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Impact of Abstinence Self-Efficacy and Treatment Services on Physical Health-Related Behaviors and Problems among Dually Diagnosed Patients

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Abstract

Objective—Physical health problems are pervasive among patients with co-occurring substance use and mental disorders. Yet, drug treatment programs often ignore tobacco use and its association with health. Abstinence self-efficacy has been associated with improved outcomes for co-occurring disorders, which in turn may also impact physical health. This study had the goal of assessing whether abstinence self-efficacy for drugs and alcohol, and provision and use of services would influence tobacco use and other health-related outcomes among 351 individuals with co-occurring disorders in residential drug treatment.

Methods—Structural models tested the impact of baseline abstinence self-efficacy and treatment service characteristics on 6-month outcomes of health problems, functional limitations, health perceptions, and cigarette and heavy alcohol use. Demographics and baseline values for outcome variables were included as covariates.

Results—Correlations within time for poor health, cigarette use, and heavy alcohol use were substantial. A longer time in drug treatment was associated with less cigarette and heavy alcohol use at a 6-month follow-up. Baseline health problems were associated with more cigarette use and functional limitations at 6-months. Abstinence self-efficacy did not predict less cigarette use, but predicted less heavy alcohol use and fewer functional limitations. Availability of specialized dual-diagnosis groups and more on-site psychological services were not directly associated with outcomes, but had an impact through indirect effects on more psychological service utilization which predicted better subjective health.

Conclusions—Improving overall treatment retention and services utilization among patients with co-occurring disorders may generalize to improved health perceptions, but specific health promotion and smoking-cessation interventions are warranted to improve health outcomes.

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DISCLOSURES

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Keywords

co-occurring disorders; health; self-efficacy; cigarette use; treatment outcomes

The physical health of individuals with co-occurring substance use and mental disorders may have been relatively neglected due to exigent concerns about their mental illness and substance use (Larson et al., 2005; Villena & Chesla, 2010). However, individuals with co-occurring disorders have high rates of chronic health problems (e.g., diabetes), multiple hospitalizations, and tend to utilize emergency and other medical services disproportionately (Parthasarathy & Weisner, 2005; Villena & Chesla, 2010). These health problems often arise due to the high levels of risky health behaviors such as alcohol and tobacco use among those with serious mental disorders (Mueser & Brunette, 2010; Parks, Svendsen, Singer, & Foti, 2006). Individuals with co-occurring disorders have elevated rates of smoking and are even less likely to quit smoking than mentally ill individuals who do not abuse drugs (Ferron et al., 2011). Despite their elevated risk for physical morbidities, there is a relative lack of literature that focuses on the co-occurrence of physical health problems among those with co-occurring disorders. Given the findings of adverse health status among individuals who have mental disorders (Banerjea, Sambamoorthi, Smelson, & Pogach, 2007; Salloum, Douaihy, Ndimbie, & Kirisci, 2004), those who have co-occurring disorders are potentially at an even greater risk for physical health problems (Villena & Chesla, 2010).

Prior research has demonstrated that participation in drug treatment may lead to improvements in physical health outcomes (Hubbard, Craddock, & Anderson, 2003; Hubbard, Craddock, Flynn, Anderson, & Etheridge, 1997). Thus, programs that are better equipped to treat individuals with co-occurring disorders may also yield improvements in their physical health outcomes that are concurrent with improvements in their substance use and mental health outcomes. In prior work, Grella and Stein (2006) found that individuals with co-occurring disorders who were treated in drug treatment programs with specific “dual diagnosis” services and more on-site psychological services subsequently had higher rates of utilizing mental health services, and in turn, showed significantly greater improvements in psychological functioning at follow-up. Further, more psychological service utilization was associated with less substance use at follow-up. This current study expands on these findings by examining whether the positive effects of specialized dual-diagnosis services, on-site psychological service availability, and greater utilization of a range of psychological services extrapolate to improved physical health and lower rates of cigarette use among patients with co-occurring disorders.

Poor health as well as perceptions of poor health among individuals with co-occurring disorders can influence their likelihood to engage in behaviors that may help prevent disease (Kirscht, 1988). This is important especially when considering that smoking rates and alcohol consumption are high among individuals with co-occurring disorders (Berk et al., 2010; Dixon et al., 2007; Ferron et al., 2011; Kalman, Morissette, & George, 2005; Lasser et al., 2000; Li, Hewitt, & Grant 2004; Morissette et al., 2008; Ostacher et al., 2006; Sher et al., 2008). Some researchers have speculated that cigarette and tobacco use may not be a primary concern to individuals with co-occurring disorders as they struggle with the immediate consequences of their substance use and/or mental health problems (Salloum et al., 2004). However, some studies have found decreases in smoking even when smoking was not the focus of drug treatment (e.g., Shelef, Diamond, Diamond, & Myers, 2009).

One health belief that has been associated with less substance use among individuals with co-occurring disorders is abstinence self-efficacy, the belief in one’s ability to abstain from using drugs and alcohol (Burlison & Kaminer, 2005; Ilgen, McKeller, & Tiet, 2005;

Warren, Stein, & Grella, 2007). In the current study, we were interested in examining whether abstinence self-efficacy for drugs and alcohol generalizes to abstaining from tobacco use. Prior research has shown that the trait of self-efficacy may have cross-situational coherence, especially across situations that are reasonably similar (Cervone, 1997; Cervone, 2000; Orom & Cervone, 2009). Gwaltney, Shiffman and Sayette (2005) found individuals with low self-efficacy generally reported lower self-efficacy across situations although they did not find that abstinence self-efficacy for quitting smoking extrapolated to alcohol and coffee consumption.

Hypotheses

Building upon this prior research, the current study is guided by three research questions. 1) How does both objective and subjective poor health of patients with co-occurring disorders relate to their cigarette use and alcohol use both concurrently and at follow-up? It is anticipated that poor health and subjective perceptions of poor health at treatment entry will be associated with higher cigarette use and heavy drinking at both baseline and 6-month follow-up. The frequency of recent use of substances other than alcohol was quite low both at baseline and at follow-up. Thus, we did not include use of other types of drugs.

2) How does baseline abstinence self-efficacy relate to health, health perceptions, alcohol and cigarette use at baseline, and how does it affect treatment outcomes? Abstinence self-efficacy will be examined as a potential mediator of outcomes (including both alcohol and tobacco use at follow-up) in the current study to examine if it generalizes across these outcomes. Due to the possibly cross-situational nature of abstinence self-efficacy (e.g., Cervone, 1997, 2000), we hypothesize that patients with higher abstinence self-efficacy for alcohol and drugs will have lower alcohol and cigarette use at 6-month follow-up.

3) How do service program characteristics, including specialized dual diagnosis services and a greater availability of on-site psychological services, as well as greater utilization of psychological services, impact patient health outcomes, including cigarette smoking? Enhancing dual diagnosis capabilities in addiction and mental treatment services has been shown to be integral to improvement in those services (Drake & Bond, 2010; McGovern, Lambert-Harris, McHugo, Giard, & Mangrum, 2010). We hypothesize that these program characteristics will be associated with improved physical health outcomes. Further, because greater exposure to substance abuse treatment is expected to decrease their level of substance use, length of time in treatment is included as a control and predictor of substance use outcomes as it was in Grella and Stein (2006).

METHODS

Participants

Participants were individuals diagnosed with co-occurring disorders from 11 residential drug abuse treatment programs that provided publicly funded substance abuse treatment to adults within Los Angeles County. All study procedures were reviewed and approved by the UCLA Institutional Review Board; a Federal Certificate of Confidentiality to protect subject confidentiality was obtained from the National Institute on Drug Abuse and participants gave informed consent. All participants were advised about the purposes of the study and the study was conducted in accordance with the Declaration of Helsinki. The study design and methods have been described elsewhere in more detail (Gil-Rivas & Grella, 2005; Grella & Gilmore, 2002). The treatment programs in the study provided an average of about 90 days of residential treatment and generally adhered to an eclectic treatment approach that emphasized 12-step recovery principles, along with varying degrees of emphasis on counseling and rehabilitation services. Programs varied in their degree of on-site integration

of mental health services and extent of collaboration with nearby mental health providers (Grella & Stein, 2006).

Four-hundred people with co-occurring disorders participated at baseline. The current sample comprises 351 adult men (53%) and women (47%) who participated in the 6-month follow-up. Program staff screened potential study participants for study inclusion based on several indicators of mental disorders (e.g., use of medications for a psychiatric problem, currently receiving mental health services, referral from a mental health provider, past inpatient psychiatric treatment). Face-to-face baseline assessments were conducted by research staff within 30 days of treatment admission, and face-to-face follow-up interviews were conducted 6-months after admission. Their average age was 36 years (range: 18–60). Approximately 34% of the participants were African American, 45% were White, 13% were Hispanic, and 8% were of other ethnicities.

Participants were assessed on the Structured Clinical Interview for the DSM-IV Axis I Disorders – Patient Edition (SCID-I/P, Version 2.0; First, Spitzer, Gibbon, & Williams, 1997) for mood, psychotic, posttraumatic stress, and substance use disorders. Nearly two thirds of the sample had a diagnosis of mood disorder, and the remainder had a psychotic disorder diagnosis. Additionally, over half were diagnosed with posttraumatic stress disorder.

Regarding lifetime substance use, 70% had a diagnosis of alcohol dependence, 65% cocaine dependence, 44% cannabis dependence, 42% amphetamine dependence, 29% opioid dependence, and 25% sedative dependence. Out of the total baseline sample, 90% were located for follow-up; 88% completed the follow-up interview; 2% did not complete the follow-up because they refused, were deceased, or could not be scheduled; and the remaining 10% were not able to be located for follow-up. Comparisons between those who did and did not complete the 6-month follow-up interview revealed no significant differences in background characteristics or in follow-up rates by program where they were treated (Warren et al., 2007).

Measures

Baseline measures. Background patient characteristics included ethnicity (African American: 1 = *yes*, 0 = *no*), age in years, cigarette use, heavy alcohol use, subjective poor health, functional limitations, and recent health problems. Other demographic characteristics, such as gender, were examined as possible predictors, but were not significantly associated with the outcome measures and were dropped from the analyses. Some items were single indicators and other items were used as indicators of underlying latent variables.

Subjective Poor Health was measured with two items assessing health perceptions. The first item was based on a 5-point scale, ranging from 1 = *excellent* to 5 = *poor*, and asked the question, “Would you say your health is...?” The second item was also based on a 5-point scale, with 1 = *much better* and 5 = *much worse*, and asked the question, “Comparing your general health to that of other people your age, would you say your health is...?”

Functional Limitations were represented as a latent variable consisting of three composite parcels of the means of 10 items from the *RAND Health Survey SF-36* (Ware & Sherbourne, 1992). Items asked the general question, “Does your health now limit you in these activities? If so, how much?” The 10 items included statements such as “Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports,” and “Lifting or carrying groceries.” Respondents were asked to rate these on a 3-point scale with 1 = *yes, limited a lot*; 2 = *yes, limited a little*; and 3 = *no, not limited at all* (coefficient alpha

= .91; items were reverse-scored so that higher scores represent poorer function). Parceling is acceptable in structural modeling when alpha coefficients are high and when sets of items are sufficiently unidimensional so that important features of individual items are not discarded when they are combined (Yuan, Bentler, & Kano, 1997).

Cigarette Use was assessed by one item that asked how many cigarettes the individual currently smoked per day.

Heavy Alcohol Use was assessed with one item measuring alcohol use to intoxication. This item assessed the number of times they used alcohol to intoxication in the month prior to treatment admission on a 0–7 scale (0 = none and 7 = 4 or more times a day).

Recent Health Problems is a sum of health problems that had affected them recently (last 12 months at baseline, last 6 months at 6-month follow-up). These included 18 possible health problems such as respiratory problems, heart or circulatory problems, liver problems, diabetes, and bone and muscle problems.

Abstinence Self-efficacy was assessed with a 20-item scale that was based on the *Situational Confidence Questionnaire* (Annis & Graham, 1988). These 20 items examined the likelihood that one could resist using alcohol or drugs in different situations. These items were rated on a 3-point scale, with 1 = *not at all confident or sure*, 2 = *somewhat confident or sure*, to 3 = *very confident or sure* (coefficient alpha = .94). The 20 items were combined at random into 4 parcels. This latent variable was positioned as a mediator of the outcomes.

Follow-up Measures.

Service Delivery and Utilization: Four variables pertaining to services provision and use were included in the current analysis: 1) Whether the programs provided “*dual-diagnosis groups*” (i.e., self-help or group counseling specifically for this population). This variable was based on information provided by the program administrators/staff. 2) *Time in treatment* (measured in days) was included as a control variable predicting service utilization and the outcome variables, since time in treatment alone could have impacted the observed outcomes rather than individual characteristics of abstinence self-efficacy and the baseline predictors. Ninety-five percent of the sample was in treatment for less than 6 months; the mean number of days of treatment was about 94 days. This variable was derived from treatment program records. 3) The total *number of psychological services* provided on-site, summed from a list of 15 possible services. This variable was based on information provided by the program administrators/staff and was designed to indicate the relative degree of integrated on-site services in the program. 4) *Psychological service utilization* consisted of the number of family, psychological, and social service counseling sessions the patient attended during the 6-month follow-up period. Services included those received in the initial drug treatment episode as well as services received in aftercare or other treatment settings. Each sum was a separate indicator of a latent variable representing service utilization. This variable was positioned as a mediator of the outcomes. This variable was based on patient self-report at the 6-month follow-up interview.

Outcome variables included *Functional Limitations*, *Recent Health Problems*, *Cigarette Use*, *Heavy Alcohol Use*, and *Subjective Poor Health*. They were assessed in the same manner at the 6-month follow-up as they were at baseline except as noted above, recent health problems were assessed for the prior 6 months rather than the prior 12 months as asked at treatment entry.

Analysis

Measurement and path models were developed and tested with a latent variable covariance structure analysis using the EQS structural equations program (Bentler, 2006). Goodness-of-fit was assessed with the Maximum-Likelihood χ^2 statistic (ML χ^2), the Comparative Fit Index, the Satorra-Bentler χ^2 , the Robust Comparative Fit Index, and the root mean squared error of approximation (RMSEA) (Bentler, 2006; Hu & Bentler, 1999). The Satorra-Bentler χ^2 was used in addition to the Maximum-Likelihood χ^2 because it is more appropriate and robust when the data depart from multivariate normality as the data did in this study (Mardia's normalized estimate = 25.74). The Comparative Fit Index and Robust Comparative Fit Index range from 0 to 1 and reflect the improvement in fit of a hypothesized model over a model of complete independence among the measured variables. Values at .95 or greater are desirable, indicating that the hypothesized model reproduces 95% or more of the covariation in the data (Hu & Bentler, 1999). The RMSEA is a measure of fit per degrees of freedom, controlling for sample size, and values less than .06 indicate a relatively good fit between the hypothesized model and the observed data (Hu & Bentler, 1999).

An initial confirmatory factor analysis (CFA) assessed the adequacy of the hypothesized measurement model and provided bivariate correlations among the model variables. We then tested a predictive path model that positioned the background variables of age and African American ethnicity, Subjective Poor Health, Heavy Alcohol Use, Cigarette Use, Functional Limitations, and Recent Health Problems as predictors of intervening variables of Abstinence Self-Efficacy and Psychological Service Utilization. In turn, these variables predicted the outcomes of Heavy Alcohol Use, Functional Limitations, Cigarette Use, Subjective Poor Health, and Recent Health Problems. Service delivery variables of time in drug treatment, number of psychological services, and dual diagnosis group participation were also direct predictors of the outcomes as well as Psychological Service Utilization. We also expected that relationships between similar measures would be significant over time (e.g., Heavy Alcohol Use at baseline, Heavy Alcohol Use at 6-month follow-up) and these relationships were included as well. Correlations were allowed among the predictive background variables. Suggestions from the LaGrange Multiplier test (Chou & Bentler, 1999) for paths to be added from background variables to the outcome variables were evaluated and were only allowed if they made sense theoretically and logically. The LaGrange Multiplier test reports supplementary modifications to the original model that will improve the fit. Non-significant paths and correlations in this model were trimmed gradually following the recommended procedure of MacCallum (1986).

RESULTS

Confirmatory factor analysis

The initial confirmatory factor analysis had an excellent fit: Robust Satorra-Bentler $\chi^2 = 381.82$, 225 *df*; Robust Comparative Fit Index = .96; RMSEA = .045, 90% confidence interval = .037–.052; Maximum-Likelihood solution: ML $\chi^2 = 421.12$, 225 *df*; CFI = .95, RMSEA = .050, 90% confidence interval = .042–.057. All hypothesized factor loadings were significant ($p < .001$). Table 1 presents the factor loadings, means, and standard deviations of the measured variables. Significance testing of the substance use variables indicated that heavy alcohol use declined significantly at 6-month follow-up ($p < .001$) but that cigarette use did not decline but rather remained stable overall. Table 2 reports the correlations among all of the latent variables and the demographic and single-item variables in the confirmatory factor analysis. No supplementary associations were added to this model as the initial fit was quite good.

As expected, there were significant associations among many of the latent and measured variables in the model (see Table 2). In addition to the expected stabilities between similar measures across time, there were substantial correlations among the health-related variables of Subjective Poor Health, Recent Health Problems, and Functional Limitations within time and across time ($p < .001$ for all associations). Greater age was associated with more objective health problems. African-Americans reported significantly more functional limitations and greater abstinence self-efficacy. They also were more likely to be in programs with fewer on-site psychological services. Abstinence Self-Efficacy was associated with less alcohol and cigarette use concurrently at baseline and with less alcohol use at the 6-month follow-up. Within time at baseline and follow-up, Subjective Poor Health and Recent Health Problems were significantly associated with Cigarette Use. Further, Subjective Poor Health and Recent Health Problems at follow-up were significantly associated with more Cigarette Use at baseline. All of the health variables had non-significant associations with Heavy Alcohol Use both concurrently and across time.

Psychological Service Utilization was most highly associated with participation in specialized dual diagnosis groups, number of on-site psychological services, and time in drug treatment. It was also associated significantly with less heavy alcohol use and better subjective health at follow-up but was associated with more health problems at both baseline and follow-up. A longer time in drug treatment was associated with less Heavy Alcohol Use and less Cigarette Use at follow-up. Dual diagnosis groups were most highly associated with the number of on-site psychological services available to the patient.

Path analysis

Figure 1 presents the final path model. This model has acceptable fit statistics (Satorra-Bentler $\chi^2 = 483.40$, 325 *df*; Robust Comparative Fit Index = .96, RMSEA = .037, 90% confidence interval = .030 – .044; Maximum-Likelihood $\chi^2 = 516.78$, 325 *df*, CFI = .96, RMSEA = .041, 90% confidence interval = .034 – .048). Abstinence Self-Efficacy was significantly predicted by African American ethnicity, and less Heavy Alcohol Use. A greater number of on-site psychological services predicted a longer time in treatment. Psychological Service Utilization was predicted by dual diagnosis group participation and a greater time in drug treatment. Heavy Alcohol Use was predicted by baseline Heavy Alcohol Use, and less time in treatment and Abstinence Self-Efficacy. Cigarette Use was predicted by prior Cigarette Use, less time in treatment, and baseline Recent Health Problems. Greater Subjective Poor Health was predicted by prior Subjective Poor Health and less Psychological Service Utilization. Functional Limitations were predicted by greater age, African-American ethnicity, Subjective Poor Health, Functional Limitations and less Abstinence Self-Efficacy at baseline. Recent health problems were predicted by age, African-American ethnicity, and Subjective Poor Health and Recent Health Problems at baseline.

The significant within-time associations among the baseline predictors are not reported in the figure for readability. The largest correlations include those between Subjective Poor Health and Functional Limitations (.44), Recent Health Problems and Functional Limitations (.42) and Recent Health Problems and Subjective Poor Health (.46). In addition, Cigarette Use and Subjective Poor Health were significantly correlated (.18) as were Cigarette Use and Recent Health Problems (.17). Other significant relationships include associations among the demographics and predictors and are similar to those reported in Table 2. There were also significant indirect effects of participation in dual diagnosis groups ($p < .05$) and greater time in drug treatment ($p < .01$) on less Subjective Poor Health mediated through more Psychological Service Utilization. Heavy Alcohol Use had an indirect effect on Functional Limitations mediated through Abstinence Self-Efficacy ($p < .05$). Number of on-site psychological services had a significant indirect effect on

Psychological Service Utilization mediated through time in treatment ($p = .01$). Number of on-site services also had a significant negative indirect effects on Heavy Alcohol Use at follow-up ($p = .01$), Subjective Poor Health at follow-up ($p = .05$), and Cigarette Use ($p = .05$).

DISCUSSION

This paper had three principal goals: 1) to examine how objective and subjective poor health of patients with co-occurring disorders related to cigarettes use and heavy alcohol use concurrently and at follow-up, 2) to assess how abstinence self-efficacy related to health, health perceptions, cigarette use, and treatment outcomes among patients with co-occurring disorders, and 3) to examine how service characteristics, specifically, a greater degree of on-site services integration as indicated by both specialized dual diagnosis services and the number of on-site psychological services, and more participation in psychological services and time in treatment impacted outcomes related to health status and functioning, and substance use (alcohol and tobacco). Prior research had indicated that this combination of services had an impact on both mental health and substance use outcomes (Grella & Stein, 2006).

Associations of health-related variables with cigarette and alcohol use

Heavy alcohol use was not significantly associated with more objective or subjective health problems or with more functional limitations either concurrently or across time. However, functional limitations, physical illness, and subjective ratings of poor health were positively associated with cigarette use at each of the two time points. Although the within-time relationships captured most of the variance and diminished possible significant relations across time, there was a significant pathway from baseline health problems to greater cigarette use. This is not a 'causal' relationship but rather is more indicative of the persistence of smoking even in the face of chronic health problems and, at least, the short term nature of associations between health problems and more tobacco use. These relations support the findings of other researchers and have important implications, considering that past research has found, for example, high rates of pulmonary illness among those with serious mental illness stemming from their high rates of smoking (Jones et al., 2004). Ferron et al. (2011) studied patients with co-occurring disorders over 11 years and found that few patients with co-occurring disorders were able to achieve abstinence from smoking. Results from the current study support those findings and demonstrate that individuals being treated for co-occurring disorders may persist in risky health behaviors even when aware of their potential deleterious health effects. Overall, cigarette use did not decline in this sample although there was much less heavy alcohol use reported; moreover, heavy alcohol use and cigarette use were no longer significantly associated at follow-up. For example, at baseline 66% of the sample reported no heavy drinking whereas at follow-up 81% reported no heavy drinking.

Six months may not have been a long enough time for the clients in this study to reduce their smoking behaviors while undergoing substance abuse treatment. Researchers have stressed the difficulty of changing behaviors that may have served as a coping mechanism or stress reducer (e.g., Asher et al., 2003), and behavior change may be particularly difficult for individuals who are recovering from addiction at the same time as coping with severe mental disorders. In a study of 96 alcohol-dependent smokers in residential treatment, almost half of the respondents reported concerns about losing smoking as a coping method for negative moods, whereas others felt that quitting smoking might affect their sobriety (Asher et al., 2003). Hence, smoking may be viewed as the "lesser of two evils" by both patients and providers when compared to use of other drugs. However, in terms of potential better health outcomes, treatment for co-occurring disorders should also incorporate

evidence-based smoking cessation interventions that equip patients with alternative and beneficial methods for coping with stress.

Abstinence self-efficacy: does it generalize?

Abstinence self-efficacy at baseline did not generalize to predicting less cigarette use at follow-up although we had expected that an orientation towards greater confidence in one's ability to avoid drugs and alcohol would also be predictive of less smoking at follow-up, given prior research indicating that self-efficacy can be cross-situational. At baseline, however, greater abstinence self-efficacy and less cigarette use were significantly although modestly associated. A global measure of abstinence self-efficacy, inclusive of cigarette use, may be more sensitive to detecting changing perceptions regarding cigarette use. In addition, many individuals in this current study may not have been motivated or ready to quit smoking. For instance, Campbell, Wander, Stark, and Holbert (1995) found only about 25% of smokers in substance abuse treatment were interested enough in quitting to attend an orientation for a smoking cessation program.

Nonetheless, many smokers with co-occurring disorders have been reported to be ready to quit smoking and motivated to participate in treatment (Hall, 2007). Although there has been concern that focusing on major life changes, such as smoking cessation, will interfere with abstinence from other substances, researchers contend that integrating smoking cessation into current treatment is greatly needed (Hall & Prochaska, 2009) and can have a positive impact on long-term substance use outcomes (Prochaska, Delucci, & Hall, 2004). The findings from the current study on relations among health and smoking support the importance of incorporating smoking cessation interventions in co-occurring disorders treatment.

Availability of services and service utilization

Psychological service utilization had its greatest impact on subjective health perceptions which was the most psychologically-oriented health-related item. Perceptions of poor health and comparisons with others may be greatly influenced by concomitant depression and other mental illness symptoms. The scores on these items did not change much over time as evidenced by the large stability coefficient (.81) so there was little opportunity to demonstrate change in this item. The fact that service utilization had even a modest effect on improving health perceptions suggests the importance of integrated psychological service utilization.

Time in treatment, in addition to being a control variable, exerted a considerable influence on the outcomes. More availability of on-site psychological services predicted a longer treatment period and, in turn, a longer time in treatment was associated with better health outcomes including less heavy alcohol use and less smoking. Other studies have shown that more mental health services utilization and longer time in treatment are associated with improved outcomes among patients with co-occurring disorders (Grella & Shi, 2011).

Other findings

The present study did not hypothesize specific relationships based on socio-demographic characteristics, however, as one would expect, older participants with co-occurring disorders reported more functional limitations and more recent health problems. African Americans were older and reported more functional limitations at both time periods and more health problems at follow-up than individuals of other ethnicities, even after controlling for age in the model. African-American ethnicity was also associated with being treated in programs that had fewer psychological services on-site. Disparities research has indicated that African-Americans' physical and mental health is impacted by stressful life events, such as

cumulative exposure to race-based discrimination (Williams, Neighbors, & Jackson, 2003), or the negative social and economic conditions that disproportionately affect African-Americans (Hatch & Dohrenwend, 2007; Kessler et al., 1994). Yet African-Americans in the present study were less likely to smoke at baseline, did not report poorer subjective health perceptions, and had higher levels of abstinence self-efficacy than others. Hence, this group may demonstrate resiliency that mitigates their greater exposure to lifetime stressors in ways that may make them particularly amenable to health-related interventions that build upon self-efficacy (Warren et al., 2007).

Limitations

There are several limitations to this study. The study was conducted with patients sampled from residential substance abuse treatment programs within a large urban county, and although efforts were made to capture a diverse group of patients, the present findings may not generalize beyond this particular study sample. As noted earlier, follow-up outcomes in this paper were only examined at 6 months; the longer-term effects of the predictors and outcomes need to be examined in future studies. The present study relied upon self-report measures of health, cigarette use, and heavy alcohol use, which are all subject to reporting bias. The lack of data on whether the programs offered smoking cessation interventions and whether the patients participated is a further limitation. Also, the relationship between time in treatment and less smoking may be due to possible restrictions on smoking if the individual is still in treatment rather than any causal relationship between more treatment and less smoking. However, the vast majority of participants were not in treatment at the time of the follow-up assessment.

In conclusion, the present study found that cigarette use changed very little among patients with co-occurring disorders who were in residential treatment. Improving overall treatment retention and services availability to patients with co-occurring disorders may beneficially impact health perceptions and health status, particularly through reductions in alcohol use, but specialized smoking-cessation and health promotions interventions are warranted.

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Figure 1.

Model depicting significant regression paths that predict physical health, heavy alcohol use and cigarette use outcomes among 351 substance-abusing, mentally ill individuals in treatment. Large circles represent latent variables; rectangles represent single-item indicators. Arrows represent regression coefficients; regression coefficients are standardized. (^a = p .05, ^b = p .01, ^c = p .001).

Table 1Summary statistics and factor loadings in CFA (All factor loadings significant, $p < .001$.)

Variables (range)	Mean (%)	SD	Factor Loading
<i>Demographics</i>			
Age (18–59 years)	36.59	8.76	———
African- American	34%		———
<i>Baseline</i>			
Subjective Poor Health			
Health rating (1–5)	3.20	1.14	.77
Comparison to others (1–5)	2.96	1.03	.72
Heavy Alcohol Use (0–7)	1.68	2.73	———
Functional limitations (1–3)			
Composite 1	1.66	0.63	.81
Composite 2	1.59	0.63	.90
Composite 3	1.47	0.60	.84
Cigarette Use (per day, 0–40)	11.56	9.35	———
Recent Health Problems (0–11)	2.66	2.20	———
Abstinence Self Efficacy (1–3)			
Composite 1	2.24	0.54	.88
Composite 2	2.21	0.60	.95
Composite 3	2.51	0.48	.80
Composite 4	2.03	0.63	.90
<i>6 Month Follow-up</i>			
Heavy Alcohol Use (0–7)	0.81	1.97	———
Cigarette Use (per day, 0–50)	11.95	10.25	———
Functional limitations			
Composite 1	1.51	0.59	.87
Composite 2	1.49	0.62	.91
Composite 3	1.39	0.59	.86
Subjective Poor Health			
Health rating (1–5)	3.18	1.14	.77
Comparison (1–5)	2.95	0.98	.76
Recent Health Problems (0–12)	1.99	1.98	———
<i>Service Characteristics</i>			
Psychological Service Utilization			
Family	13.29	56.53	.55
Psychological	48.79	113.99	.77
Social	17.73	36.21	.53
Number of Psych Services (2–10)	8.21	1.37	———
Dual diagnosis groups (%)	47%		———

Variables (range)	Mean (%)	SD	Factor Loading
Time in drug treatment (days)	93.11	51.61	———

Table 2

Correlations among variables in model

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Baseline																
1. Age																
2. African-American	.16 ^c															
3. Heavy Alcohol Use	.06	.08														
4. Functional Limitations	.30 ^c	.14 ^b	-.01													
5. Subjective Poor Health	.09	.03	.07	.48 ^c												
6. Cigarette Use	-.04	-.15 ^b	.10 ^a	.06	.19 ^c											
7. Recent Health Problems	.26 ^c	-.01	-.01	.43 ^c	.49 ^c	.19 ^c										
8. Abstinence Self-Efficacy	.06	.14 ^b	-.16 ^c	-.04	-.05	-.11 ^a	.03									
Service Characteristics																
9. Psychological Service Utilization	.01	-.11 ^a	-.04	.01	-.01	.01	.13 ^a	.08								
10. Dual Diagnosis Groups	.05	-.05	-.02	.01	.01	.07	.01	.01	.18 ^b							
11. Time in Drug Treatment	.02	-.06	-.05	.01	.02	-.02	.04	.03	.25 ^c	.08						
12. Number of Psych Services	-.05	-.16 ^c	-.07	-.03	-.01	.12 ^a	.02	-.04	.17 ^b	.64 ^c	.17 ^c					
6-month follow-up																
13. Heavy Alcohol Use	-.13 ^b	-.06	.18 ^c	-.06	-.01	.03	-.07	-.12 ^a	-.12 ^a	-.02	-.19 ^c	.03				
14. Functional Limitations	.34 ^c	.18 ^c	.04	.56 ^c	.42 ^c	.11 ^a	.38 ^c	-.11 ^a	-.06	-.04	.05	-.05	-.05			
15. Subjective Poor Health	.09	-.06	.03	.34 ^c	.79 ^c	.22 ^c	.37 ^c	-.08	-.18 ^b	-.07	-.02	-.01	.03	.51 ^c		
16. Cigarette Use	.04	-.01	.08	.07	.12 ^a	.58 ^c	.19 ^c	-.04	.07	.06	-.10 ^a	.06	.06	.07	.11	
17. Recent Health Problems	.25 ^c	.10 ^a	.08	.37 ^c	.47 ^c	.13 ^b	.57 ^c	.01	.16 ^b	-.04	-.02	-.05	-.05	.40 ^c	.43 ^c	.16 ^c

^a $p < .05$.^b $p < .01$.^c $p < .001$.