest predictor of 1-year abstinence. Treatment providers should focus on obtaining high levels of abstinence self-efficacy during treatment with the goal of achieving 100% confidence in abstinence.

Keywords: self-efficacy, substance use disorder, treatment outcomes, abstinence

Theoretical models of relapse (Marlatt & Gordon, 1985) and stages of change for substance use disorders (SUDs) highlight the important role of self-efficacy in influencing the decision to decrease substance use and in maintaining gains following SUD treatment (Bandura, 1982; DiClemente, Fairhurst, & Piotrowski, 1995).

Although results from the smoking literature are mixed (e.g., Baer, Holt, & Lichtenstein, 1986; Smith, Kraemer, Miller, DeBusk, & Taylor, 1999), high abstinence self-efficacy (i.e., confidence to remain abstinent) generally predicts reductions in substance use at follow-up (e.g., Carbonari & DiClemente, 2000; Rychtarik, Prue, Rapp, & King, 1992; Stephens, Wertz, & Roffman, 1995). However, little is known about the values that represent optimal levels of self-efficacy. Identifying the optimal level of self-efficacy is important because considerable concern remains that high levels of abstinence self-efficacy may represent overconfidence (or denial) on the part of SUD patients and may be associated with poorer prognosis (Burling, Reilly, Moltzen, & Ziff, 1989; Mayer & Koeningsmark, 1991).

In the current article, we aim to maximize the clinical use of the self-efficacy construct by addressing several important issues surrounding the relationship between abstinence self-efficacy and abstinence outcomes. These include the following: (a) identifying optimal cutoff points on measures of self-efficacy and (b) testing whether groups of overconfident individuals can be reliably identified as reflected in lower than average rates of abstinence among subgroups of highly confident patients.

Method

Participants and Procedures

Patients were recruited for participation in the study from 15 residential SUD treatment programs in the Veterans Affairs Health Care System. Women were excluded from the analyses because of the small numbers (n = 64; for more information, see Ouimette, Finney, & Moos, 1997). In each program, consecutive admissions were approached unless patient volume was in excess of data collection capabilities. If so, every other admission or every third admission was recruited. A total of 4,193 patients were invited to participate (90% of those eligible); the other 10% left the program before completing detoxification or did not participate because of scheduling problems. Of these 4,193 patients, 3,698 patients (88%) agreed to participate in this study. After detoxification was complete, research staff independent of the treatment program administered a self-report inventory at the start of treatment, discharge, and 1-year follow-up. Of the 3,698 participants, 2,967 (80%) completed the 1-year follow-up assessment (see Table 1). No statistically significant baseline differences were noted between participants who did (n = 2,967) or did not (n = 731) provide 1-year follow-up data in terms of age, education, marital status, severity of substance abuse problems, psychiatric symptoms, or 12-step group affiliation (largest $\eta^2 < .01$).

Treatment programs had a length of stay of 21–28 days and encouraged aftercare attendance via referrals to outpatient treatment and community

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Table 1
Percentage Values of Demographic and Clinical Variables of Total Sample

Demographic variable	% of sample
Age (years)	
% 18–35	22.0
% 36–50	59.0
% 51–65	16.0
% 66+	3.0
Education	
% less than high school	16.0
% high school	37.0
% high school +2 years	34.0
% college	11.0
% college +	2.0
Employment	
% unemployed	76.0
% employed part-time	6.0
% employed full-time	18.0
Religious background	
% Catholic	18.8
% Jewish	0.4
% Protestant	58.2
% other	11.5
% none	11.2
Relationship status (% with significant other)	41.0
Clinical variables	
% alcohol dependence	82.0
% drug dependence	53.0
% drug and alcohol dependence	37.0
% Inpatient substance abuse last 2 years	39.0

self-help organizations following discharge. Over 87% of patients completed treatment, and rates of substance use in the residential programs were extremely low, with more than 98% of participants reporting no in-treatment substance use. For more details about the procedures, see Ouimette et al. (1997).

Measures

Frequency of drug use. The self-report Treatment Outcomes Prospective Studies (Hubbard et al., 1989) was used to measure frequency of drug use in the past 3 months on each substance (cocaine, methamphetamines, amphetamine, heroin, other opiates, tranquilizers, inhalants) with a 5-point scale ranging from 0 (*never*) to 4 (*every day*). Separate scores for each substance and each method of administration (e.g., smoked, injected, ingested) were summed to derive a composite score.

Level of alcohol use. A quantity–frequency measure of alcohol use in the past 3 months was reported by participants using items from the Health and Daily Living Form (Moos, Cronkite, & Finney, 1990; National Institute on Alcohol Abuse and Alcoholism, 1988) and reflects the estimated usual and highest amount of alcohol (beer, wine, or hard alcohol) consumed by the individual over the course of a week (i.e., never, less than once a week, 1–3 days per week, 4–6 days per week, or every day). From these variables, an alcohol consumption measure was created that reflected average ounces of ethanol consumed per day after heavy drinking days had been factored (i.e., quantity—frequency—variability index; see Room, 1990).

Substance-related problems. Participants also completed the Problems From Substance Use scale (Ouimette, Gima, Moos, & Finney, 1999). This assesses the negative consequences of alcohol and drug use, including domains such as health, legal, monetary, occupational, residential, and interpersonal. The 18 items are scored on a 5-point scale ranging from 0 (*never*) to 4 (*often*) and internal consistency for this measure was .88 at baseline.

Psychiatric symptoms. Twenty-two items from the Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983)—measuring depression, anxiety, paranoia, and psychotic symptoms—were summed as a measure of psychiatric symptoms; each item was rated on a 5-point scale ranging from 0 (*not at all*) to 4 (*extremely*). Intake alpha was .94 for the total BSI score.

Situational Confidence Questionnaire (SCQ). The 14 items of this scale measure the participants' self-efficacy related to their ability to abstain from substances in specific tempting situations (e.g., negative emotional states, negative physical states, interpersonal conflict). For each item, the participant is asked to select from a list of six options (0%, 20%, 40%, 60%, 80%, 100%) to indicate his or her level of confidence that he or she can maintain abstinence from all substances in the situation (Annis & Graham, 1988; Miller, Ross, Emmerson, & Todt, 1989). For scoring purposes, we converted these percentages to a 6-point scale that ranged from 0 (*corresponding to 0%*) to 5 (*corresponding to 100%*) for each item and then summed and divided by 14 to obtain a mean level of confidence in remaining abstinent ($\alpha = .96$).

General self-efficacy for abstinence. This item is adapted from scales developed for cigarette smokers (Baer & Lichtenstein, 1988; Haaga, 1990). The question asks participants to rate how confident they are that they will be completely abstinent in 1 year on a 10-point scale ranging from 1 (*not at all confident*) to 10 (*extremely confident*).

Abstinence at 1-year follow-up. Participants who had no drug or alcohol use in the last 3 months were considered abstinent. Alcohol consumption over the past 3 months was assessed with items from the Health and Daily Living Form (Moos et al., 1990). Drug use over the past 3 months was assessed with items taken from the Treatment Outcomes Prospective Studies (Hubbard et al., 1989) inventories.

Data Analyses

First, measures of abstinence self-efficacy were correlated with abstinence at 1-year follow-up to compare the strength of their association. Next, a signal detection analysis was used to identify the strongest predictor of abstinence at 1 year on the basis of demographic factors, measures of baseline substance use, psychiatric symptoms, and measures of self-efficacy. The signal detection analysis was first conducted on a random selection of 75% of the patients ($n = 2{,}231$), referred to as the exploratory sample. The remaining 25% of the patients ($n = 736$) were used as a replication sample to cross-validate the model generated by the signal detection analysis in the exploratory sample.

For the current study, receiver operating characteristics (ROC) analysis was chosen because it could identify subgroups of patients with high levels of self-efficacy who might have had rates of abstinence that were lower than the overall rate of abstinence in the sample at follow-up. Thus, if the phenomena of overconfidence reliably produced a negative effect in certain patients, this might be detected through the use of this analysis. Following the procedures outlined in Smith et al.'s (1999) study, we used the ROC analysis to give equal weight to sensitivity and specificity to maximize the ability to test for both the potential benefits and potential risks associated with differing levels of self-efficacy. All variables entered into the ROC analysis are listed in Table 2. The specific software used is available at http://mirecc.stanford.edu/. Finally, other potential differences between the groups were explored by analysis of variance and chi-square analyses to generate hypotheses about factors that may underlie membership in the groups produced by signal detection analysis. This process was described previously in Winkleby et al.'s (1997) study.

Results

Interrelatedness of Self-Efficacy Measures and Abstinence at 1 Year

Significant ($p < .01$) correlations were found between all measures of self-efficacy and abstinence (see Table 3). Despite the

Table 2
F Test and Chi-Square Analyses of Sociodemographic Characteristics of Groups Identified by the ROC Analysis

	Rate of abstinence approximately equal to:								
	50%			30%			20%		
Group	2	1	7	5	3	6	4	Total	F or χ^2
% abstinent	54	52	50	37	34	33	21	31	
Age (years)									$F(6, 2058) = 49.4$**
M	58.4	45.6	41.9	47.4	38.9	41.1	43.1	43.2	
SD	6.3	11.5	7.6	11.8	5.6	8.6	9.1	9.6	
Non-Caucasian									$\chi^2(6, N = 2{,}058) = 99.6$**
n	19	167	77	46	219	124	456	1108	
%	32	59	72	40	70	62	46	54	
Significant other at intake									$\chi^2(6, N = 2{,}059) = 22.2$**
n	12	98	43	51	125	100	408	837	
%	20	35	40	44	40	50	42	41	
Less than high school education									$\chi^2(6, N = 2{,}059) = 16.0$**
n	14	54	16	23	31	31	141	310	
%	24	19	15	20	10	16	14	15	
Unemployed									$\chi^2(6, N = 2{,}059) = 15.4$*
n	51	219	81	90	222	138	768	1569	
%	87	78	76	78	71	69	78	76	
BSI									$F(6, 2058) = 34.0$**
M	29.6	29.2	31.4	17.5	37.4	29.3	38.4	34.3	
SD	18.0	19.3	18.9	14.4	19.2	16.7	17.8	18.9	
Alcohol quantity									$F(6, 2058) = 69.8$**
M	12.2	9.4	0.01	9.3	9.0	0.6	13.6	10.1	
SD	11.4	10.6	0.02	10.7	10.5	0.4	11.0	11.0	
Substance-related problems									$F(6, 2057) = 77.7$**
M	18.7	19.3	19.5	5.4	25.9	18.3	27.5	23.4	
SD	10.1	11.9	13.7	3.0	13.1	11.8	12.6	13.5	
Frequency drug									$F(6, 2055) = 11.3$**
M	1.3	2.6	4.1	1.2	3.7	3.7	2.8	3.0	
SD	2.5	3.6	3.8	1.8	4.0	4.0	4.1	3.9	
Intake confidence in abstinence									$F(6, 2058) = 64.0$**
M	8.3	9.5	7.5	6.7	8.3	7.3	7.3	7.5	
SD	2.1	1.2	2.4	2.5	2.1	2.2	2.2	2.4	
Discharge confidence in abstinence									$F(6, 2058) = 247.5$**
M	10.0	10.0	7.4	6.9	10.0	7.4	7.4	8.0	
SD	0.0	0.0	1.7	2.1	0.0	1.7	1.7	2.2	
Intake situational confidence									$F(6, 2055) = 118.6$**
M	2.9	4.7	3.1	3.3	2.6	3.0	3.0	3.2	
SD	0.9	0.3	1.3	1.2	1.1	1.2	1.2	1.3	
Discharge situational confidence									$F(6, 2056) = 57.3$**
M	4.3	4.7	3.6	3.8	4.1	3.6	3.6	3.8	
SD	0.9	0.6	1.2	1.1	1.0	1.1	1.1	1.1	

Note. ROC = receiver operating characteristics; BSI = Brief Symptom Inventory.
* $p < .05$. ** $p < .01$.

statistically significant association between measures of abstinence self-efficacy and abstinence at 1 year, the magnitude of the association is small, and little is known about optimal levels on these measures. The following ROC analysis helps to identify subgroups of patients for whom abstinence self-efficacy (either low or high) may be particularly important in determining an abstinence outcome.

ROC Analysis

Within the exploratory sample, we analyzed all demographic variables and intake and discharge measures using ROC methods on the basis of their ability to identify participants who were abstinent at 1-year follow-up. The overall rate of abstinence for the exploratory sample (n = 2,231) was 31%. The ROC analysis resulted in the formation of a decision tree with distinct groups that are presented and labeled in Figure 1. The pathways directing membership in Groups 1–3 are described in detail below. To conserve space, we refer the reader to Figure 1 for more information about how Groups 4–7 were determined.

Discharge confidence in abstinence maximally discriminated abstinent from nonabstinent participants at 1 year with an optimal cutoff of 10, $\chi^2(1, N = 2{,}231) = 59.67$, $p < .01$, $k = .17$. Among participants with a score of 10 or *full general confidence in abstinence* (i.e., 100% confidence in remaining abstinent; n = 652), 43% (n = 283/652) were abstinent at 1 year compared with 26% (n = 371/1407) of those with less than complete confidence in abstinence.

Table 3
Intercorrelations and 95% Confidence Intervals (CIs) Between Measures of Self-Efficacy and Abstinence at 1 year

Measure	1	2	3	4	5
1. Intake SCQ (CI)	—	.42 (.39–.46)	.45 (.43–.49)	.28 (.24–.32)	.09 (.05–.13)
2. Intake confidence in abstinence (CI)		—	.35 (.31–.39)	.51 (.48–.54)	.10 (.05–.14)
3. Discharge SCQ (CI)			—	.51 (.48–.55)	.15 (.11–.19)
4. Discharge confidence in abstinence (CI)				—	.18 (.14–.23)
5. 1-year abstinence (CI)					—

Note. All correlations are significant ($p < .01$). SCQ = Situational Confidence Questionnaire.

Within the subgroup of participants reporting 100% general confidence in remaining abstinent at discharge, the signal detection analysis further divided these participants on the basis of intake SCQ, $\chi^2(1, N = 652) = 15.17$, $p < .01$, $k = .15$. Of participants with an SCQ ≥ 4.14 (on a scale ranging from 0 to 5), 52% ($n = 147/282$) were abstinent at 1 year. Testing was stopped at this branch of the tree because no other variable provided significant discrimination. This group is referred to as Group 1 (see Figure 1). For those participants with an SCQ < 4.14, 37% ($n = 136/369$) were abstinent at 1 year.

These participants were divided further on the basis of their age, $\chi^2(1, N = 369) = 9.12$, $p < .01$, $k = .14$. We refer to older participants (≥50 years; $n = 32$) who had a rate of abstinence at 1 year of 54% as Group 2 and to younger participants (<50 years; $n = 310$) who had a rate of abstinence at 1 year of 34% as Group 3. Testing was stopped in both branches of the tree because no other variable provided significant discrimination.

Comparison of Groups Identified by the ROC Analysis

Table 2 presents additional information about the seven groups identified by the ROC in exploratory sample to better understand their composition. Significant omnibus differences between groups were found on each of these variables. These have been grouped according to rates of abstinence at follow-up and are arranged from high to low on this variable. Similar to the process described in Winkleby et al.'s (1997) study, these data are presented to aid in the production of hypotheses about the factors that may have been associated with group membership and might further explain the relevance of self-efficacy in these groups of individuals.

Cross-Validation of Results of ROC Analysis in Replication Sample

We cross-validated the ROC by using the cutpoints derived by the ROC from the exploratory sample to categorize participants in the replication sample. Rates of abstinence in the replication sample did not differ significantly from the rates of abstinence in the exploratory sample in six of the seven groups. Only Group 4 differed, with 21% of participants abstinent in the exploratory sample compared with 28% in the replication sample, $\chi^2(1, N = 1303) = 6.85$, $p < .01$. As was noted in Kiernan, Kraemer, Winkleby, King, and Taylor's (2001) study, this type of minimal difference in models is to be expected and indicates that the overall model presented in Figure 1 is reliable.

Discussion

For patients treated in residential SUD treatment, full confidence in abstinence (i.e., 100% confidence) at discharge was the

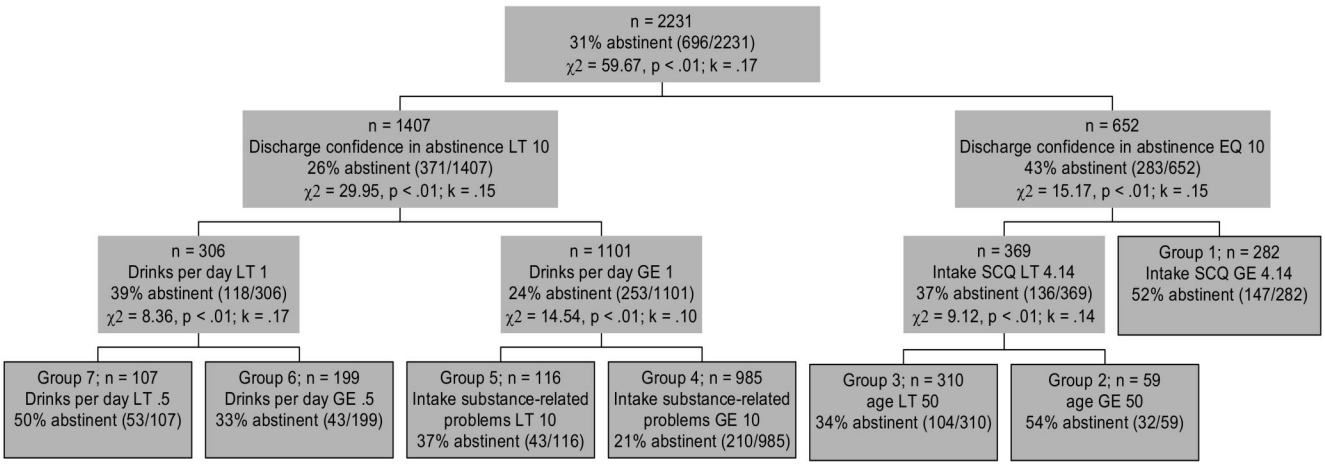

Figure 1. Results of the receiver operating characteristics analysis discriminating subgroups of patients who are abstinent at 1 year and those who are not. Because of missing data on individual measures, the numbers for all subgroups do not exactly equal the overall total for the sample. LT = less than; GE = greater than or equal to; EQ = equal to; SCQ = Situational Confidence Questionnaire.

strongest predictor of abstinence at 1 year above and beyond all other predictors, including other measures of self-efficacy, baseline measures of alcohol and substance use, and other sociodemographic factors. The present findings are consistent with those of Smith et al. (1999) and suggest that treatment should not only focus on increasing abstinence self-efficacy but should have as a goal the attainment of full confidence in abstinence at the completion of treatment. Additionally, the model generated by the signal detection analysis underscores the importance of identifying patient characteristics that interact with self-efficacy to determine subgroups of patients for whom abstinence self-efficacy is either more or less closely associated with treatment outcomes. For example, in those individuals with 100% general confidence in abstinence and lower levels of intake situational confidence, age is an important predictor of 1-year abstinence.

Some clinicians and researchers have expressed concerns that high levels of self-efficacy at discharge may suggest overconfidence or denial on the part of the patient and may be associated with negative treatment outcomes (Burling et al., 1989; Mayer & Koeningsmark, 1991). In the current study, no homogenous subgroups of patients were identified for whom the highest levels of general confidence were associated with rates of abstinence lower than the abstinence rate for the overall sample. However, it is clear that not every patient with high abstinence self-efficacy is abstinent at 1-year follow-up, leaving open the possibility that overconfidence may have negatively influenced 1-year outcomes for a portion of the sample. Although we cannot rule out the possibility of overconfidence as reliable and problematic phenomena in substance abuse treatment, the present findings suggest that concerns about overconfidence should be weighed against the clear positive association between high abstinence self-efficacy and abstinence 1 year after the completion of treatment in most SUD patients.

The cross-validation of the results in the replication sample provides evidence for stability of the overall model. However, several potential limitations of this study deserve comment. First, the absence of women from the sample may limit generalizability. Second, all of the treatment provided to SUD patients in this sample took place in a residential setting, and it is not known whether these findings would generalize to an outpatient sample. The rates of substance use during treatment were low in the present sample, but this still may have influenced measures of self-efficacy at discharge. Additionally, substance use was determined by self-report. Although biological tests tended to confirm self-reports in other published reports based on the present sample (Ouimette et al., 1997), only a subset of participants received such assays. The role that aftercare might have played in the present results is unknown at this time. Other process or personal variables not included in the current study may interact with self-efficacy to predict outcomes. Thus, predictions of abstinence could be strengthened by the inclusion of additional variables in subsequent studies. Finally, the use of an exploratory form of data analysis (i.e., ROC) is both a strength and a weakness of the current study. The exploratory nature of the work allows for the development of new hypotheses, but interpretations of the current study should be made with caution.

However, despite these limitations, the present findings provide a unique understanding of the role of abstinence self-efficacy as a potent predictor of treatment outcomes in individuals with SUDs. Results of this study provide a clinically useful way to understand the interactions between predictors of outcome and to identify specific subgroups of patients who may be either more or less likely to have positive outcomes following treatment.

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