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Self-Efficacy and Social Networks following Treatment for Alcohol or Drug Dependence and Major Depression: Disentangling Person and Time-Level Effects

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Abstract

Background—Proximal personal and environmental factors typically predict outcomes of treatment for alcohol or drug dependence (AODD), but longitudinal treatment studies have rarely examined these factors in adults with co-occurring psychiatric disorders. In adults with AODD and major depression, the aims of this study were to: 1) disaggregate person- and time-level components of network substance use and self-efficacy, 2) examine their prospective effects on post-treatment alcohol/drug use, and 3) examine whether residential environment moderated relations between these proximal factors and substance use outcomes.

Methods—Veterans ($N = 201$) enrolled in a trial of group psychotherapy for AODD and independent MDD completed assessments every 3 months during one year of post-treatment follow-up. Outcome variables were percent days drinking (PDD) and using drugs (PDDRG). Proximal variables included abstinence self-efficacy and social network drinking and drug use.

Results—Self-efficacy and network substance use at the person-level prospectively predicted PDD ($ps < .05$) and PDDRG ($ps < .05$). Within-person, time-level effects of social networks

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predicted future PDD ($ps < .05$) but not PDDRG. Controlled environments moderated person-level social network effects ($ps < .05$), such that greater time in controlled settings attenuated the association between a heavier drinking/using network and post-treatment drinking and drug use.

Conclusions—Both individual differences and time-specific fluctuations in proximal targets of psychosocial interventions are related to post-treatment substance use in adults with co-occurring AODD and MDD. More structured environmental settings appear to alleviate risk associated with social network substance use, and may be especially advised for those who have greater difficulty altering social networks during outpatient treatment.

Keywords

Substance use; co-occurring disorders; self-efficacy; social networks

Introduction

Among adults with alcohol or drug dependence (AODD), major depression (MDD) is the most common co-occurring Axis I psychiatric disorder, affecting a large percentage of those diagnosed with alcohol (20%) or drug (40%) dependence (Grant et al., 2004). Individuals with co-occurring disorders typically have a prolonged course of AODD (Hasin et al., 2002), greater treatment costs (Druss & Rosenheck, 1999; Mark, 2003), and greater risk of suicide (Bolton, Pagura, Enns, Grant, & Sareen, 2010; Glasner-Edwards et al., 2008). In treatment settings co-occurring MDD is observed at even greater rates (Lynskey, 1998) and typically predicts poorer outcomes from standard treatments (Curran, Flynn, Kirchner, & Booth, 2000; Gamble et al., 2010; Glasner-Edwards et al., 2009; Ilgen & Moos, 2005). Despite a clear need to develop better treatments for adults with co-occurring AODD and MDD, relatively few studies have examined processes that may influence post-treatment substance use in this population.

Studies examining mechanisms of change among substance users have not typically focused on individuals with co-occurring psychiatric conditions, but have identified proximal factors that may be critical for those with co-occurring AODD and MDD. Abstinence self-efficacy, typically defined as the confidence that one can resist using substances in high-risk situations, appears to be a key construct involved in maintenance of gains following treatment for AODD (Kadden & Litt, 2011) and is one of the most potent and consistent predictors of AODD treatment outcomes (Adamson, Sellman, & Frampton, 2009) across a variety of treatment settings (Dolan, Martin, & Rohsenow, 2008; Ilgen, McKellar, & Tiet, 2005; Litt, Kadden, & Stephens, 2005; Maisto, Clifford, Stout, & Davis, 2008; Maisto, Connors, & Zywiak, 2000; McKay et al., 2005). Previous treatment outcomes studies also suggest that enhanced self-efficacy is a general therapeutic element implicated in diverse treatment modalities including Alcoholics Anonymous (AA), cognitive-behavioral therapy (CBT), and motivational treatment approaches (Kelly, Hoepfner, Stout, & Pagano, 2012; LaChance, Feldstein Ewing, Bryan, & Hutchison, 2009; Long, Williams, Midgley, & Hollin, 2000). As such, self-efficacy may be a critical component involved in long-term reductions in substance use for individuals with co-occurring AODD and MDD, but the literature lacks relevant longitudinal evaluations of post-treatment self-efficacy in this population.

Features of social networks related to network member alcohol/drug use have also received considerable attention in AODD treatment research, but less so among individuals with AODD and co-occurring psychiatric disorders. The goals of reducing contacts with alcohol/drug users and strengthening relationships with sober family and friends are emphasized in various treatment approaches (e.g., CBT, network therapy), and the benefits of making these network changes have been validated in empirical studies. Post-treatment drinking outcomes have been predicted by various indicators of social network drinking (Bond, Kaskutas, & Weisner, 2003; Litt, Kadden, Kabela-Cormier, & Petry, 2007; Longabaugh, Wirtz, Zywiak, & O'Malley, 2010), and AODD treatments that focus exclusively on changing social networks have empirical support (Litt et al., 2007; Litt, Kadden, Kabela-Cormier, & Petry, 2009). Importantly, individuals with AODD and co-occurring psychiatric disorders often suffer from greater impairments in social and interpersonal functioning (Moos, 2008), suggesting that maintaining supportive social networks after treatment could be especially important for this population.

Previous studies of self-efficacy and social support in adults with AODD and mixed co-occurring psychiatric diagnoses (e.g., mood and psychotic disorders) support hypothesized links with post-treatment substance use in this population. In residential treatment settings baseline self-efficacy and general social support predicted substance use at six month follow-up (Warren, Stein, & Grella, 2007) and follow-up self-efficacy and alcohol use were correlated (Bradizza et al., 2009). Among participants of dual-diagnosis self-help groups, social support for abstinence mediated relations between group attendance and future substance use (Laudet, Cleland, Magura, Vogel, & Knight, 2004), while greater self-efficacy predicted better quality of life (Magura, Cleland, Vogel, Knight, & Laudet, 2007). These findings highlight the clinical importance of these proximal indicators, but no known study has examined longitudinal, prospective effects of self-efficacy and social networks on the outcomes of outpatient psychotherapy specifically focused on co-occurring AODD and MDD. Prior research has found that co-occurring MDD attenuates the effects of other process variables, such as 12-step affiliation (Kelly, McKellar, & Moos, 2003), demonstrating the need to investigate whether common targets of psychosocial treatment actually predict treatment outcomes within this population.

Investigations of moderators of process variable effects are also of interest in AODD treatment, to identify conditions that may attenuate or strengthen the effects of mediating mechanisms on substance use (Kadden & Litt, 2011; Longabaugh & Magill, 2011). Dynamic models of addiction relapse frame coping behaviors and cognitive processes as under the influence of contextual environment (Witkiewitz & Marlatt, 2004), suggesting that context may moderate the relative effects of proximal factors on post-treatment drinking/drug use. Prior research in this domain found weaker effects of the client-provider relationship on future substance use in residential vs. outpatient treatment (Shin, Marsh, Cao, & Andrews, 2011). In the current sample participants often resided in environments that constrain alcohol/drug use via restricted access (e.g., jail, inpatient treatment) or strong contingencies against using (e.g., sober living homes). Previous studies have demonstrated that some "controlled environments" can achieve the intended effects of limiting substance use (Greenwood, Woods, Gudyish, & Bein, 2001; Hitchcock, Stainback, & Roque, 1995; Polcin, 2009) but have not considered whether these environments might alter the

association between proximal risk/protective factors and future alcohol/drug use. Although AODD treatment in residential settings has become less common over time (McLellan, McKay, Forman, Cacciola, & Kemp, 2005), those with AODD and MDD are especially likely to utilize inpatient or residential services (Druss & Rosenheck, 1999), suggesting that investigating the moderating effects of controlled environments may have relatively greater relevance within this population.

The overall goals of this study were to investigate whether abstinence self-efficacy and social network substance use prospectively predict alcohol/drug use following outpatient treatment for co-occurring AODD and MDD, and to determine whether environmental constraints moderate these effects. Participants received six months of outpatient psychotherapy with Twelve-Step Facilitation (TSF) or Integrated Cognitive-Behavioral Therapy (ICBT), with adjunctive pharmacotherapy, and were followed for 12 months following treatment. Previous studies revealed similar decreases in substance use frequency during treatment for TSF and ICBT, but comparatively less increase in substance use during follow-up for the ICBT group (Lydecker et al., 2010; Worley et al., 2012). During treatment, self-efficacy increased similarly for both groups and was significantly associated with substance use (Glasner-Edwards et al., 2007). This study examined the effects of self-efficacy and social networks on alcohol/drug use during the year of post-treatment follow-up, hypothesizing that greater abstinence self-efficacy and lower network substance use would predict lower future alcohol/drug use. To distinguish the relative contributions of between-person differences and within-person effects, proximal variable effects were examined with disaggregated longitudinal analyses, expecting that both person-level and time-level effects would predict alcohol/drug use. We also expected that greater time in constrained environments would attenuate the prospective, person- and time-level effects of self-efficacy and social networks.

Materials and Methods

Participants

This study involved secondary data analysis of veterans who participated in a controlled trial of outpatient group psychotherapy for co-occurring AODD and MDD (Brown et al., 2006; Lydecker et al., 2010) conducted at the Veterans Affairs San Diego Healthcare System (VASDHS). Participants met DSM-IV criteria for lifetime dependence on alcohol (92%), stimulants (55%), and/or cannabis (30%) with recent use (i.e., in past 90 days) and DSM-IV criteria for MDD with at least one depressive episode occurring independently of substance use. Exclusion criteria included dependence on opiates with intravenous administration, bipolar or psychotic disorder, living remotely from the VASDHS intervention site (50 miles), or severe memory impairments. Given our focus on post-treatment outcomes, we included all participants ($N = 201$) completing at least one assessment from three months post-treatment (Month 9) to the one-year follow-up (Month 18). The sample averaged 49 years of age ($SD = 7.67$) and was mostly male (90%), with 75% reporting Caucasian ethnicity, 12% African-American, 8% Hispanic, and 4% other ethnicity. At intake few were currently employed (18.5%) or married (12%). During the 90 days prior to intake, 84% of the sample had used alcohol and 49% had used illicit drugs, and the average score on the

Hamilton Depression scale (Hamilton, 1960) at intake was 28 ($SD = 10.9$), indicative of severe depressive symptoms.

Procedures

The University of California, San Diego and VASDHS Institutional Review Boards approved the procedures for this study. Research staff received referrals from the VASDHS dual diagnosis clinic, contacted veterans to conduct brief screenings, and met with eligible veterans to explain the procedures and obtain informed consent. Participants consented to 6 months of group psychotherapy and 12 months of follow-up with assessments every 3 months, recording of group sessions, monthly psychotropic medication management appointments, random toxicology screens, and review of electronic medical records. All participating veterans consented to receive no additional formal treatment for substance use or depression during the 6-month active treatment phase. Involvement in peer or community-based therapeutic or recovery activities (e.g., community 12-step meetings) was not restricted. Further procedural details can be reviewed in the primary trial reports (Brown et al., 2006; Lydecker et al., 2010).

Veterans entered into group psychotherapy on a rolling basis, with start dates occurring every 2 weeks. After completing the intake assessment, veterans were sequentially allocated to treatment condition. Both interventions were manualized and were 6 months in duration, with twice-weekly sessions for 3 months followed by weekly sessions for an additional 3 months. Group sessions were co-delivered by a senior clinician (e.g., licensed clinical psychologist, postdoctoral fellow) and clinical psychology trainee who were trained and monitored via manual review, direct observation, and weekly review and supervision. The protocol for Twelve-Step Facilitation (TSF) was modified from Project MATCH (Project Match Research Group, 1997) for group delivery and targeting both alcohol and drug use. The Integrated Cognitive-Behavioral Therapy (ICBT) intervention was developed by adapting material from two empirically-supported treatments: cognitive-behavioral relapse prevention from Project MATCH (Kadden, 1995) and group cognitive-behavioral therapy for depression (Muñoz & Ying, 1993). Mean group attendance (22.3 sessions) was comparable between the two conditions. All veterans were offered a standardized depression pharmacotherapy protocol prescribed and monitored by psychiatrists in the VASDHS dual diagnosis clinic.

Measures

Demographic and clinical covariates were obtained at intake. All other measures utilized in this study (see Table 1 for summary statistics) were obtained from end-of-treatment (Month 6) at 3-month intervals until the one-year follow-up (Month 18).

Frequency of alcohol and drug use—We assessed substance use with the Timeline Follow-Back (TLFB), a reliable and valid calendar-assisted interview (Maisto, Sobell, & Sobell, 1982), which was extended to include alcohol and eight drug types. At each quarterly assessment the TLFB was used to separately measure alcohol and drug use during the prior 90 days. Primary outcome variables derived from the TLFB were percent days drinking (PDD) and percent days using drugs (PDDRG).

Self-efficacy—Self-efficacy was measured with the Drug-Taking Confidence Questionnaire (Sklar, Annis, & Turner, 1997), a 50-item self-report measure of perceived ability to maintain abstinence across a variety of high-risk situations (e.g., negative emotions, social celebrations, social pressure to use). On each item respondents rated their perceived confidence on an ordinal scale (0 = 0%, 1 = 20%, 2 = 40%, 3 = 60%, 4 = 80%, 5 = 100%), with the average across all items used as the self-efficacy score.

Social network alcohol/drug use—Social network variables were assessed with the Social Support Questionnaire (Sarason, Levine, Basham, & Sarason, 1983), which included supplementary measures of alcohol and drug use patterns of each support. Respondents identified members of their social support system (e.g., romantic partners, friends, family) and reported the current alcohol and drug use pattern of each member on an ordinal scale (1 = nonuser/abstainer, 2 = infrequent user, 3 = regular user, 4 = possible abuser, 5 = abuser), akin to other validated measures of network member substance use utilized in AODD clinical trials (Longabaugh et al., 2010). Responses were used to compute variables utilized in previous studies of social network effects (Bond et al., 2003; Litt et al., 2007; Longabaugh et al., 2010), including average network use (mean alcohol/drug use score across all network members), the percent of network completely abstinent from alcohol/drugs (proportion of members scored as 1), and the percent of network regularly drinking/using (proportion of members scored as 3 or greater). Each variable was computed separately for alcohol and drugs.

Constrained Environment—At each assessment participants completed a structured interview to determine their specific living environment during the prior three months, which was supplemented with information from VA electronic medical records. Controlled environments were defined as settings that restrict access to alcohol/drugs including inpatient treatment admissions, jails, and substance-free residential facilities. The controlled environment variable was the percentage of time spent residing in controlled environments within each assessment period, which declined from 25% at 3-month follow-up to 18% at 12-month follow-up. The predominant controlled environment was residential facilities (comprising 66% of days controlled), followed by inpatient admissions (26%) and jail (8%).

Statistical Analysis—To examine the effects of proximal variables, controlled environments, and their interaction in the prediction of post-treatment alcohol and drug use, we utilized hierarchical linear modeling (HLM), due to utilization of multiple time points nested within individuals and both static and time-varying covariates. All available data was included via maximum likelihood estimation, a preferred method when data contain missing values assumed missing-at-random (Schafer & Graham, 2002). No significant differences were found on any study variables between those with complete data and those with missing data, supporting this assumption. With the exception of group and time effects, all predictor variables were grand-mean centered prior to inclusion in analyses. All statistical analyses were performed in Stata 10.1 (StataCorp, 2007).

A conceptual model of our analytic approach is shown in Figure 1. Preliminary models examined covariates to control for potential confounding variables (e.g., baseline use frequency, demographics), time, and group effects on PDD and PDDRG. While not the main

focus on this study, we then examined the effects of group, time, and the group x time interaction on self-efficacy and social networks, to explore potential group differences in these proximal variables during the year of follow-up. Following these preliminary analyses, the prospective effects of proximal variables on post treatment PDD and PDDRG were examined by utilizing lagged (i.e., prior assessment) measures of self-efficacy and social networks as time-varying predictors of PDD and PDDRG. Social network variables were substance-specific, with measures of network drinking used in models of PDD and measures of network drug use in models of PDDRG. For examining moderation by controlled environments, the percent of time controlled was entered as a time-varying covariate, and then tested in interactions with the lagged proximal variables. These final models allowed a statistical test of whether current residential environment moderated the prospective effects of self-efficacy and social networks on future alcohol/drug use.

As recognized in reviews of multilevel analyses (Curran & Bauer, 2011), person-level and time-level effects are confounded in raw measures of time-varying predictors, and disaggregation of these effects is ideal when dictated by substantive interest. In the current study we expected that both between-person differences (i.e., persons generally lower in a proximal variable) and within-person effects (i.e., deviation from one's own average in a proximal variable) could be implicated in predicting future substance use. To disaggregate these effects, raw scores were grand mean-centered and then decomposed into two variables representing the person-mean and time-specific deviations from the person mean. Both variables were included simultaneously as time-varying predictors in main effect analyses, and then in the interactions with controlled environment, allowing specification and independent testing of the person-level and time-level effects.

Results

Covariates of alcohol and drug use outcomes

Preliminary models examined time-invariant covariates of post-treatment PDD and PDDRG. Greater years of education predicted lower PDD ($b = -2.71, p < .001$) and pretreatment frequency of use predicted PDD ($b = 0.28, p < .001$) and PDDRG ($b = 0.21, p < .001$). Statistically significant linear time effects revealed that PDD and PDDRG increased over the year following treatment, independent of treatment group. Furthermore, the group x time interaction was statistically significant for PDD, revealing greater increases in drinking for the TSF group during follow-up, similar to prior reports of this sample (Lydecker et al., 2010; Worley et al., 2012). All subsequent models of PDD and PDDRG accounted for these significant covariate effects.

Treatment condition differences in proximal variables and controlled environment

The next series of models examined treatment group main effects, linear time effects, and group by time interactions on self-efficacy and social network variables. Group x time interactions were statistically significant for each network drug use variable: average network drug use ($b = 0.02, SE = 0.008, p < .05$), percent-network abstinent from drugs ($b = -0.75, SE = 0.31, p < .05$), and percent-network using drugs ($b = 0.54, SE = 0.25, p < .05$). At treatment end (Month 6) the TSF group had lower average network drug use, lower

percent-network using drugs, and greater percent-network abstinent from drugs. During follow-up the two groups became more similar over time as ICBT had relatively greater increases in percent-network abstinent, and greater decreases in mean-network drug use and percent-network using drugs. Group, time, and group x time interactions were not statistically significant for self-efficacy or social network drinking variables, indicating that self-efficacy and social network drinking did not change significantly over time or differ significantly between the two treatment groups.

Disaggregated effects of self-efficacy and social networks on alcohol and drug use

We then examined whether self-efficacy and social network variables predicted future alcohol and drug use frequency during 12-month post-treatment follow-up. Models examined lagged proximal variables as time-varying predictors of PDD and PDDRG, with each proximal variable decomposed into the distinct person-level and within-person, time-level effect. Results of these models are displayed in Table 2. Nearly all person-level effects of these proximal variables were significant predictors of future PDD and PDDRG. Individuals who generally maintained greater self-efficacy, lower average network drinking/drug use, and a lower percentage of regular drinkers/users during follow-up had lower PDD and PDDRG. Lower PDD (but not PDDRG) was also predicted by greater percentage of network abstinent from alcohol. For the within-person effects, only greater average network drinking and greater percentage of network drinking predicted greater PDD. With the person-level effect controlled, these results indicate that time-specific increases in these network factors predicted greater drinking frequency in the subsequent 3 months, independent of between-person differences in these variables. Overall, between-person differences in self-efficacy and social network variables were consistently predictive of future drinking and drug use, while within-person fluctuations on two indices of social network drinking predicted future drinking frequency.

Moderation by controlled environments

To examine the moderating effects of controlled environments on drinking and drug use frequency, the controlled environment variable (percentage of total days lived in controlled settings) was first added to models as a time-varying covariate of concurrent PDD and PDDRG. More time in controlled environments was associated with lower concurrent PDD ($b = -0.10, p < .001$) and PDDRG ($b = -0.05, p < .01$). We then tested interactions between lagged proximal variables (person-level and time-level effects) and controlled environments, to test hypotheses that these environments would moderate relations between proximal variables and PDD/PDDRG. As displayed in Table 2, controlled environment significantly moderated each network-related between-person effect on future PDD, and the between-person effects of average network drug use and percent-network regularly using drugs on PDDRG. Figure 2 displays model-estimated PDD and PDDRG as a function of social network variables, with separate model estimates for participants with 0% and 50% time controlled, demonstrating that these social network influences were less potent when individuals spent more time in these structured settings. The moderating effects of controlled environments on within-person social network factors and self-efficacy (person and time-level) were not statistically significant. Overall, main effect analyses had revealed significant effects of person-level network variables on alcohol/drug use, but these effects

were moderated by controlled environments, such that the influence of generally maintaining a maladaptive drinking network was attenuated when living in controlled environments for a greater proportion of time.

Discussion

Prior studies of the proximal determinants of post-treatment alcohol/drug use have not typically focused on individuals with AODD and co-occurring psychiatric disorders, despite high rates of these co-occurring disorders in many clinical settings (Chi, Satre, & Weisner, 2006; Lynskey, 1998). Co-occurring MDD is particularly common, and individuals with AODD and MDD typically have poorer outcomes following treatment (Gamble et al., 2010; Glasner-Edwards et al., 2009; Mark Ilgen & Moos, 2005) and may have reduced effects of some therapeutic mechanisms of change on substance use (Kelly et al., 2003). Given the lack of prior research in this prevalent and high-risk population, it is critically important to determine whether common empirically-supported targets of behavioral interventions predict post-treatment substance use in this population, as a means of validating existing clinical interventions. In a sample of veterans who received outpatient group psychotherapy for AODD and MDD, we examined self-efficacy and social network substance use, residence in controlled environments, and their interaction in the prediction of drinking and drug use following treatment. Following recommendations in multilevel modeling (Curran & Bauer, 2011), we utilized disaggregated person-level and time-level analyses. This is an important consideration, given that theories related to mechanisms of change are often based on within-person processes, but empirical studies most commonly make between-person comparisons or confound between-person and within-person effects. The analyses of the current study allowed us disaggregate individual differences and within-person fluctuations in proximal factors, and independently examine their prospective effects on post-treatment drinking and drug use.

Participants who generally had greater abstinence self-efficacy during the year following treatment also had lower drinking and drug use. Self-efficacy has predicted post-treatment substance use across various treatment settings (Kadden & Litt, 2011), and our study extends these findings to adults with AODD and MDD who received outpatient treatment. Prior studies with this sample found that self-efficacy predicted time to relapse (Tate et al., 2008), and improved significantly over the course of treatment. (Glasner-Edwards et al., 2007). The current results were encouraging in demonstrating that average levels of self-efficacy in this sample did not decrease during the year following treatment and were similar for both treatment groups. These results bolster the support for the effectiveness of both types of intervention for adults with AODD and MDD; prior studies comparing CBT to 12-step-based interventions in more general addiction treatment samples had similar findings (Finney, Noyes, Coutts, & Moos, 1998). By separating person-level and time-level components of self-efficacy, we demonstrated that generally maintaining higher self-efficacy was associated with lower alcohol and drug use, while within-person, time-level fluctuations in self-efficacy were not predictive of these outcomes. It may be that generally maintaining stably high self-efficacy is more critical for limiting alcohol/drug use following treatment. Future research should determine whether specific pre-existing individual

characteristics, components of behavioral treatment, or other post-treatment processes explain the person-level effects of self-efficacy observed in this population.

We also found that the reported intensity and density of alcohol and drug use in participants' social networks predicted their own post-treatment outcomes, with lower alcohol and drug use frequency for participants with lower average use across all network members and a lower proportion of drinkers/users in their network. Furthermore, a network comprised of a greater proportion of completely abstinent members predicted lower drinking. Similar network use indicators have previously predicted drinking outcomes in alcohol-dependent samples (Bond et al., 2003; Litt et al., 2007; Longabaugh et al., 2010), and our study extends these findings to both alcohol and drug use outcomes in individuals with co-occurring AODD and MDD. Furthermore, time-level deviations in network drinking predicted future alcohol use, with increases in average network drinking level and proportion of network drinking predicting greater subsequent drinking frequency. Considering these person-level and time-level effects, these findings indicate that for individuals with co-occurring AODD and MDD, both 1) generally having greater levels of network drinking than others and 2) atypical increases in network drinking are risk factors for greater future drinking. The presence of alcohol or other drinkers can represent conditioned cues that elicit craving or other precipitants to drinking, and associating with drinkers may increase exposure to or availability of substances, or undermine patients' sobriety efforts (Hunter-Reel, McCrady, & Hildebrandt, 2009). Treatment protocols that focus on modifying social networks have demonstrated efficacy in the treatment of alcohol dependence (Litt et al., 2007; Litt et al., 2009). Our findings suggest that modifying social networks during treatment and maintaining supportive networks following treatment are likely important components of treatment for adults with AODD and co-occurring psychiatric disorders.

At some point during the year following treatment the majority of our sample (56%) resided in a "controlled environment", such as a sober living home, inpatient treatment, or jail. As hypothesized, these controlled environments moderated the person-level effects of social networks, as these measures were weaker predictors of future PDD and PDDRG when more time was spent in controlled settings. These environments appear to assist in buffering the maladaptive influence of social networks comprised predominantly of substance users, which may be particularly relevant for adults with AODD and co-occurring disorders who utilize inpatient or residential services at greater levels (Druss & Rosenheck, 1999). We note that placement in some controlled environments may have resulted from adverse legal, medical, or psychiatric events (e.g., arrests, increased suicidality) that could prompt increased motivation for abstinence, but the majority of such time involved residential sober living facilities. Our results suggest adults with AODD and MDD who have difficulty sustaining a social network supportive of sobriety may benefit the most from these residential settings.

While this study has important research and clinical implications, its limitations should be noted. The generalizability of these findings is restricted due to the demographic characteristics of this veteran sample, which was comprised of mostly Caucasian males. While this is a common limitation of clinical trials for AODD, replication in more diverse samples would improve the generalizability of these findings. Our social network measures

focused on network member characteristics reported by study participants, which is likely less reliable than independent assessment. While the moderating effects of controlled environments were in the expected direction, these environments may not fully explain our findings as environmental changes are confounded with other influential circumstances (e.g., acute medical event, probation) that may prompt changes in alcohol/drug use. While this study identified treatment-related variables that predict post-treatment substance use in adults with co-occurring AODD and MDD, underlying mechanisms of these relationships have not been identified, and such examination would be valuable in explaining more precisely how patients sustained greater levels of self-efficacy and lower levels of network substance use. As such, it will be important for future studies to explore whether specific components of treatment or pre-existing individual characteristics are related to maintenance of these protective factors following the conclusion of formal intervention.

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Figure 1.

Conceptual diagram of models examining self-efficacy and social networks, controlled environments, and their interaction in the prediction of post-treatment percent days drinking (PDD) and percent days using drugs (PDDRG) in adults with alcohol/drug dependence and major depression.

Figure 2.
Statistically significant interactions between social networks (person-level effects) and controlled environments on post-treatment drinking and drug use.

Table 1

Descriptive statistics of substance use, self efficacy, and social network variables following treatment for veterans with alcohol/drug dependence and major depression (N = 201).

	Month			
	6 M (SD)	9 M (SD)	12 M (SD)	18 M (SD)
Percent days drinking				
TSF	8.71 (20.08)	11.78 (23.97)	13.30 (24.10)	15.13 (29.12)
ICBT	12.35 (23.49)	11.45 (21.19)	12.19 (23.56)	10.87 (22.81)
Percent days using drugs				
TSF	3.70 (1.03)	3.63 (1.21)	3.64 (1.19)	3.58 (1.27)
ICBT	3.63 (1.20)	3.68 (1.20)	3.64 (1.24)	3.55 (1.33)
Self-efficacy (0–5)				
TSF	3.70 (1.03)	3.63 (1.21)	3.64 (1.19)	3.58 (1.27)
ICBT	3.63 (1.20)	3.68 (1.20)	3.64 (1.24)	3.55 (1.33)
Average network drinking (1–5) ^d				
TSF	2.35 (0.91)	2.41 (0.96)	2.43 (1.08)	2.50 (1.11)
ICBT	2.34 (1.01)	2.43 (1.07)	2.44 (1.08)	2.43 (1.03)
Average network drug use (1–5) ^d				
TSF	1.90 (0.50)	1.84 (0.48)	1.86 (0.71)	1.86 (0.56)
ICBT	2.03 (0.98)	1.96 (0.85)	1.84 (0.69)	1.93 (0.76)
Network abstinent from alcohol (%)				
TSF	65.12 (36.00)	59.52 (36.23)	65.41 (37.54)	63.38 (37.72)
ICBT	64.44 (34.78)	60.78 (35.30)	61.97 (37.20)	63.02 (35.53)
Network abstinent from drugs (%)				
TSF	93.34 (15.89)	95.39 (17.19)	94.61 (16.47)	95.51 (13.73)
ICBT	87.69 (26.97)	90.02 (20.95)	95.85 (15.17)	91.54 (23.23)
Network regularly drinking (%)				
TSF	21.55 (29.05)	21.32 (30.24)	25.70 (35.11)	26.74 (36.57)
ICBT	20.88 (31.10)	22.41 (28.12)	21.74 (31.89)	21.75 (29.12)
Network regularly using drugs (%)				
TSF	3.46 (9.61)	1.16 (6.47)	4.08 (15.31)	4.49 (13.73)
				4.20 (14.79)

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	Month			
	6	9	12	18
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
ICBT	9.44 (24.62)	6.71 (16.79)	3.28 (14.14)	6.59 (22.36)
				4.45 (13.71)

Note. TSF: Twelve-Step Facilitation; ICBT: Integrated Cognitive-Behavioral Therapy.

^a 1 = Nonuser/abstainer, 2 = Infrequent user, 3 = Regular user, 4 = Possible abuser, 5 = Abuser.

Effects of time-varying self-efficacy and social network variables and interactions with controlled environments in predicting future alcohol and drug use following outpatient treatment.

Table 2

	PDD		PDDRG	
	<i>b</i> (SE)	Within	Between	Within
Lagged proximal variables				
Self-efficacy	– 6.31 (1.33) ***	– 1.65 (0.88)	– 2.71 (0.83) ***	– 0.35 (0.78)
Average network use ^a	6.19 (1.98) **	3.37 (1.44) *	3.83 (1.65) *	2.37 (1.73)
% of network abstinent	– 0.11 (0.05) *	– 0.05 (0.03)	– 0.09 (0.05)	– 0.05 (0.04)
% of network regularly using	– 0.17 (0.05) **	0.09 (0.04) *	0.13 (0.06) *	0.06 (0.05)
Controlled environment × lagged:				
Self-efficacy	0.05 (0.03)	0.01 (0.02)	0.02 (0.02)	0.02 (0.02)
Average network use ^a	– 0.13 (0.04) **	0.01 (0.04)	– 0.15 (0.06) **	0.04 (0.06)
% of network abstinent	0.003 (0.001) **	– 0.001 (0.001)	0.003 (0.002)	– 0.001 (0.001)
% of network regularly using	– 0.003 (0.001) **	0.0004 (0.001)	– 0.004 (0.002) *	0.001 (0.002)

^a Ordinal scale (1 = Nonuser/abstainer, 2 = Infrequent user, 3 = Regular use, 4 = Possible abuser, 5 = Abuser).

* $p < .05$,

** $p < .01$,

*** $p < .001$.