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YOUNG ADULTS WITH CO-OCCURRING DISORDERS: SUBSTANCE USE DISORDER TREATMENT RESPONSE AND OUTCOMES

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Abstract

Compared to other life stages, young adulthood (ages 18–24) is characterized by qualitative differences including the highest rates of co-occurring substance use and psychiatric disorders (COD). Little is known, however, regarding young adults' response to SUD treatment, especially those with COD. Greater knowledge in this area could inform and enhance the effectiveness and efficiency of SUD care for this patient population. The current study investigated differences between 141 COD and 159 SUD-only young adults attending psychiatrically integrated residential SUD treatment on intake characteristics, during-treatment changes on clinical targets (e.g., coping skills; abstinence self-efficacy), and outcomes during the year post-discharge. Contrary to expectations, despite more severe clinical profiles at intake, COD patients showed similar during-treatment improvements on clinical target variables, and comparable abstinence rates and psychiatric symptoms during the year post-treatment. Clinicians referring young adults with COD to specialized care may wish to consider residential SUD treatment programs that integrate evidence-based psychiatric services.

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Keywords

co-occurring disorders; dual diagnosis; young adults; emerging adults; addiction; substance use disorder treatment

1. Introduction

It is estimated that between 50 and 75% of patients entering substance use disorder (SUD) treatment also present with another psychiatric disorder, often referred to as co-occurring disorders (CODs) (Center for Substance Abuse Treatment, 2005; Chan, Dennis, & Funk, 2008). Stress and coping theory (Kaplan, 1996; Lazarus, 1966; Moos, 2007) posits that problems can occur in individuals' lives if intrapersonal and environmental demands tax or exceed coping resources. Thus, in theory, the presence of co-occurring disorders may add to or compound the psychological burden of SUD, straining available coping resources and resulting in poorer treatment response and outcomes.

Young adults (ages 18–24, also referred to as emerging adults) may constitute a particularly important group of COD patients. First, they represent a large segment of the SUD treatment population. Between 1997 and 2007, 20 to 24 year-olds comprised the second largest proportion of treatment admissions (14.2%), only slightly behind 25 to 29 year-olds (14.4%) (Substance Abuse and Mental Health Services Administration, 2009). Second, in addition to high rates of stand-alone psychiatric disorders or SUD, young adulthood is also marked by the highest rates of COD (Chan et al., 2008; Substance Abuse and Mental Health Services Administration, 2012, 2012) due, in part, perhaps, to several developmentally-unique psychosocial stressors such as the initiation of independent living and educational/vocational transitions (Arnett, 2005). However, despite these qualitative differences and associated risks, little is known, specifically, about how COD young adults differ from their SUD-only counterparts on clinical and demographic profiles at treatment intake, how they respond to SUD treatment, and how they fare longitudinally regarding their SUD treatment outcomes. Greater knowledge in this area could highlight important differences that might lead to enhancements in the effectiveness and efficiency of SUD care for this large segment of the treated population.

1.1 Intake Differences

In other age cohorts, COD patients' pre-treatment abstinence rates are generally lower among adolescents (Grella, Hser, Joshi, & Rounds-Bryant, 2001) but comparable among adults (Boden & Moos, 2009; Leventhal, Mooney, DeLaune, & Schmitz, 2006; Timko, Sutkowi, & Moos, 2010). However, compared to SUD-only adults at treatment entry, COD patients tend to report more negative consequences, employ less adaptive coping strategies, and endorse poorer overall social functioning and greater psychiatric severity (Boden & Moos, 2009; Burns, Teesson, & O'Neill, 2005; Ouimette, Ahrens, Moos, & Finney, 1998; Timko et al., 2010).

1.2. Treatment Response

In studies of adults in SUD treatment, several clinical target variables have been associated with post-treatment substance use outcomes. Consequently, improvements in these variables are thought to indicate better long-term prognosis (Finney, Noyes, Coutts, & Moos, 1998; Suchman, 1965). These include treatment readiness and recovery motivation variables (DiClemente & Prochaska, 1998; Kelly & Greene, in press; Miller & Rollnick, 2012) commitment to participate in 12-step groups (Kelly, Urbanoski, Hoepfner, & Slaymaker, 2012), intentions to avoid high risk situations (Morgenstern, Frey, McCrady, Labouvie, &

Neighbors, 1996), abstinence self-efficacy (Forcehimes & Tonigan, 2008; Hoepfner, Kelly, Urbanoski, & Slaymaker, 2011; Kelly et al., 2012), and recovery-focused coping skills (Moos, 2007; Myers & Brown, 1996).

To our knowledge, however, few studies have examined the influence of co-occurring psychiatric illness on during-treatment clinical response, specifically. In a study with the current sample, significant improvement in abstinence self-efficacy was *not* moderated by the presence of major depressive disorder (MDD; Greenfield, Venner, Kelly, Slaymaker, & Bryan, 2012). Other treatment targets were not examined. Boden and Moos (2009), on the other hand, showed that COD male veteran inpatients experienced significantly *less improvement* than their SUD-only peers on self-efficacy, perceived benefits of abstinence, and adaptive coping.

1.3. Post-treatment Outcomes

1.3.1. Substance use—The presence of any co-occurring psychiatric illness at intake, baseline levels of depressive symptomatology, and psychiatric severity more generally, have been associated with poorer drug and alcohol outcomes in both adult (Brown, O’Grady, Battjes, & Farrell, 2004; Compton, Cottler, Jacobs, Ben-Abdallah, & Spitznagel, 2003; McKay & Weiss, 2001; Rounsaville, Dolinsky, Babor, & Meyer, 1987; Timko et al., 2010) and adolescent samples (Grella et al., 2001), though not in all cases (e.g., Boden & Moos, 2009).

1.3.2. Psychiatric symptoms—It appears that even in studies where COD patients have analogous substance use outcomes, disadvantages on measures of psychiatric symptoms and functioning persist up to 5 years post-treatment in both inpatient and outpatient adult samples, often independent of pre-treatment symptom levels (Boden & Moos, 2009; Burns et al., 2005; Rounsaville, Kosten, Weissman, & Kleber, 1986; Timko et al., 2010). Additionally, COD adolescents reported poorer post-treatment outcomes despite *greater response* (i.e., improvement from baseline to 1-year follow-up) on markers of psychological functioning such as self-esteem, hostility, and suicidal ideation (Grella et al., 2001).

While some have noted that certain evidence-based interventions may ameliorate both substance use and psychiatric symptoms (e.g., Flynn & Brown, 2008), COD patients receiving psychiatric services in addition to SUD treatment appear to have better outcomes than those who only receive SUD treatment (Ray, Weisner, & Mertens, 2005). Collectively, these data suggest that COD patients in typical SUD treatment settings are likely to have both poorer substance use and psychiatric outcomes over time relative to their SUD-only counterparts. However, given their prevalence in SUD treatment and developmentally unique attributes, more research is needed to understand COD young adults’ clinical profiles, treatment processes, treatment outcomes, and potentially unmet clinical needs.

1.4. Study Aims

Given our lack of knowledge among young adults in the area, in this study we wanted to determine whether young adult patients with and without a co-occurring psychiatric disorder: 1) Differed significantly at treatment intake on important clinical and demographic variables; 2) Evincing a differential treatment response characterized by different degrees of change on important treatment target variables; 3) Showed differences in their substance use and psychiatric outcomes over the year following treatment; and 4) If there were differences between patient groups on outcomes, to investigate whether any observed differences in intake or during-treatment changes might account for or explain this outcome difference. Based on prior literature, we hypothesized that COD young adults would report more severe clinical profiles overall at intake and poorer post-treatment abstinence rates and psychiatric

functioning. Given prior mixed findings in the literature we did not have any a priori predictions regarding during-treatment response.

2. Methods

2.1 Treatment Model

Participants were recruited from the Hazelden Center for Youth and Families (HCYF), a residential treatment program for adolescents and young adults whose philosophy is based on the 28-day Minnesota model (McElrath, 1997) and that employs 12-step facilitation, cognitive-behavioral, and motivational enhancement therapies (Project MATCH Research Group, 1997) in individual and group formats. In addition to therapy, patients receive education on the nature of addiction and recovery, and participate in recreational and spiritual care activities. While the program's primary focus is SUD, the multi-disciplinary clinical staff attends to the individual complexities of its patients, including psychiatric comorbidity. Thus, psychiatric assessment, psychotropic medication, and evidence-based psychological intervention for psychiatric disorders (e.g., major depressive disorder) are integrated into patient care as determined collaboratively by the patient and program staff.

2.2. Participants

Study participants were 300 young adults aged 18–24 (M age = 20.3; SD = 1.6) recruited from HCYF between October 2006 and April 2008. Table 1 contains specific information on the sample's demographic, clinical, and diagnostic profiles, both overall and as a function of diagnostic group (COD vs. SUD-Only). In general, the sample was predominantly male and Caucasian. Based on diagnostic criteria from the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (American Psychiatric Association, 2000), alcohol and cannabis use disorders were the most common SUD, though approximately one-third and one-half of the sample met criteria for opioid and cocaine use disorders, respectively, in their lifetime. Regarding psychiatric comorbidity, 47% (n = 141) presented with at least one past-month psychiatric disorder (i.e., COD), most commonly major depressive disorder, generalized anxiety disorder, and/or social phobia. On average, 83.7% of the sample completed treatment and the average participant attended for 25.5 days (SD = 5.7) (see also Kelly et al. 2012).

Relative to other SUD treatment patients, participants were more likely to be Caucasian than other young adults (18–24) in public sector residential treatment (69%; Substance Abuse and Mental Health Services Administration, 2008) as well as adults (18+) in private sector treatment (71%; Roman & Johnson, 2004). They were, however, comparable in terms of gender, marital status, and employment status (Roman & Johnson, 2004). Regarding payment source, 61% of treatment funding was from insurance reimbursement and 35% from family. Also, 34% of the sample came from households below the US median household income of \$50,221; half of our sample came from households in areas where the median household income was below \$56,000.

2.3. Procedure

A total of 607 young adults were admitted to the program during this time and 384 were initially asked to participate. Follow-up rates were 85.7% at treatment discharge (n = 257), and 81.0% at 3 months (n = 243), 73.0% at 6 months (n = 219), and 70.7% at 12 months (n = 212). Attrition was not associated with diagnostic group at any assessment wave (ps > .05). Participants were reimbursed \$30 for the intake and discharge assessments, and \$30, \$40, and \$50 for the post-treatment assessments at 3, 6 and 12 months, respectively. The study was conducted in accordance with the Institutional Review Board at Schulman

Associates IRB, an independent review board, and all participants signed informed consent documents.

2.4. Measures

2.4.1. Diagnostic group—Axis I mental illness was assessed at treatment intake with the Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (First, Spitzer, Gibbon, & Williams, 2002). Individuals were included in the COD group if they met DSM-IV past-month criteria for a co-occurring Axis I mood, anxiety, or eating disorder, excluding substance-induced disorders (lifetime criteria were used for more chronic conditions such as dysthymic disorder and generalized anxiety disorder). Attention-deficit/hyperactivity disorder, psychotic disorders, and personality disorders were not assessed.

2.4.2—Psychiatric symptomatology was assessed at treatment intake and all follow-ups with the short form of the Brief Symptom Inventory (BSI-18; Derogatis, 2001), yielding a global severity index (GSI). Participants rated symptomatic distress on a 5-point scale and raw summary scores were converted to normalized T-scores ($M = 50$; $SD = 10$) based on the standardization sample. The GSI in particular has demonstrated excellent internal consistency (coefficients $> .90$ in three distinct samples) and adequate construct validity in substance users (Wang et al., 2010).

2.4.3—Substance use (number of abstinent days) and prior number of days hospitalized for a substance use problem were assessed at treatment intake and all follow-ups for the former and at treatment intake only for the latter with the Form-90 (Miller & Del Boca, 1994). Modifications were made to subsequent assessments to capture the entire time period elapsed since the most recent assessment (see Bergman, Greene, Hoepfner, Slaymaker, & Kelly, in press). Percent days abstinent (PDA) was calculated by dividing abstinence days reported for each assessment period by number of days in the assessment period. A dichotomous variable was used to indicate whether participants had been hospitalized at an inpatient setting for a substance use problem in the year prior to treatment intake ($n = 78$; 26.4%). The Form-90 has been tested with adult and adolescent samples and has demonstrated good test-retest reliability and validity (Slesnick & Tonigan, 2004; Tonigan, Miller, & Brown, 1997).

Saliva tests (Cone et al., 2002) assessing for the presence of tetrahydrocannabinol (THC), cocaine metabolites, opiates, amphetamines, and phencyclidine (PCP), were administered to verify self-reported abstinence among participants that lived within 50 miles of the treatment facility and could attend follow-up assessments in-person (18.9% at 3 months, 7.7% at 6 months, and 6.1% at 12 months). None of these participants refused the saliva test, nor were they compensated for completion. Abstinence was confirmed in 98% of the 54 saliva tests conducted across all follow-up assessments.

2.4.4. Severity of substance dependence—The Leeds Dependence Questionnaire (LDQ; Raistrick et al., 1994), a 10-item self-report measure (scoring range = 0–30), was used to determine dependence severity not specific to a particular substance at treatment intake. The measure has shown high internal consistency ($\alpha = .93$) and construct validity in the current (Kelly, Magill, Slaymaker, & Kahler, 2010) and other samples (e.g., Lennings, 1999).

2.4.5. Substance use consequences—The Inventory of Drug Use Consequences – Recent Consequences (InDUC-2R; Tonigan & Miller, 2002) is a 50-item measure (scoring range = 0–150) that was used to assess psychosocial difficulties associated with alcohol and/

or drug use in the 90 days prior to treatment intake (e.g., “I have felt guilty or ashamed because of my drinking or drug use”). It has good to excellent test-retest reliability (subscales ranging from $r = .34$ to $.93$; Tonigan & Miller, 2002).

2.4.6—Commitment to sobriety was assessed with an original scale asking participants to rate their level agreement (on a six-point scale from strongly disagree to strongly agree) with each of five items (scoring range = 6–30) at treatment intake and discharge: “Staying sober is the most important thing in my life”; “I am totally committed to staying off of alcohol/drugs”; “I will do whatever it takes to recover from my addiction”; “I never want to return to alcohol/drug use again.”; “I have had enough alcohol and drugs”. The scale has demonstrated excellent internal consistency as well as significant incremental prediction relative to existing measures of motivation (Miller & Tonigan, 1996; Morgenstern et al., 1996) in the current sample (Kelly & Greene, in press).

2.4.7—Commitment to AA/NA and intentions to avoid risky situations were assessed at treatment intake and discharge with six-item (scoring range = 6–30) and four-item subscales (scoring range = 4–20), respectively, from the Addiction Treatment Attitudes Questionnaire (ATAQ; Morgenstern et al., 1996). The subscales have shown high internal consistency and predictive validity among adults in SUD treatment (Morgenstern et al., 1996).

2.4.8—Abstinence self-efficacy was assessed at treatment intake and discharge with a single item rated on a 10-point scale: “How confident are you that you will be able to stay clean and sober in the next 90 days or 3 months?” This single item demonstrated convergent and discriminant validity in the current sample, and showed better predictive utility for substance-related outcomes relative to a 20-item measure (Hoepfner et al., 2011).

2.4.9—Coping skills was assessed at treatment intake and discharge with the abstinence-focused coping subscale of the Adolescent Relapse Coping Questionnaire (ARCQ; Myers & Brown, 1996). This measure assesses the likelihood of using nine different coping strategies at a social gathering where alcohol and drugs are present, rated on a 7-point scale (scoring range = 9–63). The subscale has demonstrated good internal consistency, concurrent and predictive validity among adolescents in SUD treatment (Myers & Brown, 1996).

2.5. Analysis Plan

For Aim 1, we conducted a series of independent t - and χ^2 tests to compare COD and SUD-only participants on demographic characteristics and intake levels of substance use (PDA) and related phenomena (e.g., dependence severity).

For Aim 2, we constructed six within-subjects multilevel models for each of our six primary SUD treatment targets: *commitment to sobriety*, *AA/NA commitment*, *intentions to avoid risky situations*, *abstinence self-efficacy*, *abstinence-focused coping*, and *psychiatric symptoms*. Predictors were a) diagnostic group (COD vs. SUD-only), b) time (intake vs. discharge); and c) the diagnostic group by time interaction, capturing quantitatively the effect of interest (i.e., whether the change from intake to discharge differed as a function of diagnostic group). Commitment to sobriety and abstinence self-efficacy were negatively skewed and as such were modeled as Poisson distributions. The remaining four treatment targets were modeled using the normal distribution. Multilevel models were used to allow for consistency across each of the six analyses despite non-normally distributed outcomes in two cases. Effect sizes were calculated for within-group change as outlined by Morris & DeShon (2002). We also used independent t -tests to compare descriptively COD and SUD-only groups on intake and discharge levels of the treatment targets.

For Aim 3, we conducted two hierarchical linear models (HLM), with diagnostic group as the primary predictor and either abstinence or psychiatric symptoms at 3-month, 6-month, and 12-month follow-ups as the outcome. HLM was used to allow for nesting within subjects multiple observations across time (see Table 3 for intraclass correlations). Other predictors included time (modeled continuously), intake level of the outcome, education (i.e., at least some college vs. no college), and length of stay during the index treatment episode. The latter two variables were included as covariates because they were associated with attrition at the .05 level. Intake level of the outcome was included as a covariate in order to investigate the ongoing influence of baseline diagnostic group, independent of correlations between intake and follow-up observations. We also tested for the presence of a diagnostic group by time interaction to examine whether an overall trend for PDA or psychiatric symptoms over time (or lack thereof) differed between COD and SUD-only patients. PDA was considerably skewed, thus a negative log transformation was used to reduce skewness.

Regarding Aim 4, if there was a significant outcome difference observed between COD and SUD-only patients on either PDA or psychiatric symptoms, we were interested in testing whether demographic or clinical differences at treatment intake, or differences in during-treatment variables, might explain these outcome differences. To examine this, we planned to construct stepwise multilevel models using the framework of Baron and Kenny (1986). Specifically, we planned to first enter diagnostic group and the covariates (as in Aim 3), and then one of the variable sets (e.g., clinical differences at intake). If a diminution in the effect between diagnostic group and the dependent variable was observed after entering the variable set, it might indicate that the variable set partially explained poorer outcomes among COD or SUD-only patients.

All analyses were conducted in *SAS version 9.2* (SAS Institute Inc., Cary, NC). Proc *Genmod* was used to conduct multilevel models for outcomes with Poisson distributions and Proc *Mixed* was used to conduct all other HLMs. Appropriate covariance structures were determined using likelihood ratio test comparisons.

3. Results

3.1. Differences at Treatment Intake

At intake, COD patients reported significantly greater levels of dependence and substance use consequences (Table 1). Regarding SUD, a significantly greater proportion of COD patients were diagnosed with lifetime alcohol use disorder and polysubstance dependence; significantly more SUD-only patients were diagnosed with a cannabis use disorder. Also a significantly higher proportion of COD patients were female (39.7% vs. 13.8%). COD and SUD-only patients were comparable with respect to age, ethnicity, education, PDA, prior-year SUD hospitalizations, proportion arrested in the past year, and other lifetime SUD.

3.2. Differences in SUD Treatment Changes

Regarding treatment processes, there were no group differences in length of stay for the index treatment episode (25.6 days vs. 25.4 days) or treatment completion (85.1% vs. 82.4%).

Regarding potential group differences in during-treatment changes, HLM analyses revealed that the interaction was significant for psychiatric symptoms; COD patients showed *greater* symptom decrease relative to their SUD-only counterparts ($\beta = -2.886$, $F = 6.60$, $p = 0.011$). For the other five treatment target variables, none of the group by time interactions was significant suggesting during-treatment improvements did *not* differ as a function of diagnostic group.

Moreover, significant and positive main effects of time for these five clinical targets suggest both COD and SUD-only patients improved significantly from intake to discharge. Effect sizes for both groups on intentions to avoid risky situations and commitment to sobriety were of small-moderate magnitude. During-treatment changes in self-efficacy, abstinence-focused coping, and AA/NA commitment were of larger magnitude. Both COD and SUD-only patients reported significant decreases in psychiatric symptoms that were large in magnitude. Of note, despite COD patients' significantly greater decrease in psychiatric symptoms, independent samples *t*-tests showed they still reported significantly *more* psychiatric symptoms at both intake and discharge. The groups did not report significantly different intake or discharge scores on the other five treatment targets (Table 2).

3.3. Post-treatment Outcomes

3.3.1. Abstinence—Although on average, PDA declined significantly over time, these trajectories did not differ as a function of diagnostic group as indicated by the non-significant diagnostic group by time interaction ($p = .498$, not shown). Given that the interaction was non-significant, we removed it from the final model (Table 3). More days in SUD treatment during the initial index episode was a positive and unique predictor of PDA, though diagnostic group, education, and PDA at intake were not significant. Figure 1 shows PDA over the follow-up period for COD and SUD-only groups.

3.3.2. Psychiatric symptoms—Patients' psychiatric symptoms overall did not show a significant trend over time for the whole sample or as a function of diagnostic group ($p = .832$, not shown). While COD patients reported significantly more post-treatment psychiatric symptoms over time than SUD-only patients ($\beta = 3.152$, $F = 8.70$, $p = .003$), this difference was not significant after controlling for intake symptom levels (Table 3). This suggests that COD patients' more severe pre-treatment symptomatology may be accounting for this clinical disadvantage during the first post-treatment year. Psychiatric symptoms at intake was a significant predictor of psychiatric symptoms over time, though diagnostic group, education, and length of stay were not significant. Figure 2 shows psychiatric symptoms over the follow-up period for COD and SUD-only groups.

Overall, diagnostic group did not significantly predict either PDA or psychiatric symptoms; as such no analysis was conducted to investigate the demographic, clinical, or during-treatment variables that might account for hypothesized outcome disadvantages among COD patients.

3.4. Post-hoc Subsidiary Analyses

Given that abstinence rates over time were not different between the groups, it appeared as if COD patients' worse clinical profile at treatment intake was being offset by the psychiatrically integrated residential SUD treatment program. In order to determine whether in fact COD patients had poorer treatment prognosis, we conducted some post-hoc subsidiary analyses to determine whether the variables constituting this worse clinical profile were associated with PDA over time. Three exploratory HLMs were run where the primary predictor was each of the variables that significantly differentiated groups at intake, and on which the COD patients were more severe – dependence severity, substance use consequences, and psychiatric symptoms. The outcome for each analysis was PDA at 3-month, 6-month, and 12-month follow-ups. As above, level of education and treatment length of stay were included as covariates. Findings revealed that the association between substance use consequences at intake and PDA over time was negative and just missed statistical significance ($p = .051$). Neither of the associations between dependence severity or psychiatric symptoms and PDA was significant (p 's = .269 and .138, respectively). Thus, in general, more substance use consequences at intake may be associated with lower

subsequent abstinence rates. Yet, despite exhibiting significantly greater levels of substance use consequences at treatment intake (a marker of severity), the COD group reported similar abstinence rates during the post-treatment year relative to their SUD-only counterparts. This finding suggests that treatment may have helped reduce the negative prognostic impact of substance use consequences among those with COD.

4. Discussion

The current investigation compared SUD treatment-seeking young adults with and without one or more co-occurring psychiatric disorders (COD vs. SUD-only) on demographic and substance use-related variables at intake, during-treatment changes on multiple treatment targets, and post-treatment abstinence and psychiatric symptoms. Despite more severe substance use profiles at treatment intake, COD patients generally responded as well to treatment and had post-treatment outcomes that were similar to their SUD-only peers.

4.1. Comparisons at Treatment Intake

Consistent with hypotheses and prior literature (Boden & Moos, 2009; Burns et al., 2005; Leventhal et al., 2006; Ouimette et al., 1998; Timko et al., 2010), we found that COD young adults had more severe clinical profiles at intake – including greater levels of psychiatric and dependence symptomatology and substance use consequences – but similar abstinence rates. Despite higher pre-treatment rates of psychotropic medication use and psychotherapy attendance in the current sample (Bergman et al., in press) possibly mitigating the debilitating behavioral correlates of psychiatric comorbidity, it appears COD patients are still likely to present to treatment with greater clinical severity than their SUD-only peers. As a corollary, greater clinical severity at intake may be indicative of a co-occurring psychiatric disorder, warranting more in-depth assessment to aid in treatment planning.

4.2. Comparisons of Treatment Response

Despite more severe clinical profiles at intake, COD patients reported similar levels of improvement for each of commitment to sobriety, AA/NA commitment, intentions to avoid risky situations, abstinence self-efficacy and coping skills as well as *greater improvement* in psychiatric symptoms during treatment. Thus, Greenfield et al.'s (2012) finding that young adults experienced significant during-treatment improvements in self-efficacy irrespective of the presence of MDD appears to generalize to young adults with any diagnosed mood, anxiety, or eating disorder and to other important clinical targets including abstinence-focused coping skills.

These results are not consistent with reported experiences of COD male veterans in residential treatment, where they showed poorer response on self-efficacy and adaptive coping skills, but similar improvement in substance use specific coping (Boden & Moos, 2009). Of note, approximately 25% of those COD patients had been diagnosed with a psychotic disorder, reflecting potentially greater psychiatric severity and impairment in reality testing and social functioning. It is possible that young adults, too, with more severe pathology including histories of psychotic and/or manic episodes, may not respond as well as SUD-only patients or those with a less severe co-occurring disorder, but this remains to be tested. While future research may clarify this finding, the current data suggest that young adults with primarily depressive and anxiety disorders can respond as well to high-quality psychiatrically integrated residential SUD treatment relative to their peers without a co-occurring psychiatric disorder.

4.3. Comparisons of Post-treatment Outcomes

COD patients' substance use outcomes during the post-treatment year rivaled those of their SUD-only counterparts, contradicting our predictions and prior work in the area (Brown et al., 2004; Burns et al., 2005; Compton et al., 2003; Grella et al., 2001; Rounsaville et al., 1987; Timko et al., 2010). One possible explanation for the discrepancy is that samples in many of these prior studies were recruited either partially or wholly from outpatient settings. In contrast, the current study and Boden and Moos (2009) utilized patient samples from residential settings with psychiatrically integrated care models. Indeed, as in the Veteran Administration's residential SUD treatment programs which are well known for catering to severe, often psychiatrically complex patients (Moos, Humphreys, Ouimette, & Finney, 1999), staff at the program in the current study (Hazelden Center for Youth and Families) also deliver evidence-based psychological and psychopharmacological services as needed.

Residential programs such as these may be particularly well equipped to assess and address the psychiatric needs of SUD patients, thereby alleviating the greater psychological burden associated with worry, negative affect, and neurovegetative symptoms (Chan et al., 2008; Kelly et al., 2012; Ray et al., 2005). The period of initial abstinence virtually assured by residential treatment allows for continuous clinical observation in the absence of confounding psychobiological effects from alcohol or illicit drug use. This in turn may facilitate more accurate assessment and greater diagnostic precision that can elucidate therapeutic targets and enhance the effectiveness of treatment planning. During-treatment abstinence may also result in greater availability of cognitive resources, maximizing benefit from interventions that address motivation, self-efficacy, and coping skills. In addition, the residential setting may serve as a buffer against COD patients' added psychological stress vis-à-vis reduced environmental demands and more consistent, accessible sources of emotional support.

Regarding psychiatric symptoms, COD and SUD-only groups reported similar levels of post-treatment psychiatric symptomatology only after controlling for COD patients' greater symptomatology at intake. This suggests that among treatment-seeking young adults, somewhat greater symptomatology in COD patients over time may be explained by their more severe symptoms at intake. That being said, even by the end of treatment COD patients' symptoms had reduced substantially (and significantly more so than those of the SUD-only group), on average from clinical to non-clinical ranges.

This precipitous drop may lend further support to Flynn and Brown's (2008) conclusion that many evidence-based treatments help reduce both substance use and psychiatric symptoms. For example, 12-step facilitation interventions may provide linkages to mutual-help organizations, not only bolstering COD patients' abstinence rates (Bergman et al., in press; Ray et al., 2005), but also perhaps providing opportunities to challenge maladaptive social cognition, ultimately reducing anxiety (Timko, Cronkite, McKellar, Zembore, & Moos, 2013). In combination with potentially greater brain neuroplasticity and less crystallized clinical syndromes during this developmental period, this suggests that young adults' psychiatric distress may respond particularly well to integrated treatment. This decline in psychiatric symptoms may also highlight the benefit of early intervention for SUD patients (Dennis, Scott, Funk, & Foss, 2005). Yet another possibility is that conducting diagnostic interviews early following abstinence initiation (i.e., at treatment intake) may introduce diagnostic error, given that it may be hard to disentangle substance-induced from independent mood and anxiety disorders at that point (Center for Substance Abuse Treatment, 2005; Flynn & Brown, 2008) despite attempts to do so as in the current study. Irrespective of what explains this reported improvement in psychiatric symptoms, these data suggest young adult patients both with and without co-occurring psychiatric disorders are

likely to report clinically salient levels of psychopathology at intake that attenuate during SUD treatment with improvements generally maintained over time.

4.4. Do COD Patients Have Poorer SUD Treatment Prognosis?

Importantly, the prospective association between substance use consequences at intake – higher in COD patients – and abstinence rates over time was negative and approached significance ($p = .051$). Additionally, though not included in primary analyses, COD patients also reported a significantly greater percentage of heavy drinking days at intake (i.e., 6 or more drinks per drinking day). Yet, abstinence rates of COD patients were comparable to those of SUD-only patients during the year post-treatment. Thus, psychiatrically integrated residential SUD treatment offering evidence-based services may help offset COD young adults' worse initial prognosis and greater psychological burden.

4.5. Limitations

The findings outlined above should be interpreted cautiously in light of certain limitations. First, the current study employed a naturalistic, longitudinal design; therefore, clinical improvement and outcomes may not be attributed entirely to participation in the residential treatment program. For example, COD patients' more marked decrease in psychiatric symptoms may be an artifact of regression to the mean (Campbell & Kenny, 1999). Second, in addition to the equivocal validity of psychiatric diagnoses so early in treatment, self-reported abstinence was validated via biological assays in a convenience sub-sample only. Third, some have found more pronounced effects of psychiatric symptoms on illicit drug versus alcohol outcomes (Brown et al., 2004; Timko et al., 2010). Here we did not examine such differences given the abstinence emphasis in the SUD treatment program attended by participants. A more thorough examination of this issue in other young adult samples may be warranted given its potential clinical and medical implications. Fourth, although HLM is appropriate for measuring longitudinal observations nested within subjects, its use rendered us unable to calculate power or effect sizes in conventional ways. As such, non-significant findings may have been the result of sample size limitations, warranting replication in a larger sample. Finally, participants – primarily male and Caucasian – were recruited from one residential treatment facility in the Midwest; caution should be made in generalizing to other settings and samples.

4.6. Conclusions

Young adults are especially vulnerable to the development of both SUD and psychiatric disorders. Although patients in this age group are likely to comprise a substantial proportion of SUD treatment admissions, little research has been conducted on important clinical subgroups, such as those with concurrent SUD and psychiatric disorders. COD young adult patients may present with more severe clinical profiles at treatment entry. Yet, results here suggest such patients are able to improve as much during residential SUD treatment, and experience substance use and psychiatric outcomes as favorable as their SUD-only peers. The high-quality, multi-disciplinary, psychiatrically integrated residential treatment program from which the sample derived may have helped neutralize COD patients' greater psychological burden and poorer initial prognosis. As such, clinicians working with young COD patients who have never attended SUD-specific treatment, or are not responding well to conventional outpatient SUD services, may wish to consider referral to a residential program that integrates evidence-based psychosocial and psychopharmacological interventions into its model of care.

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References

- American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4. Washington, DC: Author; 2000. text revision
- Arnett, Jeffrey Jensen. The developmental context of substance use in emerging adulthood. *Journal of Drug Issues*. 2005; 35(2):235–254.
- Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*. 1986; 51(6):1173–1182. [PubMed: 3806354]
- Bergman BG, Greene MC, Hoepfner BB, Slaymaker V, Kelly JF. Psychiatric comorbidity and 12-step participation: A longitudinal investigation of treated young adults. *Alcoholism: Clinical and Experimental Research*. (in press).
- Boden, M Tyler; Moos, Rudolf. Dually diagnosed patients' responses to substance use disorder treatment. *Journal of Substance Abuse Treatment*. 2009; 37(4):335–345.10.1016/j.jsat.2009.03.012 [PubMed: 19540699]
- Brown, Barry S.; O'Grady, Kevin; Battjes, Robert J.; Farrell, Eugene V. Factors associated with treatment outcomes in an aftercare population. *The American Journal on Addictions*. 2004; 13(5): 447–460.10.1080/10550490490512780 [PubMed: 15764423]
- Burns, Lucy; Teesson, Maree; O'Neill, Katy. The impact of comorbid anxiety and depression on alcohol treatment outcomes. [Article]. *Addiction*. 2005; 100(6):787–796.10.1111/j.1360-0443.2005.001069.x [PubMed: 15918809]
- Campbell, DT.; Kenny, DA. A primer on regression artifacts. New York: The Guilford Press; 1999.
- Center for Substance Abuse Treatment. Substance abuse treatment for persons with co-occurring disorders. 2005.
- Chan, Ya-Fen; Dennis, Michael L.; Funk, Rodney R. Prevalence and comorbidity of major internalizing and externalizing problems among adolescents and adults presenting to substance abuse treatment. *Journal of Substance Abuse Treatment*. 2008; 34(1):14–24.10.1016/j.jsat.2006.12.031 [PubMed: 17574804]
- Compton, Wilson M., III; Cottler, Linda B.; Jacobs, Jacqueline L.; Ben-Abdallah, Arbi; Spitznagel, Edward L. The role of psychiatric disorders in predicting drug dependence treatment outcomes. *The American Journal of Psychiatry*. 2003; 160(5):890–895.10.1176/appi.ajp.160.5.890 [PubMed: 12727692]
- Cone EJ, Presley L, Lehrer M, Seiter W, Smith M, Kardos KW, Niedbala RS. Oral fluid testing for drugs of abuse: positive prevalence rates by Intercept immunoassay screening and GC-MS-MS confirmation and suggested cutoff concentrations. *J Anal Toxicol*. 2002; 26(8):541–546. [PubMed: 12501910]
- Dennis, Michael L.; Scott, Christy K.; Funk, Rodney; Foss, Mark A. The duration and correlates of addiction and treatment careers. *Journal of Substance Abuse Treatment*. 2005; 28(Suppl1):S51–S62.10.1016/j.jsat.2004.10.013 [PubMed: 15797639]
- Derogatis, LR. Administration, scoring, and procedures manual. Minneapolis, MN: NCS Pearson; 2001. BSI-I8: Brief Symptom Inventory 18.
- DiClemente, Carlo C.; Prochaska, James O. Toward a comprehensive, transtheoretical model of change: Stages of change and addictive behaviors. In: Miller, WR.; Heather, N., editors. Treating addictive behaviors. 2. New York, NY US: Plenum Press; 1998. p. 3–24.
- Finney, John W.; Noyes, Charlotte A.; Coutts, Adam I.; Moos, Rudolf H. Evaluating substance abuse treatment process models: I. Changes on proximal outcome variables during 12-step and

- cognitive-behavioral treatment. *Journal of Studies on Alcohol*. 1998; 59(4):371–380. [PubMed: 9647419]
- First, MB.; Spitzer, RL.; Gibbon, M.; Williams, JBW. *Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Patient Edition (SCID-I/P)*. New York: Biometrics Research, New York State Psychiatric Institute; 2002.
- Flynn, Patrick M.; Brown, Barry S. Co-occurring disorders in substance abuse treatment: Issues and prospects. *Journal of Substance Abuse Treatment*. 2008; 34(1):36–47.10.1016/j.jsat.2006.11.013 [PubMed: 17574791]
- Forcehimes, Alyssa A.; Tonigan, J Scott. Self-efficacy as a factor in abstinence from alcohol/other drug abuse: A meta-analysis. *Alcoholism Treatment Quarterly*. 2008; 26(4):480–489.10.1080/07347320802347145
- Greenfield, Brenna L.; Venner, Kamilla L.; Kelly, John F.; Slaymaker, Valerie; Bryan, Angela D. The impact of depression on abstinence self-efficacy and substance use outcomes among emerging adults in residential treatment. *Psychology of Addictive Behaviors*. 2012; 26(2):246–254.10.1037/a0026917 [PubMed: 22288980]
- Grella, Christine E.; Hser, Yih-Ing; Joshi, Vandana; Rounds-Bryant, Jennifer. Drug treatment outcomes for adolescents with comorbid mental and substance use disorders. *Journal of Nervous and Mental Disease*. 2001; 189(6):384–392.10.1097/00005053-200106000-00006 [PubMed: 11434639]
- Hoepfner, Bettina B.; Kelly, John F.; Urbanoski, Karen A.; Slaymaker, Valerie. Comparative utility of a single-item versus multiple-item measure of self-efficacy in predicting relapse among young adults. *Journal of Substance Abuse Treatment*. 2011; 41(3):305–312.10.1016/j.jsat.2011.04.005 [PubMed: 21700411]
- Kaplan, Howard B. *Psychosocial stress : perspectives on structure, theory, life-course, and methods*. San Diego: Academic Press; 1996.
- Kelly JF, Greene MC. Beyond motivation: Initial validation of the Commitment to Sobriety Scale. *Journal of Substance Abuse Treatment*. (in press).
- Kelly JF, Urbanoski KA, Hoepfner BB, Slaymaker V. “Ready, willing, and (not) able” to change: Young adults’ response to residential treatment. *Drug and Alcohol Dependence*. 2012; 121(3): 224–230.10.1016/j.drugalcdep.2011.09.003 [PubMed: 21955361]
- Kelly, John F.; Magill, Molly; Slaymaker, Valerie; Kahler, Christopher. Psychometric validation of the Leeds Dependence Questionnaire (LDQ) in a young adult clinical sample. *Addictive Behaviors*. 2010; 35(4):331–336.10.1016/j.addbeh.2009.11.005 [PubMed: 20004062]
- Lazarus, RS. *Psychological stress and the coping process*. New York: McGraw-Hill; 1966.
- Lennings CJ. An evaluation of the Leeds Dependence Questionnaire. *Journal of Child & Adolescent Substance Abuse*. 1999; 8(3):73–87.10.1300/J029v08n03_05
- Leventhal, Adam M.; Mooney, Marc E.; DeLaune, Katherine A.; Schmitz, Joy M. Using Addiction Severity Profiles to Differentiate Cocaine-Dependent Patients with and without Comorbid Major Depression. *The American Journal on Addictions*. 2006; 15(5):362–369.10.1080/10550490600860148 [PubMed: 16966192]
- McElrath D. The Minnesota Model. *Journal of Psychoactive Drugs*. 1997; 29(2):141–144. [PubMed: 9250939]
- McKay, James R.; Weiss, Richard V. A review of temporal effects and outcome predictors in substance abuse treatment studies with long-term follow-ups: Preliminary results and methodological issues. *Evaluation Review*. 2001; 25(2):113–161.10.1177/0193841x0102500202 [PubMed: 11317714]
- Miller, WR.; Rollnick, S. *Motivational interviewing: Helping people change*. 3. New York: Guilford Press; 2012.
- Miller WR, Tonigan JS. Assessing drinkers’ motivation for change: The stages of change readiness and treatment eagerness scale (SOCRATES). *Psychology of Addictive Behaviors*. 1996; 10(2):81–89.
- Miller, William R.; Del Boca, Frances K. Measurement of drinking behavior using the Form 90 family of instruments. *Journal of Studies on Alcohol*. 1994; (SUPPL 12):112–118.

- Moos RH, Humphreys K, Ouimette PC, Finney J. Evaluating and improving VA substance abuse patients' care. *Am J Med Qual.* 1999; 14(1):45–54. [PubMed: 10446663]
- Moos RH. Theory-based processes that promote the remission of substance use disorders. *Clinical Psychology Review.* 2007; 27:537–551. [PubMed: 17254686]
- Morgenstern J, Frey RM, McCrady BS, Labouvie E, Neighbors CJ. Examining mediators of change in traditional chemical dependency treatment. *Journal of Studies on Alcohol.* 1996; 57:53–64.10.1016/S0899-3289(96)90079-6 [PubMed: 8747502]
- Morris, Scott B.; DeShon, Richard P. Combining effect size estimates in meta-analysis with repeated measures and independent-groups designs. *Psychological Methods.* 2002; 7(1):105–125.10.1037/1082-989x.7.1.105 [PubMed: 11928886]
- Myers, Mark G.; Brown, Sandra A. The Adolescent Relapse Coping Questionnaire: Psychometric validation. *Journal of Studies on Alcohol.* 1996; 57(1):40–46. [PubMed: 8747500]
- Ouimette, Paige Crosby; Ahrens, Courtney; Moos, Rudolf H.; Finney, John W. During treatment changes in substance abuse patients with posttraumatic stress disorder: The influence of specific interventions and program environments. *Journal of Substance Abuse Treatment.* 1998; 15(6): 555–564.10.1016/s0740-5472(97)00315-2 [PubMed: 9845869]
- Project MATCH Research Group. Matching alcoholism treatments to client heterogeneity: Project MATCH posttreatment drinking outcomes. *Journal of Studies on Alcohol.* 1997:1–23.10.1046/j.1360-0443.1997.9212167110.x
- Raistrick D, Bradshaw J, Tober G, Weiner J, Allison J, Healey C. Development of the Leeds Dependence Questionnaire (LDQ): a questionnaire to measure alcohol and opiate dependence in the context of a treatment evaluation package. [Comparative Study]. *Addiction.* 1994; 89(5):563–572. [PubMed: 8044122]
- Ray, G Thomas; Weisner, Constance M.; Mertens, Jennifer R. Relationship between use of psychiatric services and five-year alcohol and drug treatment outcomes. *Psychiatric Services.* 2005; 56(2): 164–171.10.1176/appi.ps.56.2.164 [PubMed: 15703343]
- Roman, PM.; Johnson, JA. National treatment center study summary report: Private treatment centers. Athens, GA: Institute for Behavioral Research, University of Georgia; 2004.
- Rounsaville, Bruce J.; Dolinsky, Zelig S.; Babor, Thomas F.; Meyer, Roger E. Psychopathology as a predictor of treatment outcome in alcoholics. *Archives of General Psychiatry.* 1987; 44(6):505–513.10.1001/archpsyc.1987.01800180015002 [PubMed: 3579499]
- Rounsaville, Bruce J.; Kosten, Thomas R.; Weissman, Myrna M.; Kleber, Herbert D. Prognostic significance of psychopathology in treated opiate addicts: A 2.5-year follow-up study. *Archives of General Psychiatry.* 1986; 43(8):739–745.10.1001/archpsyc.1986.01800080025004 [PubMed: 3729668]
- Slesnick, Natasha; Tonigan, J Scott. Assessment of Alcohol and Other Drug Use by Runaway Youths: A Test-Retest Study of the Form 90. *Alcoholism Treatment Quarterly.* 2004; 22(2):21–34.10.1300/J020v22n02_03 [PubMed: 18563208]
- Substance Abuse and Mental Health Services Administration. Characteristics of Young Adult (Aged 18–25) and Youth (Aged 12–17) Admissions: 2004. 2008. Retrieved October 12, 2013, from <http://www.samhsa.gov/data/2k6/youngTX/youngTX.htm>
- Substance Abuse and Mental Health Services Administration. Treatment Episode Data Set (TEDS). Highlights - 2007. National Admissions to Substance Abuse Treatment Services. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2009. DASIS Series: S-45, DHHS Publication No. (SMA) 09-4360
- Substance Abuse and Mental Health Services Administration. Results from the 2011 National Survey on Drug Use and Health: Mental Health Findings. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2012. NSDUH Series H-45, HHS Publication No. (SMA) 12-4725
- Substance Abuse and Mental Health Services Administration. Results from the 2011 National Survey on Drug Use and Health: Summary of National Findings. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2012. NSDUH Series H-44, HHS Publication No. (SMA) 12-4713

- Suchman EA. Social patterns of illness and medical care. *Journal of Health & Human Behavior*. 1965; 6(1):2–16.10.2307/2948614 [PubMed: 14273727]
- Timko, Christine; Cronkite, Ruth C.; McKellar, John; Zmore, Sarah; Moos, Rudolf H. Dually diagnosed patients' benefits of mutual-help groups and the role of social anxiety. *Journal of Substance Abuse Treatment*. 2013; 44:216–223.10.1016/j.jsat.2012.05.007 [PubMed: 22763197]
- Timko, Christine; Sutkowi, Anne; Moos, Rudolf. Patients with dual diagnoses or substance use disorders only: 12-step group participation and 1-year outcomes. *Substance Use & Misuse*. 2010; 45(4):613–627.10.3109/10826080903452421 [PubMed: 20141467]
- Tonigan JS, Miller WR. The Inventory of Drug Use Consequences (InDUC): Test-retest reliability and sensitivity to detect change. *Psychology of Addictive Behaviors*. 2002; 16(2):165–168.10.1037//0893-164X.16.2.165 [PubMed: 12079257]
- Tonigan, J Scott; Miller, William R.; Brown, Janice M. The reliability of Form 90: An instrument for assessing alcohol treatment outcome. *Journal of Studies on Alcohol*. 1997; 58(4):358–364. [PubMed: 9203116]
- Wang, Jichuan; Kelly, Brian C.; Booth, Brenda M.; Falck, Russel S.; Leukefeld, Carl; Carlson, Robert G. Examining factorial structure and measurement invariance of the Brief Symptom Inventory (BSI)-18 among drug users. *Addictive Behaviors*. 2010; 35(1):23–29.10.1016/j.addbeh.2009.08.003 [PubMed: 19733442]

Figure 1.

Mean percent days abstinent (PDA) over time as a function of diagnostic group: co-occurring disorders (COD) vs. substance use disorder-only (SUD-only). COD and SUD-only patients have similar PDA at baseline (25.56% vs. 22.56%). Over time, COD patients had similar PDA when controlling for baseline (i.e., 0-month) PDA and other covariates ($p = .604$). Descriptively, at 3-month follow-up, the groups' PDA are somewhat comparable (93.7% vs. 92.3%), while COD patients begin to report fewer PDA at 6-month (85.7% vs. 88.6%) and 12-month follow-ups (78.3% vs. 85.5%).

—●— COD

-○- SUD-Only

Figure 2.

Mean psychiatric symptoms, measured by the Global Symptom Inventory (GSI), at baseline and each follow-up assessment, as a function of diagnostic group: co-occurring disorders (COD) vs. substance use disorder-only (SUD-only). Symptoms are represented quantitatively with *T*-scores, where the mean is 50 and standard deviation is 10 in the normative sample. COD patients endorsed significantly more psychiatric symptoms at baseline ($T = 67.5$ vs. $T = 59.5$). On average, however, over time COD and SUD-only patients endorsed similar levels of psychiatric symptoms controlling for baseline psychiatric symptoms and other covariates ($p = .864$). Descriptively, the baseline disadvantage for COD patients attenuates dramatically by 3-month follow-up ($T = 53.3$ vs. $T = 50.4$), a difference that remains relatively stable at 6-month ($T = 52.75$ vs. $T = 49.0$) and 12-month follow-ups ($T = 52.2$ vs. $T = 49.7$).

—●— COD

-○- SUD-Only

Demographic and Pre-Treatment Characteristics as a Function of Diagnostic Status: Co-occurring Disorders (COD), n = 141, versus Substance Use Disorder-Only (SUD-Only), n = 159

Table 1

Demographic	N = 300	COD	SUD-Only	χ^2	p	d/r [†]
Age M (SD)	20.34 (1.58)	20.48 (1.68)	20.23 (1.48)	1.37	.173	.158
Male	222 (74.0%)	85 (60.3%)	137 (86.2%)	26.01	< .001	.295
Caucasian	284 (94.7%)	135 (95.7%)	149 (93.7%)	0.61	.434	.045
At least some college	118 (39.3%)	60 (42.9%)	58 (36.5%)	1.27	.260	.065
Employed ^a	73 (38.0%)	28 (33.3%)	45 (41.7%)	1.39	.238	.085
Clinical						
Prior year arrest ^d	141 (53.2%)	66 (52.4%)	75 (54.0%)	0.07	.797	.016
Prior year SUD hospitalization	80 (26.7%)	38 (27.0%)	42 (26.4%)	0.01	.917	.006
Percent days abstinent M(SD)	0.24 (0.28)	0.26 (0.29)	0.23 (0.27)	0.92	.360	.106
Substance use consequences M(SD)	65.48 (24.73)	71.40 (22.99)	60.17 (25.10)	4.00	< .001	.466
Dependence severity M(SD)	18.01 (8.27)	19.91 (7.51)	16.30 (8.56)	3.84	< .001	.447
<u>Substance use disorders (lifetime)</u>						
Alcohol	227 (75.7%)	114 (80.9%)	113 (71.1%)	3.88	.049	.114
Cannabis	216 (72.0%)	87 (61.7%)	129 (81.1%)	13.99	< .001	.216
Cocaine	139 (46.3%)	66 (46.8%)	73 (45.9%)	0.02	.876	.009
Opiate	102 (34.0%)	43 (30.5%)	59 (37.1%)	1.46	.228	.070
Anxiolytic	46 (15.3%)	23 (16.3%)	23 (14.5%)	0.20	.658	.026
Amphetamine	67 (22.3%)	36 (25.5%)	31 (19.5%)	1.57	.210	.072
Hallucinogenic	46 (15.3%)	20 (14.2%)	26 (16.4%)	0.27	.603	.030
Polysubstance	38 (12.7%)	24 (17.0%)	14 (8.8%)	4.56	.033	.123
<u>Psychiatric disorders (past-month)</u>						
Major depressive	47 (15.7%)	47 (33.3%)	--	--	--	--
Dysthymic	26 (8.7%)	26 (18.4%)	--	--	--	--
Bipolar I/II	8 (2.7%)	8 (5.7%)	--	--	--	--
Mood not otherwise specified	2 (0.7%)	2 (1.4%)	--	--	--	--
Generalized anxiety	34 (11.3%)	34 (24.1%)	--	--	--	--
Social phobia	32 (10.7%)	32 (22.7%)	--	--	--	--

Demographic	N = 300	COD	SUD-Only	t/χ^2 [†]	p	d/r [†]
Posttraumatic stress	29 (9.7%)	29 (20.6%)	--	--	--	--
Specific phobia	15 (5.0%)	15 (10.6%)	--	--	--	--
Obsessive compulsive	14 (4.7%)	14 (9.9%)	--	--	--	--
Panic	10 (3.3%)	10 (7.1%)	--	--	--	--
Agoraphobia (no panic)	3 (1.0%)	3 (2.1%)	--	--	--	--
Anxiety not otherwise specified	8 (2.7%)	8 (5.7%)	--	--	--	--
Eating	13 (4.3%)	13 (9.2%)	--	--	--	--
1 psychiatric diagnosis	79 (26.3%)	79 (56.0%)	--	--	--	--
2 psychiatric diagnoses	37 (12.3%)	37 (26.2%)	--	--	--	--
3+ psychiatric diagnoses	25 (8.3%)	25 (17.7%)	--	--	--	--

Note. Substantive interpretations for *d*, a measure of effect size for between-group comparisons include small = .2, medium = .5, and large = .8 and for *r*, a measure of inter-variable association, small = .1, medium = .25, large = .5.

^a *n* = 192 (patients identifying as students, active military members, occasionally/seasonally employed, and unknown were excluded)

^b *n* = 265

[†] Differences between diagnostic groups were assessed using *t*-tests (and Cohen's *d*) for continuous variables and χ^2 tests (and *r*) for categorical variables.

Table 2

Intake scores, Discharge scores, and During-Treatment Change on Clinical Targets: Co-occurring Disorders (COD), n = 141, versus Substance Use Disorder-Only (SUD-Only), n = 159

COD				
	Intake <i>M</i> (<i>SD</i>)	Discharge <i>M</i> (<i>SD</i>)	<i>t</i>	<i>d</i>
Commitment to sobriety	24.09 (5.32)	25.73 (4.46)	3.95**	0.40
12-step commitment	22.11 (5.02)	24.72 (4.22)	7.00**	0.65
Avoiding risky situations	14.30 (3.56)	15.32 (3.14)	4.18**	0.32
Self-efficacy	6.77 (2.71)	8.30 (1.90)	6.53**	0.60
Coping skills	42.21 (11.37)	49.18 (9.37)	8.45**	0.78
Psychiatric symptoms [‡]	67.52 (7.70) ^a	55.89 (8.05) ^b	-16.25**	-1.46
SUD-Only				
Commitment to sobriety	23.88 (5.18)	25.40 (4.37)	3.75**	0.35
12-step commitment	21.24 (5.01)	23.96 (3.96)	7.50**	0.69
Avoiding risky situations	14.18 (3.52)	14.95 (3.40)	3.19*	0.26
Self-efficacy	7.11 (2.48)	8.44 (1.81)	5.39**	0.49
Coping skills	42.31 (10.29)	47.91 (8.65)	7.03**	0.62
Psychiatric symptoms [‡]	59.50 (10.48) ^a	51.23 (8.68) ^b	-10.09**	-0.85

Note. Test statistics and *p*-values refer to within-sample *t*-tests (discharge – intake) for each of the COD and SUD-only groups.

Note. Letter superscripts reflect significantly different intake or discharge scores ($p < .001$) among COD and SUD-only groups based on independent samples *t*-tests.

* $p < .01$

** $p < .001$

[‡] In separate hierarchical linear models that examined whether treatment response (discharge - intake) differed as a function of diagnostic group, only psychiatric symptoms showed a differential response, favoring the COD group (i.e., greater improvement).

Table 3

Hierarchical linear models examining associations between presence of a co-occurring psychiatric disorder and percent days abstinent (PDA) and psychiatric symptoms at 3-month, 6-month, and 12-month follow-ups

Percent Days Abstinent				
	β	<i>SE</i>	<i>F</i>	<i>p</i>
Time (continuous)	−0.077	0.009	68.95	< 0.001
Baseline PDA	0.109	0.283	0.15	0.700
At least some college	0.318	0.165	3.71	0.055
Length of stay in treatment	0.036	0.017	4.75	0.030
Co-occurring disorder	−0.084	0.162	0.27	0.604
Psychiatric Symptoms				
Time (continuous)	−0.100	0.090	1.24	0.266
Baseline psychiatric symptoms	0.369	0.054	47.06	< 0.001
At least some college	−1.783	0.998	3.19	0.075
Length of stay in treatment	−0.014	0.102	0.02	0.894
Co-occurring disorder	0.184	1.073	0.03	0.864

Note. Intraclass correlations: *ICC PDA* = 0.52; *ICCP_{PsychSymptoms}* = 0.36