ABSTRACT

Title of Document: EXAMINING THE EFFECT OF THE LET'S ACT BEHAVIORAL ACTIVATION TREATMENT FOR DEPRESSION ON SUBSTANCE ABUSE TREATMENT DROPOUT

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Despite the prevalence of depression among substance users and the negative impact of depressive symptoms on substance abuse treatment outcomes, few interventions have been developed to meet the needs of depressed substance users, particularly in low-income urban areas. The current study aimed to replicate and expand upon promising preliminary findings for the use of a brief behavioral activation approach [Life Enhancement Treatment for Substance Use (LET'S ACT; Daughters et al., 2008)] to treat depression in the context of residential substance abuse treatment. Extensions to the previous study include comparing LET'S ACT to a contact-time matched control treatment, Supportive Counseling (SC), and more definitively evaluating the effect of LET'S ACT on substance abuse treatment dropout. Results indicated that compared to SC, participants in LET'S ACT evidenced significantly lower rates of treatment dropout and depressive symptoms, as well as significantly higher rates of behavioral activation. This study builds on evidence for LET'S ACT as a short-term treatment for depression and offers initial support for the effect of LET'S ACT on substance use outcomes.

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EXAMINING THE EFFECT OF THE LET'S ACT BEHAVIORAL ACTIVATION TREATMENT FOR DEPRESSION ON SUBSTANCE ABUSE TREATMENT DROPOUT

By

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Chapter 1: Introduction

1.1 Overview

Major depressive disorder (MDD), as well as elevated depressive symptoms, are highly prevalent in substance users and have significant clinical and public health implications, including poor substance abuse treatment outcomes and treatment dropout (McKay et al., 2002). Rates of substance use and depression disproportionately affect ethnic minorities in inner-city areas; yet unfortunately, few interventions targeting depression have been developed to meet the specific needs of depressed, minority substance users living in the inner-city (Hasin et al., 2005; Moneyham et al., 2000). One approach that has been suggested to be useful in this context is behavioral activation (BA), which treats depression by increasing individuals' engagement in pleasant events to increase levels of positive reinforcement (Jacobsen et al., 1996; Lejuez et al., 2001). Daughters and colleagues (2008) have adapted BA to meet the specific needs of low-income, inner-city substance users with depression, and in a preliminary pilot study for this treatment [Life Enhancement Treatment for Substance Use (LET'S ACT)], LET'S ACT was associated with a significant reduction in self-reported depressive symptoms and a significant increase in enjoyment and reward value of activities. Although preliminary findings for LET'S ACT are promising, several extensions to this previous study are necessary to establish further the efficacy of LET'S ACT, including utilization of a contact time-matched control treatment and a larger sample size to allow for a more definitive evaluation of treatment dropout. Towards this end, the current study compared LET'S ACT to Supportive Counseling (SC) among a sample of 58 low-income substance users with depression (MDD or clinical elevated depressive symptoms indicated by a

Beck Depression Inventory score ≥ 12) currently receiving residential substance abuse treatment in N.E. Washington, D.C. to investigate the utility of LET'S ACT in reducing residential substance abuse treatment dropout, as well as decreasing depressive symptoms and increasing rates of behavioral activation.

1.2 Depression and Substance Use Comorbidity

Major depressive disorder (MDD) and substance use disorder (SUD) are highly comorbid, which has significant clinical and public health implications. A national drug use survey revealed that 22% of individuals with an SUD also met for past year MDD (SAMHSA, 2004), and other studies have indicated that over 50% of illicit drug users present to substance abuse treatment with clinically significant depressive symptomatology and are in need of depression treatment (Johnson, Neal, Brems, & Fisher, 2006). The prevalence of SUD-MDD comorbidity is particularly relevant to Washington D.C., where the rate of illicit drug use is approximately 40% higher than the national rate (SAMHSA, 2005). Specifically, of individuals living in D.C. over 12 years of age, 51.2% report using illicit drugs in their lifetime, and 19.5% in the past year (SAMHSA, 2005). Of those presenting to substance abuse treatment centers in the D.C. area, MDD is highly prevalent. For example, at a 136-bed residential substance abuse treatment center in Northeast D.C., rates are 31% for current MDD and 41% for lifetime MDD at intake (n = 295; data from clinical interviews conducted at the Salvation Army Harbor Light Residential Substance abuse treatment Program in 2007-2008). Further, in inner-city areas, rates of substance use and depression disproportionately affect ethnic minorities, as well as those living in poverty (Hasin et al., 2005; Moneyham et al., 2000). For African Americans in particular, depressive symptomatology and substance use have

been shown to be more strongly related to each other than in Caucasian samples (Jones-Webb, Jacobs, Flack, & Liu, 1996). Thus, particularly in this population, the prevalence of this comorbidity represents a significant clinical and public health consideration (Thase, Salloum, & Cornelius, 2001).

1.3 Depression, Treatment Dropout, and Substance Abuse Treatment Outcomes

The presence of MDD or elevated depressive symptoms among substance users has been shown to be associated with an increased likelihood of dropping out of substance abuse treatment (McKay et al., 2002; Tate et al., 2004; Thase, et al., 2001); treatment dropout is of particular importance, because treatment length is a consistent predictor of long-term treatment outcomes (Hubbard, Craddock, & Anderson, 2003; Simpson, Joe, & Brown, 1997). In a sample of illicit drug users, Brown and colleagues (1998) found that treatment dropout was not related to substance use severity, but rather was significantly correlated with baseline depression; further, higher levels of depressive symptoms during treatment were significantly associated with greater drug cravings and relapse (Brown, Monti, Myers et al., 1998). Numerous studies have found depression to be consistently associated with relapse (Hasin et al., 2002; Rounsaville, et al., 1986), shorter abstinence attempts following treatment (Greenfield et al., 1998), and increased subsequent treatment readmission rates (Alterman, McLellan, & Shifman, 1993; Moos, Mertens, & Brenna, 1994). As a more specific example, Hasin and colleagues (2002) examined the timing of depressive episodes in relation to substance use remission and relapse in a sample of 250 substance dependent inclients. Participants were given a baseline assessment, and then 6-, 12-, and 18-month follow-up assessments pertaining to remission and relapse of substance use. Participants with current substance-induced

MDD at baseline were less likely to maintain remission than clients without current MDD. Lifetime MDD was also associated with a reduced likelihood of remission of substance dependence; additionally, current MDD during abstinence predicted relapse following discharge (Hasin et al., 2002). Given the relationship between MDD, treatment dropout, and substance use relapse, treating depression may be an important mechanism to also improve substance use outcomes.

1.4 Existing Treatment Approaches for Comorbid Depression among Substance Users

Despite the prevalence of co-occurring MDD and SUD and the associated poor outcomes, few controlled clinical trials have been performed to develop or evaluate psychosocial treatments for depressed substance users, particularly among low-income minority drug users. Further, a large majority of the work in treating this comorbidity involves provision of psychotropic medication, which is often difficult in inner-city residential substance abuse treatment centers without regular physician access (Friedmann, Alexander, & D'Aunno, 1999). Additionally, given mixed pharmacological findings in treating this comorbidity (see Nunes & Levin, 2004 for a review), there appears to be an important role for psychosocial treatment. In particular, studies have indicated that the use of pharmacotherapy may lead to reductions in depression but has either no effect on drug use outcomes (Carroll, Nich, & Rounsaville, 1995; Cornelius et al., 1998; Nunes et al., 1995) or may lead to actual increases in substance use relapse rates compared to placebo (Schmitz et al., 2001). Carpenter et al. (2004) indicated that sertraline was associated only with significant decreases in depression and substance use when examining a positive or negative environmental context as a moderator of this relationship; this study pointed specifically to the need to enhance pharmacological

treatment with a “behavioral intervention targeting the accessibility of reinforcement” given the significant moderating role of environmental context on depression and substance use outcomes (Carpenter et al., 2004). Taken together, psychosocial treatments that target depression among substance users, specifically focusing on changes in environmental context, may be necessary.

1.4.1 Psychosocial Treatments for Depression among Substance Users

The most common psychosocial intervention that has been evaluated as a treatment for depressed substance users is CBT (Carroll & Onken, 2005), which when administered as a treatment for substance use among depressed substance users is typically based on relapse prevention strategies (Marlatt & Gordon, 1985) and has been adapted specifically for cocaine users (Carroll et al., 1995). CBT for depression (CBT-D) is typically administered as an individual treatment and often includes daily thought and mood monitoring, cognitive restructuring, and social skills and assertiveness training. CBT-D has been shown to have a positive effect on alcohol and depression outcomes in alcoholics with elevated depressive symptoms (Brown, Evans, Miller, Burgess, & Mueller, 1997; Turner & Wehl, 1984), and similar findings have been found using CBT-D for injection drug users meeting criteria for MDD or dysthymia (Stein et al., 2004); further, in this study, depression remission was associated with a reduced frequency of cocaine and heroin use (Stein et al., 2004). As another example of an application of CBT to a depressed substance using population, Brown and colleagues (2006) evaluated an integrated cognitive behavioral treatment (ICBT) in sample of substance dependent individuals with MDD. ICBT participants demonstrated significantly lower depressive symptoms (HAMD) than controls; findings also demonstrated a trend toward improved

substance use outcomes in the ICBT condition, but results did not reach statistical significance (Brown, Glasner-Edwards, Tate, McQuaid, Chalekian, & Granholm, 2006). Although the findings are not well-established, the evidence reviewed suggests that depression may be a potential target for future treatment outcome research aimed at improving substance use outcomes in these populations.

1.4.3 Methodological Limitations of Past Research

Despite the clinical necessity to develop effective psychosocial treatments for depressed substance users, systematic, randomized controlled trials with sufficient sample sizes to evaluate such treatments are scarce and are met with significant methodological limitations. Whereas the above mentioned studies have begun to evaluate the efficacy of psychosocial treatments for depression in substance users (mainly CBT), sample sizes remain small (Brown et al., 1997), a full range of necessary outcome assessments are not available (e.g., substance use outcomes, Watkins et al., 2006; follow-up depression outcomes, Brown et al., 1997), or the effects on substance use outcomes are not quite significant (e.g., Brown et al., 2006). Further, a large majority of studies evaluating psychosocial treatments for this comorbidity have been intended as treatments for substance use only (see Carroll & Onken, 2007; Crits-Christoph et al., 1999 for reviews), thus do not include depression in the inclusion criteria and/or have only examined treatment's effect on depression in secondary analyses (e.g., Carroll et al., 1995, see Rounsaville, 2004 for a review).

1.4.4 Application of CBT-D to Low-Income, Inner-City, Minority Drug Users: Cultural and Setting Limitations

Another significant consideration is the applicability of previously evaluated CBT-D interventions to low-income, inner-city, minority illicit drug users. Most studies have focused solely on treating alcoholics (e.g., Brown et al., 1997) and utilized predominantly Caucasian samples (e.g., Brown et al., 1997; Stein et al., 2004). Such findings may not be appropriately transferable to inner-city, minority illicit drug users, a population representing a significant portion of substance abuse treatment admissions. For example, in 2005, African Americans comprised 22% of national substance abuse treatment admissions and 51% of admissions for crack/cocaine (SAMSHA, 2006). Further, inner-city, minority illicit drug users often have the highest rates of substance use and depression comorbidity (Huang et al., 2006; Kessler et al., 2003). Particularly with regard to substance abuse treatment dropout, past research has pointed to the need to examine specific needs of racial minorities in treatment, given that significantly fewer African Americans (30.7%) than Whites (46.1%) complete residential substance abuse treatment (Jacobson, Robinson, & Bluthenthal, 2007). Challenging the appropriateness of current treatment approaches that can be integrated effectively into a residential substance abuse treatment center and applied to this underserved and understudied population is necessary.

Certain characteristics of CBT-D may hinder its ability to be incorporated into a large, inner-city residential substance abuse treatment setting, particularly given limited resources and high client volume (Morgenstern et al., 2001). First, CBT-D has been shown to be too time intensive to be incorporated easily into a substance abuse treatment plan due to the necessary length of sessions and treatment duration; further, CBT-D is typically administered as an individual treatment, which may often be difficult to

administer in a substance abuse treatment setting with limited resources available for individual clients (Morgenstern et al., 2001). Second, the majority of therapists in traditional substance abuse treatment centers are not trained to implement CBT-D or other more complex treatments (McCoy, Messiah, & Zhao, 2002). Third, CBT-D also poses difficulty with regard to client comprehension. More elaborate cognitive techniques involving high levels of awareness of cognitions, such as cognitive restructuring, may be challenging in some regards for chronic drug users, who often present with limited formal education and/or with cognitive impairments due to the effects of long-term, chronic illicit drug use. Even low levels of cognitive impairment have been shown to affect retention negatively in a CBT treatment for illicit drug users, perhaps due to lack of comprehension or inappropriateness of complex cognitive techniques (Aharonovich et al., 2006; see also Carroll, Kiluk, Nich, Babuscio, Brewer, Potenza, Ball, Martino, Rounsaville, & Lejuez, in press).

Feasibility of integration into a residential center is a clinical necessity due to the prevalence of residential substance abuse treatment provided in the U.S., particularly in low-income, inner-city environments, as well as due to the scarcity of mental health services available in these settings. Nationally, approximately 40% of individuals seeking substance abuse treatment receive residential care (according to the 2004 SAMHSA Treatment Episode Data Set), and in D.C. specifically, 33% of all drug/alcohol treatment facilities offer residential care (SAMHSA, 2006). Further, an estimate of up to 61% of individuals in residential substance abuse treatment centers meet for comorbid lifetime MDD (Rounsaville et al., 1991); despite this prevalence, residential centers often lack

sufficient mental health services internally (Etheridge, Craddock, Dunteman, & Hubbard, 1995).

1.5 Development of Depression and Substance Dependence: Reinforcement Theory

Considering the aforementioned limitations of CBT-D, a more straightforward approach based on reinforcement theory may serve as a context to understand the development of depression and substance use among this underserved, at-risk group. Although CBT-D is grounded in aspects of reinforcement theory, modifying CBT-D to limit its focus solely on behavioral changes may be a more appropriate, straightforward approach for this population.

According to behavioral theory, depression results from a loss of positive reinforcement for healthy behaviors (Ferster, 1973; Lewinsohn, 1974; Skinner, 1953). Loss of reinforcement may occur in the form of *quantitative* (i.e., number or intensity) or *qualitative* (e.g., type: social, intellectual; function: stimulation seeking, achievement) aspects of an event, availability of reinforcement in the environment (e.g., social isolation, poverty), instrumental behavior (e.g., social skill, academic ability), and/or the result of an increased frequency of punishment (Lewinsohn, 1974). This theory is supported with early work by Lewinsohn using the Pleasant Events Schedule (PES; MacPhillamy & Lewinsohn, 1971). Following the generation of individualized pleasant event schedules and subsequent monitoring of the frequency of events and daily mood state, depressed, non-depressed, psychiatric, and normal controls all exhibit a significant positive relationship between mood level and frequency of pleasant activities (Lewinsohn & Graf, 1973; Lewinsohn & Libet, 1972). Further, evidence indicates that depressed individuals engage in fewer pleasant activities and report less pleasure from these

activities (Lewinsohn & Graf, 1973; MacPhillamy & Lewinsohn, 1971). Moreover, depressed individuals engage in fewer interpersonal behaviors, thereby suggesting they may be receiving less social reinforcement (Hopko et al., 2005; Lewinsohn & Shaffer, 1971). Finally, behavioral activation (BA) treatments that increase access to pleasant events and positive reinforcers, as well as decrease the intensity and frequency of aversive events and consequences, have been markedly successful in treating depression (Hopko et al., 2003; Jacobson et al., 1996; Lejuez, Hopko, & Hopko, 2001; Lejuez et al., 2001; Martell, Addis, & Jacobson, 2001). Further, this behavioral approach has been shown to be as effective as cognitive behavioral therapy (CBT) in treating depression (Jacobsen et al., 1996; Zeiss, Lewinsohn, & Muñoz, 1979), but may not present many of the aforementioned limitations of CBT when applied to a low-income, inner-city, illicit drug using population receiving residential substance abuse treatment.

1.5.1 Use of Behavioral Activation Treatment to Target an Increase in Reinforcement

A brief, uncomplicated behavioral approach offers an important benefit to meet the unique needs of inner-city minority substance users as an alternative to CBT-D. Specifically, BA treatments for depression are based on reinforcement theory and are aimed at increasing contact with pleasant events and positive reinforcers, as well as decreasing the intensity and frequency of aversive events and consequences (Lewinsohn & Graf, 1973; Lewinsohn, Sullivan, & Grosscup, 1980). This presents a functional approach to treating depression, focusing on activities, goal-setting, and establishing life values, and the fundamental themes of reinforcement overlap with typical components of substance abuse treatments (e.g., decreasing avoidant tendencies, improving social support, increasing emotional expression, teaching stress management, working on life

priorities). Thus, utilization of a functional reinforcement approach would target depressive symptoms and also potentially show substance use gains by focusing on practical elements such as substance-free daily activities and goals.

As discussed previously, the main limitations of CBT-D in its application to a substance abuse treatment center (e.g., time intensiveness and complexity, which may hinder substance abuse treatment staff adoption and client comprehension) may not be obstacles when using BA in this population. BA may be more easily adopted in this setting due to the lack of mental health specific training needed for staff, its group format, time efficiency (e.g., fewer and shorter sessions), and ease of comprehension by clients due to its uncomplicated, straightforward protocol (Daughters et al., 2008; Lejuez, Hopko, & Hopko, 2001). Further, a BA approach would offer significant advantages for individuals with comorbid depression in particular, including the ability to target and address problems that arise from the unique combination of depressive symptoms and substance use (Rounsaville, 2004), such as increased tendency towards treatment attrition and relapse fueled by the comorbidity (McKay et al., 2002; Rounsaville, 2004). Changing one's environment, a main target in BA, is also crucial for substance use outcomes, and thus may represent a key improvement from previous treatments that showed mixed substance use outcomes even when improving depression.

1.6 Preliminary Support for the Life Enhancement Treatment for Depression (LET'S ACT)

Daughters and colleagues (2008) recently developed the Life Enhancement Treatment for Depression (LET'S ACT), which is based on the empirically validated Behavioral Activation Treatment for Depression (BAT-D; Lejuez, Hopko, & Hopko,

2001) and has been modified to accommodate the needs and lifestyles of a substance using population currently receiving residential substance abuse treatment. The vocabulary within the LET'S ACT manual has been simplified, and complex concepts and forms have been eliminated, replaced, or modified. To address both the early and late stages of substance abuse treatment, earlier sessions focus on modifying behavior in treatment, while the last sessions move toward post-residential treatment discharge planning and goals. A more detailed description of the LET'S ACT treatment is presented in the Methods section.

In this original publication, Daughters et al. (2008) compared LET'S ACT to treatment as usual (TAU) in treating depressive symptoms among inner-city illicit drug users in an inclient treatment setting. Specifically, 44 adult illicit drug users with mild to moderate depressive symptoms (BDI-II $\geq$ 10) who were currently receiving inclient substance abuse treatment (contracted to $\geq$ 60 days of treatment) were randomly assigned to either treatment as usual alone (TAU) or TAU plus LET'S ACT (which was delivered in 6 sessions plus two review maintenance sessions following treatment). Clients were assessed at baseline for DSM-IV psychiatric diagnoses, depressive symptoms (HAMD, BDI-II), and enjoyment and reward value of activities (EROS). Clients were again assessed at post-treatment and a 2-week follow-up. Treatment satisfaction and dropout rates also were assessed at post treatment. There was a significant group x time interaction such that clients receiving LET'S ACT evidenced significantly greater improvements than the TAU only group in severity of depression [HAMD; $F(1, 37) = 7.5$, $p < .01$, $\square^2 = .17$], enjoyment and reward value of activities at post-treatment [EROS; $F(1, 37) = 8.1$, $p < .01$, $\square^2 = .18$], and depressive symptoms at 2-week follow-up

[BDI-II; $F(1, 30) = 6.3$, $p < .05$, $\square^2 = .17$]. The LET'S ACT group also reported significantly higher treatment satisfaction ratings [$F(1, 38) = 10.8$, $p < .01$, $\square^2 = .23$]. Treatment dropout was approximately 4.5% for LET'S ACT ($n = 1$) and 22.7% for TAU ($n = 5$). This difference was not statistically significant [$\chi^2(1) = 3.3$, $p = .068$], but the high odds ratio is noteworthy ($B = 1.82$; $SE = 1.14$; $OR = 6.18$). Taken together, this study provides initial support for the efficacy of LET'S ACT in treating depressive symptoms and improving the enjoyment and reward value of activities among illicit drug users receiving residential substance abuse treatment.

1.6.1 Extensions to Preliminary Study of LET'S ACT

The preliminary findings of LET'S ACT in Daughters et al. (2008) are encouraging, yet the study has some limitations and clear opportunities for extension, including the following: 1) comparison with a contact-time matched control; 2) further investigation of the effect of LET'S ACT on treatment dropout; 3) modification of LET'S ACT into a 5-session protocol to allow for inclusion of 30-day clients in order to increase the effectiveness of the treatment and adoptability at a residential treatment center; and 4) enhancing the assessment of behavioral activation to include the BADS (Kanter et al., 2007), which was designed specifically to assess increases in behavioral activation over the course of a BA-focused depression treatment.

First, inclusion of a contact-time matched control is necessary to enable further investigation as to whether beneficial effects of LET'S ACT are a result of the ingredients of the treatment and not solely the increased individualized attention. While treatment as usual (TAU) in Daughters et al. (2008) is a logical starting point for a control group, the treatment groups at the residential center are large, not mental health or

depression-specific, and do not cater to individuals' specific needs. Thus, solely based on the findings of Daughters et al. (2008), it is difficult to discern whether the positive findings are a result of increased contact time and individual attention or the unique effects of LET'S ACT, thus making the inclusion of a more active, individual control treatment such as supportive counseling (SC) necessary.

Beyond adding a contact-time matched control treatment, a second logical second step for the current study is further investigate the utility of LET'S ACT in reducing treatment dropout, which was suggested in the preliminary study, but findings did not reach statistical significance. Treatment dropout is a significant main outcome in which to focus in this current study given its implications regarding long-term substance use outcomes; treatment length has consistently been shown to be directly related to rates of relapse, as well as HIV risk and other negative psychosocial outcomes such as unemployment, homelessness, and poverty (Hubbard, Craddock, & Anderson, 2003; Simpson, Joe, & Brown, 1997).

A third future direction for the evaluation of LET'S ACT relates to its effectiveness and the ease of adoption in a residential facility. In the Daughters et al. (2008) study, participants had to hold a contract length over 60 days to be included in the study to have enough time at the Center to receive all 8 sessions (6 treatment sessions and two review maintenance sessions) following initial screening and recruitment procedures. Recent changes in funding for substance abuse treatment has shifted from longer to shorter contract lengths, with a 30 day contract now being a common length found at urban residential substance abuse treatment centers (for example through federal funding agencies such as Court Services and Offender Supervision Agency (CSOSA) and

Addiction Prevention Recovery Administration (APRA). In turn, the 6-session (plus two maintenance sessions) protocol precludes enrollment of any clients with a 30-day contract, which comprises a large portion of clients (e.g., approximately 75% per month according to data collected at the Salvation Army Harbor Light from July 2008 through July 2009). Given the pressure to provide brief-time efficient treatments in this context, another future direction is to evaluate a shorter version of LET'S ACT that would accommodate 30-day clients. A 5-session version (which does not eliminate any material but rather combines session content of sessions 4-6 into two sessions) was a logical extension for the current study, as it would allow for 30-day clients to receive treatment that would begin treatment in their 2nd week at the Center and still cover all material covered in the LET'S ACT intervention evaluated in Daughters et al. (2008).

Finally, a fourth logical future direction would be to expand on the assessment of behavioral activation-related outcomes. Daughters et al. (2008) utilized primarily the Environmental Reward Observation Scale (EROS; Armemento & Hopko, 2007) to assess level of environmental reinforcement and reward derived from activities (known as response-contingent positive reinforcement) as the main behavioral activation-related outcome. In addition to the EROS, a measure assessing overall activity level, avoidance, and impairment in main life areas (work, school, social) is another dimension of behavioral activation commonly included in randomized controlled trials evaluating behavioral activation treatments (Kanter et al., 2007; 2008). The Behavioral Activation for Depression Scale (BADS; Kanter et al., 2007) is a 25-item self-report scale that assesses overall activity level, as well as specific behaviors that are hypothesized to be responsible for change in BA treatments for depression. That is, it assesses behaviors that

should lead to increased contact with response-contingent positive reinforcement. The BADS does not assess response-contingent reinforcement directly, rather whether individuals are making behavioral changes that should potentially lead to increased response-contingent reinforcement, and thus would be an important addition to the assessment of behavioral activation in the evaluation of LET'S ACT.

1.7 Current Study

The current study is a systematic replication and extension of the initial LET'S ACT study (Daughters et al., 2008). Extensions of the previous study include 1) utilization of a contact-time matched control treatment; 2) further investigation of the effect of LET'S ACT on substance abuse treatment dropout; 3) modification of the treatment manuals to deliver treatment optimally in 5 sessions to allow for inclusion of 30-day clients to increase the utility of the treatment in today's residential treatment centers; and 4) expand on the assessment of behavioral activation outcomes to include a measure of overall activation and behavioral changes that may lead to increased response-contingent reinforcement using the BADS. In sum, the current study compared LET'S ACT to Supportive Counseling (SC) with both groups receiving residential substance abuse treatment (TAU) among a sample of 58 low-income substance users with depression currently receiving residential substance abuse treatment in inner-city Washington, D.C. In a systematic replication and extension of the Daughters et al. (2008) study, the current study aimed to expand on this important preliminary investigation to investigate the utility of LET'S ACT in reducing residential substance abuse treatment dropout using a 5-session treatment protocol which modified the previous LET'S ACT manual to combine sessions 4-6 into two sessions. Specifically, we hypothesized that

participants who received LET'S ACT would evidence 1) greater reductions in substance abuse treatment dropout [categorical dropout (yes/no) and days to treatment dropout]; 2) greater reductions in depression (self-reported and clinician-rated depressive symptoms); and 3) greater increases in behavioral activation (measured by the EROS and BADS self-report measures).

1.8 Design considerations

Several decisions were made regarding the experimental design and inclusion/exclusion criteria. First, we considered what type of control or treatment condition we should use to compare to LET'S ACT. Several factors indicate that the supportive counseling comparison may be most appropriate for this particular project. First, the use of SC builds on the findings of Daughters and colleagues (2008) by adding a contact-matched control rather than using treatment as usual (TAU) as the control condition. Second, the proposed trial is highly preliminary and seeks to determine if LET'S ACT may be better than non-specific therapy factors – such as therapeutic alliance and contact time – each of which have been shown to be effective in reducing dropout in and of themselves (Horvath & Symonds, 1991; Craig, 1985). The current study aims to provide the groundwork prior to the consideration of a randomized controlled trial (RCT) with LET'S ACT and more compelling comparison conditions. SC is a logical first step, particularly given the resources and time limitations of the current project.

A second relevant consideration was the inclusion of individuals with other comorbid psychopathology and/or use of psychotropic medications. Due to the high rate of comorbidity in drug dependence and psychotropic medication use (DeJong, van den

Brink, Harteveld, & van der Wielen, 1993; Ziedonis et al., 1994), it was clear that including such individuals would maximize external validity (Rounsaville, Weiss, & Carroll, 1999), and in contrast, excluding these individuals would greatly limit our sample. Thus, we elected to include comorbid conditions (with the exception of acute psychosis), and individuals taking psychotropic medications if stabilized for over 3 months. Any group differences in comorbid diagnoses were considered as covariates in all analyses.

Third, we considered whether we should examine treatment dropout or post-treatment relapse (using follow-up assessments) as the main substance use outcome. The end decision was to focus on treatment dropout for three reasons. First, individuals who dropout of treatment are clearly at increased risk for substance use relapse and are less likely to have received sufficient treatment to address depressive symptoms. Thus, treatment dropout has unique implications for dual diagnosis populations, given that the depression-related outcomes associated with treatment dropout may also impact substance use relapse. Second, the current proposal stems directly from prior work suggesting the utility of LET'S ACT in reducing treatment dropout; these findings were not quite significant but worthy of further exploration. Third, treatment dropout is the most feasible dependent variable of substance use outcomes given the scope and time limitations of the current project, and studies have indicated dropout to be a strong proxy for relapse (e.g., Bottlender & Soyka, 2005).

Fourth, we also discussed the most appropriate period of time for initial assessment. To ensure that initial withdrawal symptoms did not interfere with an individual's ability to complete the assessment session, as well as to control for the

effects of time in treatment, participants were assessed no sooner than 48 hours and no later than 7 days after they arrive at the facility. It should be noted that individuals must have passed through detoxification and be completely free of drugs at intake, thereby limiting the likelihood of extreme withdrawal effects even at the 48 hour period. This consideration enabled therapy to begin in the first or second week of one's entrance into the treatment center; however, we also balanced the need to have all sessions completed before 30 days for any client with a 30-day contract (which comprised approximately 60% of our sample).

In line with the issue of timing of the initial assessment and accommodating 30-day clients, we also discussed the most appropriate length (number of sessions) for optimal delivery of the treatment, considering issues related to both efficacy and effectiveness. Although we initially wanted to further test the original 6-session manuals (that included 2 review maintenance sessions following the 6 sessions) used in the Daughters et al. (2008) study, we also noted that we wanted to accommodate the large percentage of clients that were only in treatment for 28 to 30 days; the 6-session (plus two maintenance sessions) protocol was not able to be administered to clients with 30-day contract lengths, given the initial delay in beginning treatment due to a) the need to control for any lingering effects of detoxification, as well as b) study procedures that preceded initiation of treatment (including the initial SCID screening, recruitment, and baseline assessment procedures). Weighing the benefits of increased effectiveness and optimal applicability to the residential treatment center given the pressure to provide brief, time-efficient treatments, we decided to develop a 5-session version of LET'S ACT to allow for inclusion of clients with 30-day contract lengths (which comprised 58.6% of

the current sample). The 5-session version did not eliminate any material from the original 6-session manual, but rather combined session content of the last three treatment sessions into two sessions (4 and 5). We viewed this 5-session format to be optimal delivery of the treatment; sessions were spaced out maximally over 3 weeks, allowing for 30-day clients to begin treatment in their 2nd week at the Center and still cover all material included in Daughters et al. (2008).

Lastly, we also discussed the appropriate timing for assessing clinician-rated depression, balancing the need to closely track changes in symptomatology, while also allowing for sufficient time to pass for the assessment of remission. Some individuals, particularly those with 30-day contracts, only had approximately 3 weeks in between their baseline and post-treatment assessments, thus not allowing for a full month to assess for MDD remission. In response, we chose to conduct the MDD module of the SCID-IV-NP and the assessment of clinician-rated depressive symptoms (HAMD) again only at the 2-week follow up to ensure ample time in between assessments yet still closely examining any change from baseline.

Chapter 2: Research Design and Methods

2.1 Overall Design

The current study was conducted at an inner-city residential substance abuse treatment program and recruited 58 depressed substance dependent individuals over a 9-month period. The overall design examined group differences in dropout from the substance abuse treatment center and the extent to which treatment affected depression (self-reported and clinician-rated) and behavioral activation outcomes (level of activation, environmental reinforcement). Assessments were administered at baseline prior to

starting the treatment, immediately following the LET'S ACT treatment, and at a 2-week follow up for participants who were still in treatment (those with a contract length > 30 days). This design allowed for an examination of the effect of LET'S ACT on substance abuse treatment dropout, depression, and behavioral activation.

2.2. Recruitment

Participants (n = 58) were recruited from the Salvation Army Harbor Light Residential Treatment Center in Northeast Washington, D.C. The center requires complete abstinence from drugs and alcohol, with the exception of caffeine and nicotine; regular drug testing is provided and any use is grounds for dismissal from the center. When needed, detoxification from an outside source is required prior to entry into the center. Aside from scheduled activities (e.g., group retreats, physician visits), residents are not permitted to leave the center grounds during treatment. Although clients at the facility often meet criteria for a dual diagnosis, treatment for mental health problems other than substance use is typically not available, and the treatment center does not have a psychiatrist on staff. Clients with psychiatric problems receive substance abuse treatment at this center, but off-site health centers are utilized to provide pharmacological treatment (~25% of clients).

Within the first week of their arrival to the treatment center, all individuals entering the center had a screening assessment session in which they were given the SCID-IV-NP (First et al., 2001) and the BDI-II (Beck, Steer, & Ball, 1996). Individuals who conducted the intake assessments were trained interviewers predominantly independent of the current study. Recruitment for the study was based on the initial assessment. Inclusion criteria consisted of the following: 1) minimum of 18 years of age;

2) DSM-IV diagnosis of past year Substance Dependence as measured by the SCID-IV-NP (First et al., 2001); 3) DSM-IV diagnosis of Major Depressive Disorder (MDD) and/or score ≥ 12 on the BDI-II; 4) complete detoxification as needed prior to entry into the center and/or abstinent for at least one week prior to study participation; and 5) have the ability to speak and read English sufficiently to complete intervention procedures (determined by ability to read BDI-II at intake). Clients were excluded from the study if 1) they were taking but not stabilized on psychotropic medication (i.e., < 3 months), or 2) met diagnostic criteria for current psychotic symptoms (measured by the SCID-IV-NP, First et al., 2001).

Residents at the treatment center who met initial eligibility requirements based on the SCID-IV were approached by a research assistant on the following Friday afternoon (no center implemented treatment groups are scheduled for these times). The research assistant asked the resident if they would like to participate in a treatment study that focuses on their mood. They were told that they would complete a baseline assessment session that day that would last about an hour and a half, and then the following three weeks they would participate in treatment groups that meet twice a week. Lastly, they were told that they would complete an assessment following treatment that will be similar to the baseline assessment, and one 2 weeks later if still in treatment. Payment would be provided only for the research assessments ($25 for each assessment completed). If interested, the participant provided informed consent, and then the baseline session commenced which consisted of a packet of questionnaires. If participants declined participation (which occurred once during recruitment), they were able to return to unsupervised free time activities to limit any knowledge by treatment center staff member

as to whether or not they had chosen to participate, thereby limiting any appearance of coercion to participate. Individuals who agreed to participate in the study signed the informed consent and then were assigned a subject number that was listed on all data forms. Given issues of reading comprehension, efforts were made to ensure that participants understood all facets of the consent form and the study itself, however individuals who were unable to read and therefore unable to understand the consent form on their own were not included, given that both treatments required written homework assignments. The SCID-IV interviewers noted literacy (based on ability to read the BDI-II), and any individuals unable to read the BDI-II, even if they met all other inclusion criteria, were not recruited (n = 4). All assessment sessions were held in private rooms at the Salvation Army Harbor Light facility during designated "free time" periods at the center. The center director had provided permission for access to clients every Friday during these times until the study was complete.

2.3 Procedure

Once recruited and consent was provided, participants began the baseline assessment in a room at the Center with about 10 large tables. Each participant sat at a separate table when completing the baseline assessment. The baseline assessment consisted of a battery of self-report measures assessing demographics, drug use severity, depressive symptomatology, and behavioral activation (activity level, enjoyment and reward from activities). A proctor was in the questionnaire room at all times to provide instruction and answer any questions the participants have. Following completion of the interviews and self-report measures, participants signed two receipts (one for the participant, one for our records) to receive $25 in gift cards following discharge from

residential treatment. Their receipt listed instructions to obtain the gift cards, which involves calling research staff and providing a mailing address where we could send the gift cards. Names and addresses were verified against the copy of the receipt we kept from the assessment. Gift cards were only mailed following discharge so staff did not know if individuals have chosen to participate. Further, the payment receipts only included names and no number so that client name and responses could not be matched by any study personnel.

Following the baseline, subjects were randomized to either LET'S ACT or SC with treatment beginning the following Monday or Tuesday to ensure ample group size but also limit delay to participation. Following completion of the baseline session, all five therapy sessions were scheduled across the next 3 weeks of the participant's stay in the center, and the groups (SC and LET'S ACT) consisted of 3-5 participants. Groups occurred during the morning timeslots, and thus (with the exception of Fridays) clients were taken out of their scheduled groups for one hour. This was consistent across therapists, given that all therapists ran groups during the 9 am to 11 am timeslots. The post-treatment assessment occurred the Friday afternoon after all treatment sessions had been completed. For participants who were still in the center 15 days following the post-assessment, a similar assessment was given as a 2-week follow up. At this assessment, clinician-rated depression ratings were administered (using the HAMD) and MDD remission was also assessed by a trained SCID interviewer. The research assistants who helped with conducting the assessments (with the exception of Ms. Magidson who did the initial treatment assignment) were blind to treatment group. Participants were also paid $25 in gift cards for the post-treatment assessment and the 2-week follow up in the same

manner as was performed for the baseline. No payment was given at the 5 treatment sessions; total possible payment was $75.

2.4 Overview of Treatment

In this study, groups were randomized either to LET'S ACT or SC, and treatment was delivered in five sessions over a 3-week period. Each of the treatment sessions lasted approximately 1 hour. A description the treatment is presented below.

2.4.1 LET'S ACT

LET'S ACT is based on the empirically validated Behavioral Activation Treatment for Depression (BAT-D; Lejuez, Hopko, & Hopko, 2001) and was modified to accommodate the needs and lifestyles of a substance using population currently receiving inclient substance abuse treatment. The vocabulary within the LET'S ACT manual was simplified to be more comprehendible to those with limited formal education background and/or cognitive deficits resulting from acute and more long-term pharmacological effects of repeated drug use. Complex concepts and forms were eliminated, replaced, or modified. To further accommodate treatment compliance and homework completion, clients were given pocket sized client manuals which include daily monitoring forms, daily goal sheets, life area assessments, and additional note pages. Attendance and completion of homework assignments was recorded at the start of each treatment session for all clients.

Specifically, treatment included five sessions over a three-week period and was provided in small group format, with each group consisting of 3-5 clients. To address both the early and late stages of substance abuse treatment, earlier sessions focused on modifying behavior in treatment, while the last sessions gradually moved toward post-

residential treatment discharge planning and goals. The first session consisted of an introduction of the treatment rationale, life values and goals exercises, and homework was assigned to self-monitor current activities and daily moods. The second session reviewed the content of the first and the homework, and moved onto identifying activities to fulfill the life area goals set in the first session. Behavioral contracts were also introduced in this session. Session three focused on establishing daily and weekly goals, and daily and weekly goal setting in the client manual was the homework assigned throughout the remainder of treatment. Finally, sessions four and five focused on reviewing daily and weekly goal setting exercises, integrating new activities into daily and weekly goals, and discussing a post-treatment plan.

2.4.2 Supportive Counseling (SC)

To control for the non-specific elements of therapist contact and additional treatment group involvement, the other half of the clients received SC, which also consisted of five group sessions over 3 weeks. This treatment did not follow a clearly defined theoretical model and can be best described as unconditional support and reflective listening in response to any issues the participant brought to session, which has been utilized as a control condition in other treatment outcome studies specific to substance abuse (e.g., Azrin et al., 1994) and depression (Manne et al., 2007; Thase et al., 2000). For the purposes of this study, SC specifically avoided behavioral activation techniques. Although no therapeutic content for LET'S ACT was added into SC, features such as the use of a manual and journal writing homework forms were utilized to control for the effects of homework and manualization in LET'S ACT. Attendance and completion of homework assignments was also recorded at the start of each treatment

session to control for the effects of recording such information.

2.5 Therapist adherence, fidelity, and competence

Four therapists were cross-trained in LET'S ACT and SC by Dr. Daughters, and all therapists administered both treatments to control for therapist effects. Therapists were randomly assigned treatment groups by the research coordinator, Ms. Magidson, based on a set therapist rotation but were also counterbalanced across groups. The administration of treatment was completely separate from research assessments. Therapists were supervised by Dr. Lejuez at a weekly supervision meeting open to all lab members, and Dr. Daughters was also available for consultation as needed for study therapists. Therapist manuals developed by Dr. Daughters, Dr. Lejuez, and Ms. Magidson were used at all times to ensure standardization of treatment delivery. Therapists were provided feedback on their sessions and were given additional supervision when indicated. All therapists completed therapist adherence forms, which outlined the components of the manual for each session for both LET'S ACT and SC treatment conditions. After each session, therapists completed the adherence forms and provided them to Ms. Magidson weekly. All therapy sessions were audiotaped, and therapists uploaded their session MP3's into a study folder on a shared drive. MP3 files were saved as the group number and session number, thus protecting participants' confidentiality without having any identifying information linking the files to them. Ms. Magidson listened to 20% of audiotaped sessions (there were 80 sessions in total for the 16 groups), listening to at least two treatment sessions of each treatment type per therapist (16 sessions total). For each session, Ms. Magidson used the therapist adherence forms to assess competency with the treatment protocol and adherence to the components of the manual for each session.

There were separate forms for SC and LET'S ACT, and a key issue focused on when listening to the recorded sessions was the avoidance of directive feedback and behavioral activation techniques specifically in the SC condition. When any therapist drift from the protocol was detected, therapists were given feedback during supervision. Participants' adherence to treatment was assessed by their attendance at program sessions and homework completion using forms developed for the LET'S ACT and SC protocols that were filled out by the therapist following each session. This was done for both conditions to control for any effects of recording attendance and homework completion.

2.6 Participants

The final sample consisted of 58 participants who met inclusion criteria for the study. A total of 4 participants who met all inclusion criteria but were not literate (assessed at BDI-II administration at the screening) were not recruited for the study, and 1 participant who was approached for the study refused. 16 treatment groups were conducted with 3-5 participants in each group. Groups were conducted from November 1st, 2008 through July 27th, 2009 (see Figure i for a consort diagram of study recruitment and retention).

As shown in Table 1, the mean age of the sample was 44.78 (*SD* = 9.39), ranging in age from 24-65 years. Men comprised 65.5% of the sample (*n* = 38), and 89.7% identified as African American (*n* = 52). In terms of education, 75.9% reported having a high school education/GED or less (*n* = 44), and 24.1% reported having more than a high school diploma or GED (e.g., a few years of college or technical school; *n* = 14). With regard to income and employment, 82.1% made less than $10,000 per year (*n* = 47), and 84% of the sample reported being unemployed prior to the start of treatment (*n* = 48).

With regard to marital status, 81.1% of the sample was single and never had been married (*n* = 47). Regarding treatment characteristics, 53.4% were voluntarily attending treatment (*n* = 31) as opposed to being court-mandated (46.6%; *n* = 27); 59% of the sample had a 30-day contract of residential treatment (*n* = 34), 31% had a 60-day contract (*n* = 18), and 10.3% had >60 day contract (90 or 180 days; *n* = 6).

In terms of clinical variables (see Table 2), 60.3% of the sample met criteria for current MDD and the mean BDI-II score was 18.89 (*SD* = 9.41); 71% of the sample also met criteria for recurrent MDD. Regarding psychotropic medication, 53.4% were stabilized on psychotropic medication at baseline, and 46.6% were not taking any psychotropic medications. In terms of the most prevalent drug dependencies (over 5% of the sample meeting criteria), 50.9% of the sample met criteria for current alcohol dependence, 46.6% of the sample met criteria for current cocaine dependence, 24.1% current opioid dependence, 8.8% met criteria for current marijuana dependence, and 47.4% of the sample met criteria for current dependence for two or more drug classes. Lastly, with regard to other comorbid Axis I and II diagnoses, we examined the prevalence of any comorbid conditions in which > 5% of the sample met criteria, which included Post-traumatic Stress Disorder (PTSD), Generalized Anxiety Disorder (GAD), Borderline Personality Disorder (BPD), and Antisocial Personality Disorder (ASPD). With regard to comorbid anxiety, 21.8% of the sample also met criteria for current PTSD and17.5% met criteria for current GAD. In terms of Axis-II comorbidity, 36.8% met criteria for BPD, and 49.1% met criteria for ASPD. See Table 2 for the rates of all baseline clinical variables (including comorbid conditions) for the sample and by group.

2.7 Measures

Measures were organized into four domains: (a) demographics, baseline substance use, and comorbid psychopathology to be used as potential covariates in analyses; (b) depressive symptomatology, which was used to examine specific symptom-level changes in depression; (c) behavioral activation measures of activity level and environmental reinforcement to test treatment effect on behavioral activation; and (d) therapy-related factors to identify additional considerations for the optimal administration of treatment.

Table 20. Descriptions of assessment measures in four domains

Domain	**Measure**	**Description**
Demographics, Substance Use, and Psychopathology	Demographics Questionnaire *Baseline*	Basic information on age, gender, race, education level, marital status, and total household income
	Legal Status *Baseline*	Criminal history, court mandated or voluntary status
	SCID-NP *Screening*	Diagnostic information (Axis I Psychopathology, BPD and ASPD)
	Medication Questionnaire *Baseline*	Frequency, dosage, and type of various medications, including psychotropic, non-psychotropic, and over-the-counter medication
Depressive Symptomatology	HAMD *Screening, 2-week follow up*	Clinician-rated severity of depressive symptoms
	BDI-II *Screening, Post, 2-week follow up*	Self-report assessment of depressive symptoms
Behavioral Activation: Activity Level and Environmental Reinforcement	BADS *Baseline, Post, 2-week follow up*	Self-report assessment designed to measure increases in BA; 4 subscales include activation, avoidance/rumination, and work/school and social impairment
	EROS *Baseline, Post, 2-week follow up*	Assessment of reward and enjoyment derived from activities; environmental reinforcement
Therapy-related factors	Program Evaluation Form *Post*	Satisfaction rating of residential treatment
	CMR *Baseline*	Assessment of treatment motivation, readiness, and circumstances surrounding substance abuse treatment
	WAI *Post*	Therapeutic alliance
	Treatment center dropout *Baseline to post*	Dropout rates of LET'S ACT and SC participants in first 30 days of treatment, date of dropout, and reason

2.7.1 Demographics, Substance Use, and Psychopathology

Demographic Questionnaire. A short self-report questionnaire was administered at baseline to obtain age, gender, race, education level, marital status, and total household income.

The Legal Status Form provided information as to whether the participant's admission to substance abuse treatment center was voluntary or court-mandated. Further, the form was composed of additional questions pertaining to one's past arrest and conviction history, type of arrests/convictions, and length of time spent incarcerated.

Structured Clinical Interview for DSM-IV (SCID-NP, non-client version; First, Spitzer, Gibbon, & Williams, 1995). Diagnostic inclusions/exclusions and lifetime prevalence of Axis I diagnoses (including but not limited to MDD, alcohol dependence, non-alcohol substance dependence, and current psychosis) were determined at screening using the SCID-NP, which has demonstrated high reliability and validity in substance using samples (Kranzler et al., 1996; Spitzer, Williams, Gibbon, & First, 1989). BPD and ASPD were the only two Axis-II conditions assessed. Psychosis, current MDD, and substance dependencies were used for study inclusion criteria, and other Axis I and II comorbidities were used as potential covariates in analyses. Lastly, the MDD module of the SCID was also administered at the 2-week post-treatment assessment to assess for MDD remission (see Appendix for results).

Medication Questionnaire. To determine if psychotropic or other medication may influence the expected results, we collected data from the subjects by simply asking which medications they had been taking currently (if any), how long they had been taking these medications, as well as dosage and frequency. Medication was coded as a

dichotomous variable: 1) psychotropic medication or 2) any other over-the-counter medications or treatments for other medical conditions. Clients were excluded if not stabilized on psychotropic medication for > 3 months (this is also asked at the intake interview). Any changes in medications were also assessed at post assessments.

2.7.2 Depressive Symptomatology

The Hamilton Rating Scale for Depression (HAMD; Hamilton, 1960) was used as a clinician assessment of depressive symptom severity. This 21-item scale includes questions pertaining to libido, energy, weight, and appetite changes. Scores are combined into a single total score, and the measure has been shown to have strong divergent/convergent validity and reliability. The HAMD was administered at screening with the SCID interview and at the 2-week follow up with the MDD module of the SCID.

The Beck Depression Inventory-II (BDI-II; Beck, Steer, & Ball, 1996) was used to assess self-reported depressive symptoms. The BDI-II is a 21-item inventory that assesses the severity of depressive symptomatology. Each item is rated on a 0-3 scale with summary scores ranging between 0 and 63. The BDI-II has consistently shown strong reliability and validity, as well as high concurrent validity with HAMD ratings (Beck, Steer, & Carbin, 1988). The BDI-II was administered at screening with the SCID and at the two subsequent assessments.

2.7.3 Behavioral Activation: Activity Level and Environmental Reinforcement

The Behavioral Activation for Depression Scale (BADS; Kanter, Mulick, Busch, Berlin, & Martell, 2007) was used to assess specific changes in activity level. The BADS was specifically designed to assess when and how clients become activated over the course of treatment in order to measure the efficacy of behavioral activation in treating

depression. Specifically, participants are asked to state how true a list of 25 statements is for him/her in the past week, and answers are provided on a 7-point scale ranging from 0 (not at all) to 6 (completely). The BADS has four subscales. "Activation" is made up of 7 items that assess "goal-directed activation" and completion of scheduled activities (for example, "I engaged in a wide and diverse array of activities" and "I did something that was hard to do but it was worth it"). The "Avoidance/Rumination" subscale consists of 8 items and is aimed at measuring avoidance behaviors that may be interfering with activation (e.g., "I did things to avoid feeling sadness or other painful emotions," "I tried not to think about certain things"), and the last two subscales examine specific domains of impairment, including "Work/School Impairment" and "Social Impairment." Both contain 5 items and measure behaviors directed toward the accomplishment of important life goals (e.g., "I took time off of work, or other responsibilities simply because I was too tired or didn't feel like going in" and "I was withdrawn and quiet, even around people I know well"). In addition to the four subscales, a total score reflects overall "behavioral activation" which encompasses overall activity level, levels of avoidance behaviors, as well as goal-directed activity and social/occupational impairment. Higher scores indicate higher levels of behavioral activation (and lower levels avoidance/rumination, impairment for the subscales). The BADS has been demonstrated to have good factor structure, internal consistency, test-retest reliability, and construct and predictive validity (Kanter et al., 2007; 2008). The BADS was administered at all assessment time points.

The Environmental Reward Observation Scale (EROS; Armemento & Hopko, 2007) was used to compare levels of environmental reinforcement across treatment groups. The EROS is a 10-item self-report measure that aims to assess response-

contingent positive reinforcement, such that items are intended to measure "increased behavior and positive affect as a consequence of rewarding environmental experiences," as well as the degree to which an individual is obtaining positive reinforcement from the environment as a result of his/her behavior. The measure asked participants to rate the degree in which they agree with each statement (1 = strongly disagree to 4 = strongly agree) and examples of items include: "In general, I am very satisfied with the way I spend my time" and "I wish that I could find more hobbies that would bring me a sense of pleasure." Reliability and (divergent/convergent) validity indices for the EROS are strong (Armemento & Hopko, 2007). The EROS was administered at all assessment time points.

2.7.4 Therapy-related factors

The Program Evaluation Form is an 8-item self-report measure assessing participant's perceived quality and satisfaction of treatment (LET'S ACT or SC). Questions include "To what extent has this program met your needs?" and "How would you rate the quality of the service you received?" Answers are provided on a 4-point Likert scale; participants' ratings can be seen as reflecting overall satisfaction with the LET'S ACT or SC treatment programs.

The Circumstances, Motivation, Readiness Scale (CMR; De Leon, Melnick, Kressel, & Jainchill, 1994) was used to assess treatment motivation. The CMR is an 18-item factored version of the 42-item CMRS used in residential substance abuse treatment samples. The self-report measure employs Likert-type items rated on a 5-point scale from "strongly disagree" to "strongly agree" and all questions are at a 3rd grade reading level. The three subscales are circumstances (external pressures to enter or leave treatment),

motivation (intrinsic pressures regarding the need to change), and readiness (perceived need for treatment). In addition to the subscale scores, a total CMR score assessed the individuals' overall potential to enter and remain in substance abuse treatment. The measure has demonstrated strong reliability, with Cronbach alpha values ranging from .60 on subscales to .85 for the total score.

The Working Alliance Inventory (WAI; Horvath & Greenberg, 1989) was used to assess therapeutic alliance and was administered at the post-treatment session. The WAI is a 36-item measure composed of items reflecting desirable aspects of the therapeutic relationship, and each item is assessed on a 7-point Likert scale ranging from 1 (never) to 7 (always), higher scores indicating a more positive therapeutic alliance.

Treatment Dropout was calculated using two indices, one continuous and one categorical. First, we had a dichotomous index of whether an individual has dropped out before the completion of 30 days; the second was days missed before the completion of 30 days. LET'S ACT and SC therapists provided the research coordinator, Ms. Magidson, with a list of any subject numbers of participants that dropped out of the treatment center and reasons for dropping out. This information was cross-checked with Center staff, and the date of dropout was also confirmed with the Center intake coordinator. Treatment dropout was classified as two types of dropout: dropout due to noncompliance with the residential treatment center agreement (e.g., rule violations, substance use, etc.), or voluntary withdrawal.

Chapter 3: Results

To address the primary study hypotheses, that participants who received LET'S ACT would evidence greater reductions in substance abuse treatment dropout, greater reductions in depressive symptoms, and greater increases in behavioral activation, a number of steps were undertaken and are outlined below. The first step included a comparison of the two groups on all baseline demographic and clinical variables to ensure baseline equivalence of groups. Next, we identified a set of potential covariates for each analysis based on literature reviews of theoretically-relevant variables, which included variables such as basic demographic information including age and gender, contract type, court-mandated status, current class of drug dependencies, whether someone was dependent on multiple drugs, use of psychotropic medication as well as any comorbid anxiety disorder or Axis-II disorder. The population we recruited often has numerous comorbid Axis I and II conditions (including numerous drug dependencies), and thus to maximize effectiveness of the current trial yet still maintain internal validity we chose to consider any of these comorbid diagnoses as covariates if related to the main outcome for each analysis, as these variables could potentially impact all three main outcomes. Thus, for each analysis, we examined the relationship between the theory-driven potential covariates and the main outcome (using chi square analyses for two categorical variables, ANOVAs for one categorical and one continuous variable, and correlations for two continuous variables). Any variable significantly related to the main outcome ($p < .05$) was included as a covariate in the analysis of that main outcome.

To address the first study hypothesis, comparing rates of substance abuse treatment dropout by group, a logistic regression (to predict treatment dropout) and Cox

proportional hazards survival regression analysis (to predict days to dropout) were used. For the second and third hypotheses, to examine differential effects of treatment on depression and behavioral activation, generalized estimating equations (GEE; Liang & Zeger, 1986; Zeger & Liang, 1986) analyses were utilized for variables assessed at all 3 time points (BDI-II, BADS, EROS). GEE allows for inclusion of either categorical or continuous independent variables and is advantageous when examining multiple observations that are correlated across time. In all GEE analyses, we centered our linear time variable for consistency and clarity of interpretation. Clinician-rated depressive symptoms (HAMD) were only assessed at baseline and the 2-week follow up[1], thus for this main outcome with two time points, only repeated measures ANOVAs were used. Lastly, to supplement GEE analyses that examined change over the 3 time points, we also utilized repeated measures ANOVA analyses to examine changes in BDI-II, BADS, and EROS scores from pre- to immediately post-treatment, when the majority of our sample was assessed (any client with a 30-day contract was not still in treatment to receive a 2-week follow up assessment).

3.1 Equivalence of Groups

LET'S ACT and SC were compared to ensure equivalence of groups on relevant variables such as demographics (Table 1), clinical variables such as court-mandated status, treatment motivation/readiness, contract length, class of drug dependency, and any comorbid diagnoses (Table 2), as well as baseline levels of the outcome variables, such as baseline depressive symptoms and MDD status, and baseline levels of behavioral activation (Table 3). Tables 1, 2, and 3 provide detailed information on the descriptive

[1] We also assessed MDD remission at the 2-week follow up with the HAMD; see Appendix for the analysis predicting MDD status at the 2-week follow up. This was considered a secondary analysis given the small sample size and limitations in interpreting this finding, which is explained in the Appendix.

information for all variables for the total sample and by group. Additionally, group differences for all variables were assessed using ANOVAs for continuous variables and chi-square tests for categorical variables. As shown in Tables 1, 2, and 3, the only variable that was significantly different between groups was prevalence of alcohol dependence, such that there was a significantly higher rate of individuals that met criteria for alcohol dependence at baseline in the SC group (69%) compared to the LET'S ACT group (32.1%; χ^2 (1) = 7.73). There were no differences across the two treatment conditions on any of the other demographic or baseline clinical variables (all *p*s > .05). We then examined the relationship between alcohol dependence and our main outcome variables (treatment dropout yes/no, days to dropout, HAMD, BDI, BADS, and EROS scores) to identify any relationship in which alcohol dependence was related to the main outcome variable. Alcohol dependence was not shown to be significantly related to any of our main outcome variables (all *p*s > .15), and thus was not included as a covariate in analyses.

3.2 Comparison of 30-day vs. 60, 90, and 180 day contracts

We also examined any differences between individuals with a 30-day contract and those with longer-term contracts to examine the potential for biased results at the 2-week follow up if significant differences were to exist between those who are excluded from the 2-week follow up assessment given their 30-day contract status. All baseline demographic and clinical variables used to compare group differences (LA vs. SC) were included. The only significant differences between contract length types were prevalence of alcohol dependence and BPD diagnoses. With regard to alcohol dependence, 63.6% of the 30-day clients met criteria for alcohol dependence compared to 33.3% of the longer-

term clients (χ^2 (1) = 5.11, $p < .02$). With regard to BPD, there was a significantly greater proportion of the longer-term contract participants that met criteria for BPD (54.2%) compared to those with 30-day contracts (37.5%; χ^2 (1) = 4.24, $p < .04$), which further suggests that we cannot assume the 30-day clients were more or less severe than the longer-term clients[2]. Moreover, there were no significant differences between the baseline levels of any of the main outcome variables when comparing individuals with 30-day vs. longer term contract lengths (all *p*s > .30). See Tables 15-17 for results.

3.3 Therapy-related factors

Before analyzing our main outcomes, we examined group differences in therapy-related factors at post-treatment, such as treatment satisfaction and working alliance. As shown in Table 6, there were no differences between groups on treatment satisfaction or working alliance (all *p*s > .60).

3.4 Primary Hypothesis 1: Treatment dropout

3.4.1 Logistic Regression Predicting Categorical Dropout

The first step in examining the relationship between treatment condition and dropout from the residential treatment center was to first examine any relevant baseline variables that may be related to treatment dropout. To provide further descriptive data on our sample and factors associated with substance abuse treatment dropout, all variables discussed previously when examining treatment group differences (demographic, clinically relevant variables, baseline levels of the main outcomes of depression and behavioral activation) were examined in relation to treatment dropout (categorical status

[2] For all analyses that included the 2-week follow up (all GEE analyses and the HAMD repeated measures ANOVA), we also conducted the analyses with alcohol dependence and BPD as covariates. The inclusion of these two variables as covariates did not affect results; all significant results remained significant, and all nonsignificant results remained nonsignificant.

of dropout from center in first 30 days). ANOVAs were used for continuous variables and chi-square tests for categorical variables. The only variable significantly related to treatment dropout was being on psychotropic medication (yes/no), such that participants who dropped out of the center were significantly more likely to be taking psychotropic medication (χ^2 (1) = 8.08, p = .004). In fact, all participants (n = 8) who dropped out of the treatment center were stabilized on psychotropic medication at the baseline assessment. See Tables 12, 13, and 14 for the relationships between all other baseline demographic and clinical variables in relation to treatment dropout.

In line with our first hypothesis (outlined in 1.7) that participants in LET'S ACT would evidence significantly lower rates of residential treatment dropout as compared to those in SC, we conducted an intent-to-treat logistic regression analysis predicting dropout from residential treatment in the 30-day study period (Dropout = 1, No dropout = 0).[3] Psychotropic medication status was not utilized as a covariate in the subsequent analysis given that it acted as a constant in its relationship with treatment dropout (because all participants who dropped out were on psychotropic medication). Thus, in the first step we entered our independent variable: treatment condition (LA = 1, SC = 0). The analysis revealed a main effect for treatment condition, such that individuals in the Supportive Counseling were more likely to dropout of treatment compared to those in the LET'S ACT condition (*OR* = 8.91, *CI* = 1.02-77.91, $p < .05$). See Table 5 for results of this analysis.

[3] Of note, we also conducted the same analyses for treatment dropout (both the logistic regression and cox proportional hazards survival analysis) using a completer sample and found no differences in results; specifically all significant results remained significant and all nonsignificant results remained nonsignificant. We chose to only report the intent-to-treat analysis given its consideration as the "gold standard" for RCTs over completer analyses (Little & Yau, 1994).

3.3.2 Cox Proportional Hazards Survival Regression Analysis Predicting Days to Dropout

As a richer analysis of dropout using continuous assessment, we examined the effects of treatment condition on days to dropout using an intent-to-treat Cox proportional hazards survival regression analysis predicting days to dropout from the center (in the 30 day period). First, we examined what baseline variables (same as discussed above for logistic regression) were associated with days to dropout to again give a richer descriptive picture of our sample and the factors associated with the number of days in treatment. All categorical variables (demographic information, baseline diagnoses, contract information) were analyzed in relation to days to dropout using ANOVAs. Results of the ANOVA indicated that no variables were significantly related to days to dropout (all *p*s > .2). Baseline continuous variables (including age, baseline levels of main outcome variables) were examined using correlations with the variable of days to dropout. Results indicate that the baseline BADS total score ($r = .27$, $p = .04$), the Activation subscale ($r = .27$, $p = .04$), and baseline EROS scores ($r = .26$, $p = .05$) were the three variables significantly related to days to treatment dropout, however no demographic or baseline variables that would potentially be included as a covariate in the analysis (i.e., age, gender, court-mandated status, contract type, current class of drug dependencies, dependency on multiple drugs, comorbid anxiety or Axis-II disorders) were significantly related to days to dropout.

In the first step of the Cox proportional hazards survival regression analysis predicting days to dropout, we entered treatment condition (LA = 1, SC = 0). The analysis revealed that receiving Supportive Counseling was significantly associated with

a shorter number of days to treatment dropout compared to LET'S ACT (*hazards ratio* = 7.92, *CI* = .98-64.57, *p* = .05). Specifically, SC predicted approximately an eightfold increase in the likelihood of treatment dropout on any given day within the 30-day period. See Table 6 for results.

3.5 Primary Hypothesis 2: Depression outcomes

To test the second hypothesis, whether participants in LET'S ACT vs. SC evidenced a greater reduction in depressive symptoms over time, we conducted analyses on both self-reported depressive symptoms (BDI-II) and clinician-rated depressive symptoms (HAMD). See Figure 1 for a consort diagram of recruitment and retention throughout the study, which includes the sample size for each group at each assessment time point for the analyses conducted in the remaining sections.

3.5.1 Self-reported depressive symptoms: GEE analysis

First, we examined change in self-reported depressive symptoms over time using the BDI-II at three assessment time points: baseline, post-treatment, and 2-week follow up. We used GEE analyses to capture change over time in depressive symptoms using all three time points. Before examining group differences, we first examined which baseline variables were significantly related to change in BDI scores over time to identify potential covariates for analyses from our theory-driven set of potential covariates (age, gender, current class of drug dependencies, dependency on multiple drugs, use of psychotropic medication, as well as any comorbid anxiety disorder or Axis-II disorder). For categorical baseline variables, we examined the relationships using ANOVAs, and for continuous baseline variables, we used correlations with the variable of average BDI-II score over the three time points. The only categorical variable related to average BDI-

II score over time was sex, such that men evidenced a greater decrease in BDI-II scores compared to women. Men had a mean BDI-II score of 18.52 at baseline (*SD* = 8.83), and their average BDI-II score over the three time points was 15.17 (*SD* = 9.09). Women had a mean BDI-II score of 19.68 (*SD* = 11.54) and their average BDI-II score over the three time points was 17.02 (*SD* = 10.47).

Gender was included as a covariate in all analyses. First, we tested the main effects of time and treatment, and then we tested the interaction between treatment condition and time to examine whether there was a significant difference in the rate of change in BDI-II score in the LET'S ACT vs. SC group across the 3 time points. In the final model, which included time, gender, treatment, and the treatment x time interaction, the main effect of time was significant (*B* = -5.58, *SE* = 1.21, $p < .001$), demonstrating that there was a significant decrease in depressive symptoms over time for the entire sample. There was not a significant main effect for gender or treatment, but the treatment x time interaction was significant in the final model (*B* = -3.49, *SE* = 1.52, *p* = .02), indicating that individuals in the LET'S ACT group evidenced a significantly greater reduction in BDI-II score over time as compared to those in SC (See Table 7).

3.5.2 Repeated measures of pre- to post-treatment changes in self-reported depressive symptoms

To supplement GEE analyses that examined change over the 3 time points, we also utilized repeated measures ANOVA analyses to examine changes in self-reported depressive symptoms (BDI-II) from pre- to post-treatment, given the larger sample size at these two time points. First, we examined the relationships between relevant baseline variables and the change in BDI-II from pre- to post-treatment to identify potential

covariates to include in the analysis (again considering age, gender, current class of drug dependencies, multiple drug dependencies, use of psychotropic medication, as well as any comorbid anxiety disorder or Axis-II disorder). Two baseline variables in our set of potential covariates were found to be significantly related to change in BDI-II from pre- to post-treatment: sex and age, such that men were more likely to evidence a greater change in depression from pre- to post-treatment, as well as those who were younger.

We included gender and age as covariates, and we tested the interaction between treatment condition and time to examine whether there was a significant difference in the rate of change in BDI-II score from pre- to post-treatment in the LET'S ACT vs. SC group. We used repeated measures ANOVAs with treatment group as the between subjects factor and scores on the BDI-II as the within subject factor. Results indicated that a group x time interaction was not significant between the two groups on the BDI-II ($F(1, 44) = 0.001$, $p = .99$, $\eta^2 = 0$). See Table 8 for results of the group x time interaction and Tables 18 and 19 for means of BDI-II scores at baseline and post-treatment point by group.[4]

3.5.3 Clinician-rated depressive symptoms

Next, we examined clinician-rated depressive symptoms using the HAMD. The clinician reports (HAMD and SCID-IV-NP) were only conducted at baseline and the 2-week follow up to ensure ample time in between clinician assessments. To assess change in HAMD from pre- to post-treatment, we utilized repeated measures ANOVAs (this is the only analysis for the HAMD because GEE was not conducted with only two available time points).

[4] Of note, we also conducted both analyses without including covariates in the model and obtained the same results. All significant relationships remained significant, and all non-significant relationships remained non-significant.

First, we examined the relationships between relevant baseline variables and the change in HAMD scores from baseline to the 2-week follow up to identify potential covariates to include in the analysis (again considering age, gender, current class of drug dependencies, multiple drug dependencies, use of psychotropic medication, as well as any comorbid anxiety disorder or Axis-II disorder). Of these variables, only being on psychotropic medication (dichotomous variable) at baseline was significantly related to change in HAMD score from baseline to the 2-week follow up ($p = .003$), such that being on medication at baseline was related to a greater change in HAMD score from baseline to the 2-week follow up ($F(1, 18) = 6.82$, $p = .02$).

In all analyses related to change in HAMD, we included use of psychotropic medication as a covariate. First, we tested the interaction between treatment condition and time to examine whether there was a significant difference in the rate of change in HAMD scores from baseline the 2-week follow up in the LET'S ACT vs. SC group. We used repeated measures ANOVAs with treatment group as the between subjects factor and scores on the HAMD as the within subject factor. Results indicated a significant group x time interaction, such that individuals in the LET'S ACT group demonstrated significantly greater reductions in HAMD scores from baseline to the 2-week follow up compared to the Supportive Counseling condition ($F(1, 17) = 4.30$, $p = .05$, $\eta^2 = .20$). Next, we did a follow up probe of the interaction. In the LET'S ACT group, repeated measures analyses indicated a significant decrease in HAMD scores from baseline to the 2-week follow up ($F(1, 13) = 10.79$, $p = .006$, $\eta^2 = .45$). In the Supportive Counseling group, repeated measures analyses did not demonstrate a significant decrease in HAMD

scores ($F(1, 5) = .132$, $p = .732$, $\eta^2 = .03$). See Table 8 for results and Tables 18 and 19 for means of HAMD scores at baseline and 2-week follow up by group.[5]

3.6 Primary Hypothesis 3: Behavioral Activation outcomes

To examine the third primary hypothesis, is LET'S ACT associated with greater increases in behavioral activation over time compared to Supportive Counseling, we utilized GEE analyses to examine changes in two measures of behavioral activation over the three assessment time points. As described previously, the BADS assesses overall levels of activation, while the EROS assesses reinforcement derived from activities. Both measures were administered at all three assessment time points, and separate GEE analyses were used to capture change over time for each measure.

3.6.1. Overall levels of activation: GEE analysis

Starting with the BADS, we first examined the relationships between baseline demographic/clinical variables and change in BADS over the three time points to identify potential covariates to include in analyses. For all categorical baseline variables, we used ANOVAs, and for all continuous baseline variables, we used correlations. No variables we considered as potential covariates were significantly related to change in BADS over the three time points (age, gender, current class of drug dependencies, dependency on multiple drugs, use of psychotropic medication, as well as any comorbid anxiety disorder or Axis-II disorder).

Next, we tested the main effects of time and treatment, and then we tested the interaction between treatment condition and time to examine whether there was a significant difference in the rate of change in BADS score in the LET'S ACT vs. SC

[5] We also conducted the same analyses without including use of psychotropic medication as a covariate and obtained the same results.

group across the 3 time points. In the final model, which included time, treatment, and the treatment x time interaction, the main effect of time was significant (B = 10.52, SE = 4.83, $p < .05$), demonstrating that there was a significant increase in levels of activation over time for the entire sample. There was not a significant main effect for treatment or a significant treatment x time interaction (ps > .3). See Table 9 for results.

3.6.2 Environmental reinforcement derived from activities: GEE analysis

Next, for the EROS analysis, we first examined the relationships between baseline demographic/clinical variables and change in EROS over the three time points to identify potential covariates to include in analyses. No potential covariates were significantly related to change in EROS score over time (the same set of theory-driven covariates considered above for BADS were utilized for EROS).

Next, we tested the main effects of time and treatment, and then we tested the interaction between treatment condition and time to examine whether there was a significant difference in the rate of change in EROS score in the LET'S ACT vs. SC group across the 3 time points. In the final model, which included time, treatment, and the treatment x time interaction, the main effects of time and treatment were not significant (ps > .2), and there was not a significant treatment x time interaction (B = -.72, SE = 1.16, p = .53). See Table 10 for results.

3.6.3. Repeated measures of pre- to post-treatment changes in behavioral activation

To supplement GEE analyses that examined change in behavioral activation measures over the 3 time points, we also utilized repeated measures ANOVA analyses to examine changes in behavioral activation (both the BADS and the EROS) from pre- to post-treatment, given the larger sample size at these two time points.

3.6.4. Repeated measures of pre- to post-treatment changes: BADS

First, we examined the relationships between relevant baseline variables and the change in BADS from pre- to post-treatment to identify potential covariates to include in the analysis (again considering age, gender, current class of drug dependencies, multiple drug dependencies, use of psychotropic medication, as well as any comorbid anxiety disorder or Axis-II disorder). Analyses indicated that no potential covariates were significantly related to change in BADS score from pre- to post-treatment (all *p*s > .2).

Next, we tested the interaction between treatment condition and time to examine whether there was a significant difference in the rate of change in BADS scores from pre- to post-treatment in the LET'S ACT vs. SC group. We used repeated measures ANOVAs with treatment group as the between subjects factor and scores on the BADS as the within subject factor. Results indicated a group x time interaction existed between the two groups on the BADS ($F(1, 46) = 5.19$, $p < .05$, $\eta^2 = .1$), such that LET'S ACT participants evidenced significantly greater increases in behavioral activation compared to those in the Supportive Counseling condition (see Table 8). Next, we conducted a follow up probe of this interaction to test for the main effects by group. For the LET'S ACT group, repeated measures analyses indicated a significant increase in BADS scores from pre- to post-treatment ($F(1, 27) = 15.66$, $p < .001$, $\eta^2 = .37$). In the Supportive Counseling group, repeated measures analyses did not indicate a significant change in BADS scores from pre- to post-treatment ($F(1, 19) = .02$, $p = .89$, $\eta^2 = .001$). See Tables 18 and 19 for the means of baseline and post BADS scores by group[6].

[6] We also conducted the same analyses for each BADS subscale. Results indicated a treatment x time interaction only on the Social Impairment (SI) subscale ($F(1, 46) = 6.2$, $p < .05$, $\eta^2 = .12$). A follow-up probe demonstrated a significant reduction in SI from pre- to post-treatment only in the LET'S ACT condition ($F(1, 27) = 11.39$, $p = .002$, $\eta^2 = .3$). See Table viii for results and Tables xviii and xix for means

3.6.5. Repeated measures of pre- to post-treatment changes: EROS

We conducted the same analyses for the EROS to capture changes in reward associated with activities. First, we examined the relationships between relevant baseline variables and the change in EROS from pre- to post-treatment to identify potential covariates to include in the analysis (again considering the same set of theoretically-derived potential covariates as used in the previous BADS and EROS analyses). No potential covariates were significantly related to change in EROS score from pre- to post-treatment (all *p*s > .2).

Next, we tested the interaction between treatment condition and time to examine whether there was a significant difference in the rate of change in EROS scores from pre- to post-treatment in the LET'S ACT vs. SC group. We used repeated measures ANOVAs with treatment group as the between subjects factor and scores on the EROS as the within subjects factor. Results indicated that a group x time interaction did not exist between the two groups on the EROS ($F(1, 46) = 1.06$, $p = .31$, $\eta^2 = .02$), such that there was no difference between groups on increases in reward associated with activities from pre- to post-treatment (See Table 8 for results and Tables 18 and 19 for means by group).

Chapter 4: Discussion

4.1 Summary of Main Findings

The current study compared the LET'S ACT behavioral activation treatment for depression to a Supportive Counseling (SC) control condition among individuals in residential substance abuse treatment who presented with elevated depressive symptoms

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of all subscales at pre and post. Note that items are reverse scored to create the SI subscale; higher scores indicate lower rates of social impairment.

(BDI-II score ≥ 12) or a current diagnosis of major depressive disorder (MDD) in their first week of residential substance abuse treatment. The study was a replication and extension of the Daughters et al. (2008) study that established the initial efficacy of LET'S ACT in treating depression among substance users receiving residential treatment. The current study built on the previous findings by 1) including a contact-time matched control condition (SC) as opposed to TAU; 2) further examining the effect of LET'S ACT on substance abuse treatment dropout; 3) modifying the 6-session LET'S ACT protocol into an abbreviated 5-session version to extend its application to the high percentage of clients who have 30-day residential treatment contract lengths; and 4) building on the assessment of behavioral activation outcomes by including a measure of overall activation over the course of treatment using the Behavioral Activation for Depression Scale (BADS; Kanter et al., 2007). Specifically, the currently study compared LET'S ACT to SC to examine differential effects on a) residential substance abuse treatment dropout; b) self-reported (BDI-II) and clinician-rated (HAMD) depressive symptoms; and c) measures of behavioral activation, including environmental reinforcement (EROS) and overall activation (BADS).

Beginning with the effect on treatment dropout, we examined dropout in two ways: 1) predicting dropout (yes/no) during the initial 30-day period and 2) predicting days to dropout using a Cox proportional hazards survival regression analysis. Findings indicated treatment was significantly associated with dropout, such that a higher number of individuals in SC dropped out of treatment (n = 8; 27.6%) compared to in the LET'S ACT condition (n = 1; 12.5%); specifically, individuals in the SC condition were approximately 8.9 times more likely to have dropped out of treatment. Further, treatment

was also significantly associated with a shorter number of days to treatment dropout, such that SC predicted approximately an eightfold increase in the likelihood of dropout on any given day. This examination of the hazards ratio suggests that being placed in the LET'S ACT condition served as a protective factor from dropout.

Regarding the effects on depression, GEE analyses indicated a significant treatment x time interaction predicting change in self-reported depressive symptoms (BDI-II scores) over the three assessment time points, such that individuals in the LET'S ACT condition demonstrated a significantly greater reduction in self-reported depressive symptoms compared to the SC condition. However, when this same interaction was tested using a repeated measures analysis of the first two time points (from baseline to post-treatment), a significant interaction was not evident. This suggests that group differences in the change in depressive symptoms are not evident immediately by post-treatment (both the LET'S ACT groups and SC groups evidence decreases in BDI-II scores from pre- to post-treatment), but that only individuals in the LET'S ACT group continue to demonstrate significant reductions in depressive symptoms at the 2-week follow up compared to SC.

This finding is discussed further below in relation to the changes in behavioral activation observed. However, we first also must acknowledge that the lack of differences between groups in change in BDI-II score at the 1st post-treatment follow-up may be due to factors such as the effect of continued abstinence on reductions in depression as well as further adjustment to the treatment setting from the baseline to post-treatment assessments, both of which affect the sample at large. Further, it also should be noted that GEE is a more powerful approach statistical approach, which may be somewhat

responsible for the differential effects, but the findings are consistent with Daughters et al. (2008). Daughters and colleagues found that the treatment x time interaction for BDI-II scores was only evident at the 2-week follow up point and not by post-treatment, thus demonstrating that individuals in LET'S ACT continued to show greater reductions in depressive symptoms following treatment compared to those in the TAU condition (Daughters et al., 2008). Similar findings were also demonstrated in the current study for the assessment of clinician-rated depressive symptoms, such that a significant treatment x time interaction existed with clinician-rated depressive symptoms (HAMD) from baseline to the 2-week follow up, such that individuals in the LET'S ACT condition evidenced a significantly greater reduction in HAMD scores from baseline to the 2-week follow up compared to those in the SC condition.

Findings related to effects of treatment on behavioral activation process variables revealed a significant treatment x time interaction from pre- to post-treatment on the BADS, such that individuals in the LET'S ACT condition evidenced a significant increase in overall levels of behavioral activation compared to those in SC. However, the GEE analysis demonstrated that a significant interaction was not evident over the three time points, suggesting that the superior improvements in BA in the LET'S ACT condition vs. SC were not maintained at the 2-week follow up. Lastly, there were no significant differences between groups on changes in the EROS from baseline to post-treatment or to the 2-week follow up, thus suggesting that perhaps measures of BA, and not necessarily environmental reinforcement, are more accurately tapping a potential ingredient of LET'S ACT.

In sum, the current study further demonstrates the efficacy of a 5-session version of LET'S ACT in reducing self-report and clinician-rated depressive symptoms at a 2-week follow up assessment compared to SC. Findings also support the effect of LET'S ACT on an activation-related process variable, demonstrating a significantly greater improvement in levels of activation from pre-to post-treatment compared to SC. Lastly, and perhaps most importantly, the current study is the first to examine the effect of LET'S ACT on substance use outcomes (treatment dropout), such that LET'S ACT was associated significantly with lower rates of treatment dropout and greater delay to dropout compared to SC.

It is interesting to note the timing of the significant changes in depression and behavioral activation. Changes in BA occurred during the 3-week treatment period and then appear to have slowed, while depressive symptoms in the two groups seem to have significantly differed in rates of change at the 2-week follow up period. This finding can be interpreted as a delayed effect of LET'S ACT on depressive symptoms, or that only in the LET'S ACT condition are effects on depressive symptoms lasting; however, longer-term follow ups are needed to assess whether treatment effects remain beyond a 2-week period. We can also interpret this finding in relation to the changes in behavioral process variables in numerous ways. This finding may suggest a temporal relationship between changes in depression and behavioral activation, such that only following improvements in behavioral activation do we see reductions in depressive symptoms. Alternatively, this finding may suggest a "desynchrony" effect (Rachman & Hodgson, 1974), where behavior changes first and then depressive symptoms, but not necessarily indicating a causal relationship between the two, rather reflecting independent variations of the two

variables that are not improving “in unison” (Rachman & Hodgson, 1974). Future work is needed to identify mechanisms of LET’S ACT that contribute to reduced depressive symptoms; testing these hypotheses will require more complex analyses of mediation, which were unable to be conducted in the current study given the small sample size (particularly at the 2-week follow up time point).

Another related question is why a significant treatment x time interaction existed on the BADS from pre- to post-treatment but did not hold by the 2-week follow up. There are numerous possible interpretations of this finding. For example, perhaps the findings were not maintained by the 2-week follow up due to the fact that participants were in the same constricted environment for the 2 weeks following treatment. Due to the limited nature of activity options and one’s inability to determine independent schedules at the Center, perhaps there was little room for continued significant increases in levels of BA following treatment. Alternatively, this finding could be interpreted as demonstrating that therapist contact and guidance may be necessary to maintain increases in behavioral activation, and thus the increases in behavioral activation were no longer evident at the 2-week follow up following termination of treatment. This would support the notion that future LET’S ACT protocols should incorporate either more focus on sustained changes following treatment or maintenance sessions to promote more lasting behavioral changes. Maintenance sessions were implemented in the Daughters et al. (2008) protocol; however, this was not feasible in the current study for individuals with only 30-day contract lengths. Perhaps future trials that include shorter term clients could implement maintenance LET’S ACT sessions in the initial period following treatment discharge to more directly promote behavioral changes in one’s post-treatment environment.

However, it is not clear if the lack of significant change in BA evidenced post-treatment necessitates a level of intervention that was provided in the treatment period; alternatively, this slowed improvement in BA following treatment could signal rather impending problems in depressive symptoms if participants were followed out further. Lastly, we must also note that the small sample size at the 2-week follow up time point may have precluded detection of meaningful differences between groups.

Finally, we must also question the absence of an effect of treatment on measures of environmental reinforcement, or reward associated with activities. Interestingly, Daughters et al. (2008) did find a significant treatment x time interaction for EROS scores, such that individuals in LET'S ACT demonstrated significantly greater improvements in environmental reinforcement compared to the TAU group. In the current study, both groups demonstrated increases in levels of reinforcement from pre- to post-treatment; however, the rate of improvement across groups was similar. A possible explanation for why the findings did not replicate may be the difference in control groups, such that individuals in SC may be experiencing improvements in reinforcement and reward generated from activities as a result of the supportive, therapeutic process of SC. Given that this group did not evidence significant increases in overall activity level reflected by the BADS, the increases in reinforcement may not be due to added activities or behavioral repertoires, as targeted in LET'S ACT, but rather greater meaning or enjoyment derived from activities may be an active ingredient in SC that needs to be further examined in future research.

This finding of a significant treatment x time interaction for BADS but not EROS scores may suggest that LET'S ACT uniquely captures the activation component of BA,

specifically that LET'S ACT is associated with increases in activation and potentially increases in activities that may lead to positive reinforcement, but not necessarily increases in the actual levels of positive reinforcement experienced by activities. However, this finding needs to be further replicated, and we must also consider the context of the study, that this treatment took place at an inner-city residential substance abuse treatment center with very few activity options that may potentially diversify activities or be associated with increases in enjoyment. The limited activity options available for clients in a residential setting may potentially explain why LET'S ACT did not demonstrate an effect on *reinforcement* derived from activities and only on overall levels of activation. It would be interesting to examine longer-term changes in BADS and EROS scores to see whether treatment has a longer term effect on enjoyment/reward associated with activities following treatment discharge, once an individual has more activity options and independence in selecting activities.

4.2 Limitations/Future Directions

A primary limitation of the current study concerns the modest sample size. The sample size issue in the current study was further complicated by treatment dropout being the main outcome, which contributed to a) low retention across study assessments, and b) differential sample sizes for the two conditions (with SC having lower sample sizes at the two post- and follow up assessments). With regard to the first issue, the low sample size was of particular salience at the 2-week follow up assessment (n = 21), given that any individuals who dropped out of treatment or had a 30-day contract length did not receive a 2-week follow up assessment. This could have been rectified by tracking participants to conduct follow-up assessments following treatment discharge, but due to limited staffing

and resources, we were not able to conduct these follow-up assessments. With regard to the second issue, that dropout differentially affected the SC sample size, we examined differences in baseline characteristics comparing individuals who dropped out of treatment vs. those who remained in treatment to detect whether those who dropped out were a more severely impaired group that could potentially affect results when not included in the depression and BA analyses. However, the comparison revealed no significant differences between groups that would reflect greater impairment, including no differences at baseline on any of the main outcome variables or comorbid diagnoses (see Tables 13 and 14). Thus, although there was a smaller SC sample size at the post-treatment and 2-week follow ups due to treatment dropout, we do not believe that any distinct characteristics of this subgroup would have significantly biased results.

As a second related limitation resulting from treatment dropout being the main outcome, all individuals who dropped out of treatment in the 30-day study period did so prior to the post-treatment assessment, which precluded obtaining an assessment of change for these individuals. We thus could not examine change in our main outcome variables as predictors of dropout (e.g., depression, behavioral activation measures), and we also were not able to conduct any mediation analyses of treatment dropout. Given the brief nature of the 5-session treatment, we chose not to conduct a midpoint assessment that might have provided some data to that end, but we could do so in future studies if the treatment durations are a bit longer. The midpoint assessment (of at least the main outcome measures) would enable examination of the relationships between these variables among those who dropped out of treatment. Further, future studies may also consider conducting assessments regardless of whether an individual has dropped out of

the Center (i.e. track participants following dropout) so that treatment dropout does not preclude our ability to test study hypotheses.

Although we were unable to examine potential mechanisms accounting for the effect of LET'S ACT on lower rates of treatment dropout, we were able to examine the baseline variables that were related to treatment retention. Interestingly, the only baseline clinical variables associated with treatment retention were related to behavioral activation, including baseline BADS total score (r = .27, p = .04), specifically the Activation subscale (r = .27, p = .04), and baseline EROS scores (r = .26, p = .05), indicating that individuals with higher levels of overall activation and reinforcement derived from activities at baseline were more likely to remain in treatment each given day. These correlations suggest a potential link between levels of behavioral activation/reinforcement and treatment retention. Although research has predominantly focused on the effect of depression on dropout (e.g., McKay et al., 2002; Tate et al., 2004), perhaps future research is warranted in examining the effect of behavioral activation measures in relation to treatment dropout. Further, these measures of behavioral activation may be potential mechanisms to consider in future work when examining mediators of the effect of the LET'S ACT treatment on residential treatment dropout.

A third limitation relates to the assessment of treatment dropout among individuals with differing contract lengths. We chose to only assess treatment dropout in the first 30 days of treatment rather than dropout overall as an attempt to equalize time in treatment among those with 30 vs. longer-term contract lengths. However, future work should also examine whether this affects those with longer contracts differently, as one

could argue that dropping out in the first 30 days is qualitatively different for someone in treatment 30 days vs. 60, 90, or 180 days. The current study included all contract lengths to maximize effectiveness with regard to adoptability by the Center for 30-day clients in particular; however, future studies that aim to replicate the effect of LET'S ACT on treatment dropout may consider only including certain contract lengths to minimize group differences (even if still limiting dropout to the first 30 days).

Lastly, a final limitation concerned the nature of our sample. In the current study, we recruited low-income, largely minority substance users in residential substance abuse treatment, rather than a more demographically heterogeneous sample of substance users. Although low-income minority substance users in residential substance abuse treatment represent an underserved, at-risk population that may be most severe and most in need of prevention and intervention efforts, there is a possibility that the current findings may not generalize to a more demographically diverse sample, or a sample of individuals in a less restrictive treatment setting. Additionally, the current study design, as well as treatment format, is not transportable to illiterate clients, which should be a consideration for future directions of this research. Although many of the primary outcome measures in this study were self-report, future assessments could incorporate audio-enhanced, computer assisted self-interviewing (audio-CASI technology) to include individuals with lower levels of literacy. With regard to the applicability of the treatment components to individuals who are illiterate, homework assignments could be modified to use illustrative formats; for example, activity monitoring forms could utilize pictures rather than words, as suggested by Lejuez and colleagues in their revised BA manual (Lejuez, Hopko, Acierno, Daughters, & Pagoto, in press).

There exist numerous limitations and opportunities to expand upon and enhance this line of research to further establish the efficacy of LET'S ACT in improving depression and substance use outcomes. Beyond the clear need for a larger sample size and additional assessment time points, additional ideas for future studies that seek to expand upon the current work may include comparing LET'S ACT to another treatment (e.g., CBT) rather than a SC control condition to further establish the superior effects of LET'S ACT over CBT in this population, as well as to test the unique behavioral mechanisms of the LET'S ACT treatment. Future studies could examine a more complex mediation model to explain the effects of LET'S ACT on substance use outcomes, depression, and behavioral activation, as well as the inter-relationships of these variables as mechanisms of change.

Finally, the current study was the first to begin to examine the *effectiveness* of the LET'S ACT treatment in its ability to be administered across contract lengths in residential treatment by modifying the protocol to accommodate the large majority of 30-day clients. Future work should continue to build on these findings to further establish the effectiveness of the treatment. For example, future investigations could explore the effectiveness of LET'S ACT when implemented in other types of treatment settings or with other types of substance using samples. Further, future studies could continue to test the ability to integrate LET'S ACT into a substance abuse treatment center (for example by training counselors to implement the sessions and/or by incorporating the LET'S ACT group as part of the Center's treatment schedule). In sum, there exists numerous opportunities to not only further establish efficacy of LET'S ACT in improving depression and substance use outcomes, but also to expand on evidence of the

effectiveness of LET'S ACT and ability to further integrate LET'S ACT into substance abuse treatment settings.

Primary Tables

Table 1. Group differences: Demographic information

	Overall (n = 58)	LA (n = 29)	SC (n = 29)	Statistic (LA vs. SC)	p
Age, mean *(SD)*	44.78 (9.39)	44.21 (10.59)	45.34 (8.15)	F (1, 56) = .21	.65
Gender, % male	65.5	65.5	65.5	χ^2 (1) = 0	1.0
Marital Status				χ^2 (3) = 1.5	.68
Single, %	81	82.8	79.3		
Living with a partner as if married, %	5.2	3.4	6.9		
Married but separated, %	12.1	10.3	13.8		
Married, %	1.7	3.4	0		
Race				χ^2 (3) = 1.41	.71
White, %	5.2	3.4	6.9		
Black, %	89.7	93.1	86.2		
Hispanic , %	3.4	3.4	3.4		
Other, %	1.7	0	3.4		
Education				χ^2 (1) = 3.39	.07
≤ High school/GED, %	75.9	65.5	86.2		
> High school/GED, %	24.1	34.5	13.8		
Total Annual Income				χ^2 (1) = .49	.49
<$10,000, %	82.1	78.6	85.7		
> $10,000, %	17.9	21.4	14.3		
Unemployed, %	84	82.8	82.8	χ^2 (4) = 3.32	.51

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 2. Group differences: Baseline clinical variables+

	Overall (n = 58)	LA (n = 29)	SC (n = 29)	Statistic (LA vs. SC)	p
Contract Type				χ^2 (4) = 8.13	.09
30-day, %	59	44.8	72.4		
60-day, %	31	31	24.1		
>60 days (90 or 180)	10	24.1	3.4		
Court Mandated, % yes	46.6	55.2	37.9	χ^2 (1) = .28	.60
CMR (Total), mean (*SD*)	74.81 (9.33)	74.62 (10.70)	75 (7.9)	F (1, 56)= .02	.88
Circumstances, mean (*SD*)	21.81 (4.59)	22.04 (5.19)	21.59 (3.98)	F (1, 56)= .14	.71
Motivation, mean (*SD*)	22.31 (3.42)	21.86 (4.06)	22.76 (2.64)	F (1, 56)= .99	.32
Readiness, mean (*SD*)	30.69 (3.98)	30.72 (3.65)	30.66 (4.35)	F (1, 56)= .01	.95
Depression					
Current MDD, %	60.3	58.6	62.1	χ^2 (1) = .11	.74
Recurrent MDD, %	71	61.5	75.9	χ^2 (1) = 2.25	.13
On Psychotropic Medication, %	53.4	51.7	58.6	χ^2 (1) = .43	.51
Current Drug Dependences					
Alcohol, %**	50.9	32.1	69	χ^2 (1) = 7.73	.01
Marijuana, %	8.8	10.7	6.8	χ^2 (1) = .26	.61
Cocaine, %	46.6	42.3	55.2	χ^2 (1) = .86	.35
Opioid, %	24.1	23.1	27.6	χ^2 (1) = .29	.59
Multiple dependencies, %	47.4	35.7	58.6	χ^2 (1) = 2.99	.08
Current Anxiety Disorders					
PTSD, %	21.8	25	18.5	χ^2 (1)= .34	.56
GAD, %	17.5	17.9	17.2	χ^2 (1)= .01	.95
Axis II Comorbidity					
BPD, %	36.8	50	27.6	χ^2 (1) = 3.02	.08
ASPD, %	49.1	60.7	37.9	χ^2 (1) = 2.96	.09

Note. +only includes diagnoses for which > 5% of sample met criteria; * $p < .05$, ** $p < .01$, *** $p < .001$

Table 3. Group differences: Baseline levels of main outcome variables

	Total Sample (n = 58)	LA (n = 29)	SC (n = 29)	Statistic (LA vs. SC)	p
Depressive Symptoms					
Clinician-Rated (HAMD), mean (*SD*)	5.51 (3.54)	5.96 (3.67)	5.07 (3.42)	F (1, 55) = .91	.35
Self-Reported (BDI-II), mean (*SD*)	18.89 (9.41)	18.65 (10.91)	19.14 (7.77)	F (1, 55) =.04	.85
Behavioral Activation					
BADS, mean (*SD*)	75.18 (24.12)	72.61 (25.19)	77.75 (23.15)	F (1, 56) = .65	.42
Activation	18.76 (9.37)	18.33 (8.58)	19.18 (10.22)	F (1, 56) = .12	.74
Avoidance/Rumination	21.09 (11.37)	21.38 (10.66)	20.79 (12.21)	F (1, 56) = .04	.85
Work/School Impairment	19.63 (7.10)	18.76 (7.38)	20.50 (6.84)	F (1, 56) = .87	.36
Social Impairment	15.71 (7.63)	14.14 (7.56)	17.28 (7.51)	F (1, 56) = 2.52	.12
Environmental Reinforcement					
EROS (mean, *SD*)	24.67 (4.81)	24.66 (4.98)	24.69 (4.71)	F (1, 56) = .001	.98

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 4. Correlation matrix for measures of depression and behavioral activation

	1	2	3	4	5	6	7	8
1. BADS Total	--	.40**	.75**	.77**	.82**	.58**	-.39**	-.28*
2. BADS-AC		--	-.13	.04	.20	.62**	-.14	-.09
3. BADS-AR			--	.57**	.52**	.28*	-.29*	-.21
4. BADS-WS				--	.62**	.25	-.27*	-.18
5. BADS-SI					--	.42**	-.37*	-.29*
6. EROS Total						--	-.30*	-.36**
7. HAMD total							--	.40**
8. BDI-II								--

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 5. Intent-to-treat logistic regression predicting residential treatment dropout

Variable	*B*	*SE*	*Wald*	*OR* (95% CI)	*P*
Step 1					
Treatment	2.19	1.11	3.91	8.91 (1.02 – 77.91)	.05

Table 6. Cox proportional hazards survival regression analysis predicting days to dropout

Variable	*B*	*SE*	*Wald*	*HR* (95% CI)	*p*
Step 1					
Treatment	2.07	1.07	3.75	7.92 (.98 -64.57)	.05

Table 7. GEE analysis predicting BDI-II change from baseline to 2-week follow up

Variable	*B*	*SE*	χ^2	*P*
Main effects				
Time (centered)	-5.58	1.21	21.38	.00
Gender	-1.99	2.53	0.62	.43
Treatment	-2.2	2.27	.94	.33
Treatment X Time	-3.49	1.52	5.26	.02

Table 8. Repeated measures ANOVA: Group x Time interactions pre- to post-treatment

Variable	Statistic	η^2	*p*
Depressive Symptoms			
Self-Reported (BDI-II)	$F(1, 44) = .01$	0	.99
Clinician-Rated (HAMD)*	$F(1, 18) = 4.78$	.21	.04
Behavioral Activation			
BADS*	$F(1, 45) = 5.39$	.10	.03
Activation	$F(1, 46) = .03$	.01	.87
Avoidance/Rumination	$F(1, 46) = 2.01$	.04	.15
Work/School Impairment	$F(1, 46) = 2.41$	.05	.13
Social Impairment*	$F(1, 46) = 6.20$	.12	.02
Environmental Reinforcement			
EROS	$F(1, 46) = 1.06$	.02	.31

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 9. GEE analysis predicting BADS change from baseline to 2-week follow up

Variable	*B*	*SE*	χ^2	*P*
Main effects				
Time (centered)	10.52	4.83	4.75	.03
Treatment	-6.44	6.87	.88	.35
Treatment X Time	-4.44	5.71	.61	.44

Table 10. GEE analysis predicting EROS change from baseline to 2-week follow up

Variable	*B*	*SE*	χ^2	*P*
Main effects				
Time (centered)	1.24	1.03	1.45	.23
Treatment	-.41	1.43	.08	.78
Treatment X Time	-.72	1.16	.39	.53

Table 11. Group differences: therapy-related variables

Variable	LA (n = 29)	SC (n = 29)	Statistic (LA vs. SC)	p
Treatment Satisfaction, mean (*SD*)	25.46 (4.17)	26.3 (7.04)	F (1, 46) = .266	.61
Working Alliance (WAI), mean (*SD*)	27.37 (11.38)	25.8 (8.28)	F (1, 46) = .273	.60

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Secondary Tables

Table 12. Demographic variables related to residential treatment dropout (yes/no)

	Dropout Yes (n = 8)	Dropout No (n = 50)	Statistic	p
Age, mean *(SD)*	41.88 (5.79)	45.24 (9.8)	F (1, 56) = .89	.35
Gender, % male	87.5	62	χ^2 (1) = 1.99	.16
Marital Status			χ^2 (3) = 2.8	.42
Single, %	62.5	84		
Race			χ^2 (3) = 1.45	.69
Black, %	87.5	90		
Education			χ^2 (1) = .86	.35
Less than high school/GED, %	87.5	72		
More than high school, %	12.5	28		
Total Annual Income			χ^2 (1) = .18	.67
<$10,000, %	87.5	81.3		
> $10,000, %	12.5	18.8		
Employment			χ^2 (4) = 7.96	.09
Unemployed, %	75	85.7		

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 13. Baseline clinical variables related to residential treatment dropout (yes/no)

	Dropout Yes (n = 8)	Dropout No (n = 50)	Statistic	*P*
Treatment*			χ^2 (1) = 5.22	.02
LET'S ACT	12.5	56		
SC	87.5	44		
Contract Type			χ^2 (1) = .06	.81
30-day, %	62.5	58		
>30 days (60, 90 or 180), %	37.5	42		
Court Mandated, % yes	37.5	48	χ^2 (1) = .31	.58
CMR (Total), mean (*SD*)	79.25 (8.96)	74.10 (9.27)	*F* (1, 56)= 2.14	.15
Circumstances, mean (*SD*)	23.13 (5.17)	21.6 (4.51)	*F* (1, 56)= .76	.39
Motivation, mean (*SD*)	23.75 (2.55)	22.08 (3.5)	*F* (1, 56)= 1.66	.20
Readiness, mean (*SD*)	32.38 (3.46)	30.42 (4.03)	*F* (1, 56)= 1.68	.20
Depression				
Current MDD, %	87.5	56	χ^2 (1) = 2.86	.09
Recurrent MDD, %	75	65.3	χ^2 (1) = .29	.59
On Psychotropic Medication, %**	100	46	χ^2 (1) = 8.08	.004
Current Drug Dependences				
Alcohol, %	75	46.9	χ^2 (1) = 2.17	.14
Marijuana, %	12.5	8.2	χ^2 (1) = .16	.69
Cocaine, %	62.5	46.9	χ^2 (1) = .67	.41
Opioid, %	25	24.5	χ^2 (1) = .01	.98
Multiple dependencies, %	75	42.9	χ^2 (1) = 2.85	.09
Current Anxiety Disorders				
PTSD, %	25	21.3	χ^2 (1)= .06	.81
GAD, %	12.5	18.4	χ^2 (1)= .16	.69
Axis II Comorbidity				
BPD, %	25	18.4	χ^2 (1) = .73	.39
ASPD, %	37.5	51	χ^2 (1) = .50	.48

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 14. Baseline levels of outcome variables related to residential treatment dropout (yes/no)

	Dropout Yes (n = 8)	Dropout No (n = 50)	Statistic	p
Depressive Symptoms				
Clinician-Rated (HAMD), mean (*SD*)	4.50 (3.5)	5.67 (3.56)	F (1, 55) = .75	.39
Self-Reported (BDI-II), mean (*SD*)	18.25(10.01)	19.00 (9.42)	F (1, 55) = .04	.84
Behavioral Activation				
BADS, mean (*SD*)	64.58 (29.92)	76.87 (22.97)	F (1, 56) = 1.82	.18
Activation	13.33 (8.23)	19.62 (9.32)	F (1, 56) = 3.23	.08
Avoidance/Rumination	18.50 (16.35)	21.50 (10.53)	F (1, 56) = .48	.49
Work/School Impairment	17.50 (5.15)	19.97 (7.35)	F (1, 56) = .83	.37
Social Impairment	15.25 (7.61)	15.78 (7.71)	F (1, 56) = .03	.86
Environmental Reinforcement				
EROS (mean, *SD*)	22.00 (3.82)	25.10 (4.84)	F (1, 56) = 2.97	.09

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 15. Group differences by contract length (30-day vs. 60, 90, and 180): Demographic information

	30-day (n = 34)	60, 90, 180-day (n = 23)	Statistic (30 vs. 60, 90, 180)	p
Age, mean *(SD)*	44.29 (8.64)	45.46 (10.51)	F (1, 56) = .21	.65
Gender, % male	67.6	62.5	χ^2 (1) = .17	.69
Marital Status			χ^2 (3) = 1.50	.68
Single, %	82.4	79.2		
Race			χ^2 (3) = 3.61	.31
Black, %	88.2	91.7		
Education			χ^2 (1) = .57	.45
Less than high school/GED, %	79.4	70.8		
More than high school/GED, %	20.6	29.1		
Total Annual Income			χ^2 (1) = .46	.79
<$10,000, %	82.4	75		
> $10,000, %	17.6	25		
Unemployed, %	88.2	83.3	χ^2 (4) = 3.07	.54

Note. * p < .05, ** p < .01, *** p < .001

Table 16. Group differences by contract length (30-day vs. 60, 90, and 180): Baseline clinical variables+

	30-day (n = 34)	60, 90, 180-day (n = 23)	Statistic (30 vs. 60, 90, 180)	p
CMR (Total), mean (*SD*)	73.82 (8.57)	76.21 (10.34)	F (1, 56)= .92	.34
Circumstances, mean (*SD*)	21.09 (4.37)	22.84 (4.79)	F (1, 56)= 2.08	.16
Motivation, mean (*SD*)	22.18 (3.79)	22.50 (2.89)	F (1, 56)= .12	.73
Readiness, mean (*SD*)	30.56 (3.64)	30.88 (4.50)	F (1, 56)= .09	.77
Depression				
Current MDD, %	61.8	58.3	χ^2 (1) = .07	.79
Recurrent MDD, %	66.7	66.7	χ^2 (1) = 0	1.00
On Psychotropic Medication, %	50.0	58.3	χ^2 (1) = .39	.53
Current Drug Dependences				
Alcohol, %*	63.6	33.3	χ^2 (1) = 5.11	.02
Marijuana, %	9.1	8.3	χ^2 (1) = .01	.92
Cocaine, %	39.4	62.5	χ^2 (1) = 2.97	.10
Opioid, %	18.2	33.3	χ^2 (1) = 1.72	.19
Multiple dependencies, %	48.5	45.8	χ^2 (1) = .04	.84
Current Anxiety Disorders				
PTSD, %	19.4	25	χ^2 (1)= .25	.62
GAD, %	21.2	12.5	χ^2 (1)= .73	.39
Axis II Comorbidity				
BPD, %*	37.5	54.2	χ^2 (1) = 4.24	.04
ASPD, %	42.4	58.33	χ^2 (1) = 1.41	.24

Note. +only includes diagnoses for which > 5% of sample met criteria; * $p < .05$, ** $p < .01$, *** $p < .001$

Table 17. Group differences by contract length (30-day vs. 60, 90, and 180): Baseline levels of the main outcome variables

	30-day (n = 34)	60, 90, 180 (n = 23)	Statistic (30 vs. 60, 90, 180)	p
Depressive Symptoms				
Clinician-Rated (HAMD), mean (*SD*)	5.18 (3.62)	6.00 (3.44)	F (1, 55) = .74	.39
Self-Reported (BDI-II), mean (*SD*)	19.73 (8.11)	17.75 (11.04)	F (1, 55) = .61	.44
Behavioral Activation				
BADS, mean (*SD*)	74.20 (24.19)	76.57 (24.48)	F (1, 56) = .134	.72
Activation	19.12 (9.38)	18.24 (9.52)	F (1, 56) = .12	.73
Avoidance/Rumination	19.79 (11.93)	22.92 (10.49)	F (1, 56) = 1.06	.31
Work/School Impairment	20.25 (6.21)	18.75 (8.27)	F (1, 56) = .62	.43
Social Impairment	15.03 (7.97)	16.67 (7.18)	F (1, 56) = .64	.43
Environmental Reinforcement				
EROS (mean, *SD*)	24.29 (4.50)	25.21 (5.27)	F (1, 56) = .51	.48

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 18. Mean values of main outcome variables at baseline and post: Let's Act only

Variable	Baseline (n = 29)	Post (n = 28)
Depressive Symptoms		
Self-Reported (BDI-II), mean (*SD*)	18.65 (10.91)	13.46 (9.71)
Behavioral Activation		
BADS, mean (*SD*)***	72.61 (25.19)	86.01 (21.5)
Activation	18.33 (8.58)	20.95 (10.05)
Avoidance/Rumination*	21.38 (10.66)	25.89 (9.90)
Work/School Impairment	18.76 (7.38)	20.97 (6.84)
Social Impairment**	14.14 (7.56)	18.19 (6.71)
Environmental Reinforcement		
EROS (mean, *SD*)	24.66 (4.98)	26.12 (4.86)
	Baseline (n = 29)	2-week FU (n = 15)
Depressive Symptoms		
Clinician-Rated (HAMD), mean (*SD*)**	5.96 (3.67)	3.60 (3.85)

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 19. Mean values of main outcome variables at baseline and post: SC only

Variable	Baseline (n = 29)	Post (n = 20)
Depressive Symptoms		
Self-Reported (BDI-II), mean (*SD*)	19.14 (7.77)	12.90 (7.73)
Behavioral Activation		
BADS, mean (*SD*)	77.75 (23.15)	85.33 (26.4)
Activation	19.18 (10.22)	23.68 (11.11)
Avoidance/Rumination	20.79 (12.21)	23.00 (10.46)
Work/School Impairment	20.50 (6.84)	20.65 (7.53)
Social Impairment	17.28 (7.51)	18.00 (7.88)
Environmental Reinforcement		
EROS (mean, *SD*)	24.69 (4.71)	25.75 (4.95)

	Baseline (n = 29)	2-week FU (n = 6)
Depressive Symptoms		
Clinician-Rated (HAMD), mean (*SD*)	5.07 (3.42)	3.33 (2.34)

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Figure 1. Consort diagram of study enrollment and retention

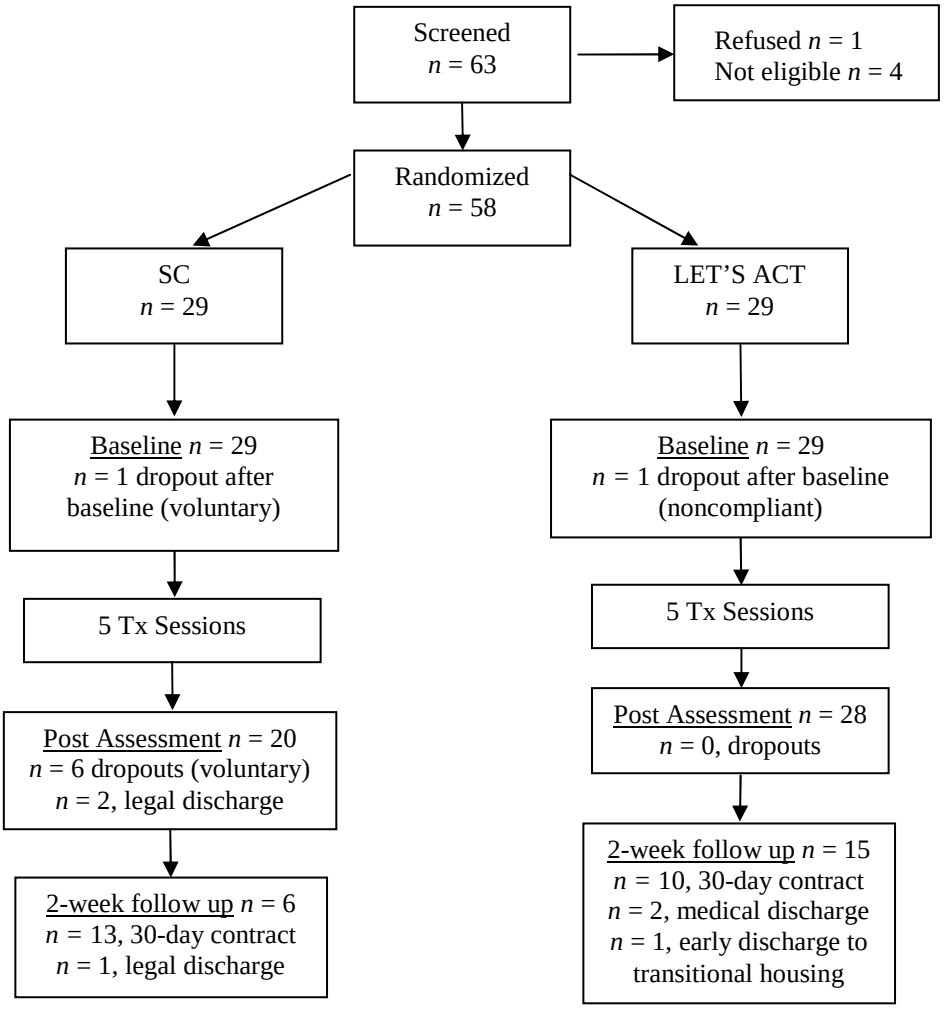
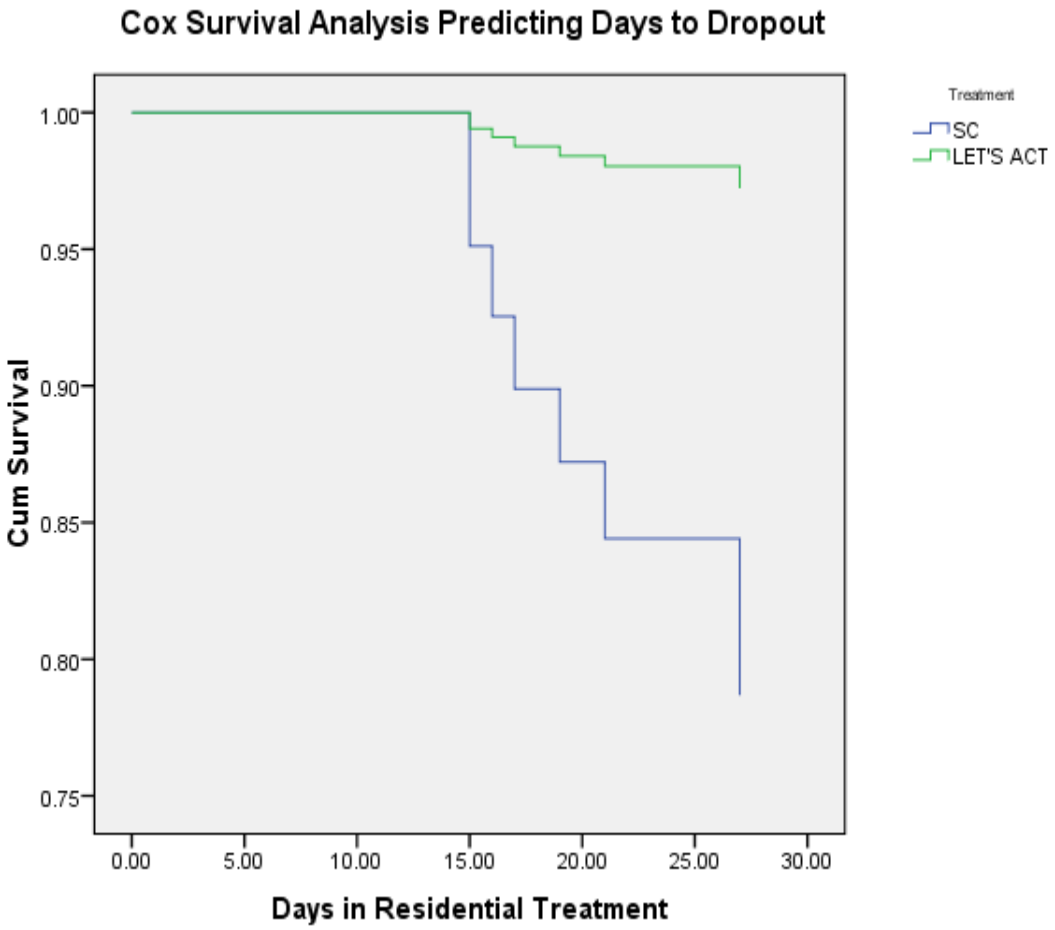


Figure 2. Intent-to-treat Cox Proportional Hazards Survival Regression Analysis



Appendix

Predicting MDD at the 2-week follow up assessment

As a supplementary analysis to examine whether treatment group was associated with the likelihood of having an MDD diagnosis at the 2-week follow up, we conducted a logistic regression predicting MDD diagnosis at the follow up (yes/no). Before conducting the analysis, we also examined any baseline and demographic variables that may be related to MDD at the 2-week follow up. No baseline variables were significantly related to MDD at the 2 week follow up (all *p*s > .10), including baseline MDD status (χ^2 (1) = 3.7, p = .10). Therefore, in the first step of the logistic regression analysis, we entered treatment condition (LET'S ACT = 1, SC = 0). Results did not indicate a main effect for treatment condition, such that there was no significant difference in likelihood of having an MDD diagnosis at the 2-week follow up based on treatment condition (*OR* = 2.00, *CI* = .24-16.61, p = .52).

Predicting MDD remission at the 2-week follow up in the current study has significant limitations, mainly due to small sample size and difficulty of interpretation. We were unable to include only individuals who met criteria for MDD at the screening given that this would significantly limit sample size. Of individuals who had a 2-week follow up assessment and met criteria for MDD at baseline (n = 9), 4 met criteria for MDD at the 2-week follow up, and 5 demonstrated remission. However, 8 of these individuals were in LET'S ACT and only 1 in SC, and thus we could not control for baseline MDD to examine whether treatment predicted MDD remission at the 2-week follow up given that there was only 1 SC participant that could be included. Thus, these findings remain difficult to interpret and provide scarce clinical meaning because we are

not predicting MDD remission but rather MDD status at the 2-week follow up regardless of baseline MDD status.

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