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The Effect of a Behavioral Activation Treatment for Substance Use on Post-treatment Abstinence: A Randomized Controlled Trial

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Abstract

Aims—to compare outcomes for a behavioral activation group treatment for substance use (LETS ACT), versus a time and group size matched control condition delivered in a residential treatment setting.

Design—single-site two-arm parallel-group randomized clinical trial with follow-up assessment at 3, 6 and 12 months post-treatment.

Setting—residential substance use treatment facility in the USA.

Participants—participants were 263 adults [mean age 42.7 [11.8]; 29.3% female; 94.7% African American; 72.6% court mandated] whose insurance dictated 30-day (65.4%) or 90-day (34.6%) treatment duration.

Intervention and comparator—LETS ACT (n=142) is a treatment originally developed for depression and modified for substance use. It teaches participants to increase positively reinforcing value-driven activities in order to counter depression and relapse. The control group (SC; n=121) received time and group-size matched supportive counseling. Treatment was delivered in five or eight one-hour sessions depending on patient length of stay.

Measurements—percent abstinent at follow-up, percent of substance use days among those reporting use, depressive symptoms (BDI), and adverse consequences of drug use (SIP-AD).

Findings—LETS ACT had significantly higher abstinence rates at 3 months (odds ratio=2.2, 95% confidence interval=1.3–3.7), 6 months (odds ratio=2.6, 95% confidence interval=1.3–5.0), and 12 months (odds ratio=2.9, 95% confidence interval=1.3–6.1) post-treatment compared with SC. LETS ACT participants reported significantly fewer adverse consequences from substance use at 12 months post-treatment (B=4.50, SE=2.17, 95% confidence interval=0.22–8.78). Treatment

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condition had no effect on percent substance use days among those who resumed use or on change in depressive symptoms; the latter decreased over time only in those who remained abstinent after residential treatment irrespective of condition ($B=0.43$, $SE=0.11$, 95% confidence interval= $0.22-0.65$).

Conclusions—a behavioral activation group treatment for substance use (LETS ACT) appears to increase the likelihood of abstinence and reduce adverse consequences from substance use up to 12 months post-treatment.

Introduction

Worldwide, there is a substance use treatment gap, in which only a fraction of individuals in need of substance use treatment receive services (1–3). In the US, over 20 million individuals meet criteria for a substance use disorder (SUD), yet less than 15% receive treatment(4). Racial and ethnic minority groups are at a heightened risk for low treatment utilization and completion, largely due to socioeconomic factors (5). Even among individuals who do receive treatment, rates of relapse are high, ranging from 40% to 60% within 1 year following treatment (6). In addition to clinical consequences, high rates of relapse and continued substance use contribute to significant societal costs (7), highlighting the need for low-cost, evidence-based interventions that can be integrated into community-based substance use treatment.

Reinforcement theory and behavioral economic models of substance use provide an important theoretical foundation to guide behavioral interventions for SUDs (8, 9). These models suggest that substance use develops and is maintained in part by few competing rewarding activities in one's environment and a lack of reinforcement derived from non-substance use-related alternative behaviors. Early animal research found greater drug self-administration in the context of limited access to alternative reinforcers in the environment (8). Empirical data among humans has also supported this link between substance use and lower rates of substance-free reinforcement. Reductions in drug use following contingency management has been associated with increased frequency of substance-free positive activities (10). Heavy-drinking college students report lower participation in substance-free rewarding activities compared to non-heavy drinking peers, and fewer heavy-drinkers reported pleasure from engagement in such activities (11). Further, low rates of substance-free reinforcement predicts an increase in substance use over time, even after controlling for reward derived from substance use (12, 13). This research has led to a recent call to increase substance-free reinforcement in one's environment as a critical strategy to reduce SUD relapse(9), and the need for interventions to “increase positive, reinforcing activities and experiences in daily life—the activities that bring pleasure, enjoyment, engagement, excitement, hope for improvement and sense of belonging and purpose” (9).

In line with these recommendations and based upon the theoretical foundations of reinforcement theory (14, 15) and behavioral economic models of substance use (16), the Life Enhancement Treatment for Substance Use (LETS ACT)(17) is a behavioral activation treatment that was developed to treat depressive symptoms among low-income individuals with SUD in residential substance use treatment. LETS ACT is modified from the

Behavioral Activation Treatment for Depression(18), which is based upon the principles of reinforcement theory and is an established(18–20) and cost-effective(21) treatment for depression. Preliminary evidence applying BA to address increases in substance-free positive reinforcement have shown promising results for reducing college student alcohol use (22) and smoking (23). Prior work evaluating LETS ACT demonstrated its efficacy in reducing depressive symptoms and increasing environmental reward from pre- to post-treatment(24), as well as reducing rates of residential substance use treatment dropout (25).

Although promising, prior studies evaluating LETS ACT have included relatively small sample sizes, short follow-up periods, and have not included biochemically-verified measures of substance use. In addition, prior work has focused exclusively on substance users with co-occurring depression and has not examined effectiveness on substance use outcomes. To extend upon prior work, the current study tested the effect of LETS ACT, compared to a control condition, on: 1) percent remaining abstinent after residential treatment (primary outcome); 2) percent of days using substances among those non-abstinent; 3) depressive symptoms; and 4) adverse consequences from substance use.

Method

Study Design

This was a single-site two-arm parallel-group trial conducted in a 136-bed residential substance use treatment center in Northeast Washington, DC. All participants received treatment as usual (TAU) and were randomized by group to receive either behavioral activation (LETS ACT; n=142) or supportive counseling (SC; n=121). Research assessments occurred at pre-treatment and 3, 6, and 12 month post-treatment follow-ups. All study procedures received Institutional Review Board approval.

Study Sample and Procedures

Patients at the residential substance use treatment facility were either court-mandated to attend the program by the criminal justice system or entered treatment voluntarily and received public funding. Patients had contracted lengths of stay of 30 or 90 days, which was dictated by the funding agency, with no basis in clinical characteristics. Patients were not permitted to leave the facility except for necessary medical or mental health appointments.

All patients at the substance use treatment center participated in an intake interview within one week of admission, at which point they were assessed for eligibility, provided informed consent, completed the pre-treatment assessment, and then randomized to condition. Study exclusion criteria were: 1) <5th grade English reading level; 2) current psychotic symptoms; and 3) initiation of psychotropic medication within the past three months. Group random assignment was conducted with a computerized urn randomization program. The two treatment conditions were balanced on assigned treatment length (5 or 8 sessions), which was determined by patients' contracted length of stay at the treatment facility to ensure adequate time to receive all treatment sessions. Following treatment, participants had the option to complete follow-up assessments at the substance use treatment facility, a public

location with adequate privacy (e.g., public library), or their homes. Participants and research staff assessing outcomes were blind to condition.

Figure 1 provides study flow from recruitment to analysis and pre-treatment participant characteristics are presented in Table 1. The first group was enrolled in October 2010 and the last follow-up contact was in May 2015. Follow-up rates at each assessment ranged from 81.7% to 86.6%, 245 (93.2%) attended at least one follow-up, and 192 (73.6%) attended all three follow-ups. Eight different attrition patterns were observed, which did not differ between treatment conditions ($\chi^2(7)=3.90, p=0.79$). Post treatment incarceration rates were similar for LETS ACT ($n=55, 38.7\%$) and SC ($n=45, 37.2\%$; $\chi^2(1)=0.00, p=0.99$), and of those incarcerated, there were no significant group differences in the number of days incarcerated (LETS ACT= 90.9 ± 91.1 ; SC = 98.7 ± 108.2) ($F(1, 99)=0.15, p=0.70$).

Study Measures

Participant characteristics—Participants self-reported age, gender, race/ethnicity, education, employment status, and the number of prior treatment episodes. Treatment facility records corroborated self-report of psychotropic medication and the court mandate to attend treatment by a pretrial release to treatment program. DSM-IV substance dependence was assessed by trained interviewers using the Structured Clinical Interview for the DSM-IV (SCID-IV) (26) (26). The number of drug classes used weekly was assessed via participants' self-reported past year frequency of substance use across eleven drug classes. Number of days incarcerated following pre-treatment was self-reported by participants at each assessment.

Outcome measures—The primary outcome is a binary measure of abstinence at each of the post-treatment assessments, defined as self-reported and biochemically verified. Biochemical verification of alcohol use was provided with a breathalyzer test and illicit drug use with a five panel Integrated E-Z Split Key Cup urine screen that tested for cocaine, amphetamine, phencyclidine (PCP), tetrahydrocannabinol (THC), and opiates. Biochemical verification showed 73.0% agreement with self-report, with 8.6% false-positives (abstinence reported with positive biochemical verification) and 18.4% false negatives (substance use reported with negative biochemical verification). False negatives are expected when assessments did not occur within a detectable time period after substance use. Participants with missing data and biochemical false-negatives were classified as non-abstinent.

Secondary outcomes included percent substance use days in the 90 days prior to each post-treatment assessment among participants with self-reported substance use, and change from pre-treatment through 12 months post-treatment in levels of depressive symptoms and adverse consequences from substance use. The Timeline Follow-back Interview (TLFB)(27) was used to determine number of days used any alcohol or illicit drug. Depressive symptoms were self-reported using the Beck Depression Inventory (BDI-II)(28). Adverse consequences from substance use were self-reported using the Short Inventory of Problems-Alcohol and Drugs (SIP-AD)(29). Participants rated 15 items on a 4-point Likert scale, “never” to “daily or almost daily”, within five domains (three items per domain), namely physical (e.g. My physical health has been harmed because of my drinking or drug use), interpersonal (e.g. My

family has been hurt by my drinking or drug use), intrapersonal (e.g. I have been unhappy because of my drinking or drug use), impulse control (e.g. I have taken foolish risks when I have been drinking or using drugs), and social responsibility (e.g. I have failed to do what is expected of me because of my drinking or drug use).

Study Interventions

Treatment as Usual (TAU)—All participants received TAU, consisting of daily group sessions attended by approximately 30–50 patients, dependent on current enrollment at the treatment facility. Session topics included Alcoholics/Narcotics Anonymous, 12-step, relapse prevention, spirituality, and drug education. Psychiatry services for co-occurring disorders did not occur on site; patients attended medical appointments in the community for maintenance on any pre-treatment prescribed psychiatric medications. Participation in research did not impact TAU services.

Life Enhancement Treatment for Substance Use (LETS ACT)—LETS ACT is a small group (3–5 members) behavioral activation treatment. Sessions focus on the treatment rationale and generating, scheduling, engaging in, and recording value-driven substance-free behaviors that serve to increase daily positive reinforcement. The treatment rationale is a core component of each session and is provided with the use of a visual aide linking mood, urge, and behavior. Sessions focus on identifying important life areas, values, and activities that will aide in their movement from a maladaptive response to negative mood to an increase in behaviors that facilitate positive reinforcement. Early sessions focus on identifying and increasing value driven behaviors while still in the residential facility, shifting in later sessions to planning for post-treatment. Patients are provided pocket-sized booklets for daily activity planning, with room for generating additional life area values and activities. Both the 5- and 8-session conditions received the same instructional content. The 8-session condition received one additional session to monitor activities and generate life area values prior to beginning daily activity planning, and two additional sessions to practice daily activity planning and completion. A more detailed description of the treatment content is provided elsewhere(17).

Supportive Counseling (SC)—The Supportive Counseling condition was time-matched for therapeutic contact and group size (30). Group members establish a list of continually evolving discussion topics. The therapist provides unconditional support, utilizes reflective listening techniques, and manages group dynamics by encouraging equal participation across patients (31). SC therapists were trained to actively avoid behavioral activation techniques. To equate the use of booklets with the LETS ACT condition, homework assignments include daily journal entries in pocket-sized booklets on a topic of choice.

Therapists—Study therapists across conditions included clinical psychology doctoral students and post-doctoral fellows. Therapist training included didactics, observation, and role-plays. Therapists were trained in both conditions. Treatment manuals were used at all times in both conditions to ensure standardization of treatment and consistency of delivery, and steps were taken to prevent cross contamination following NIH Behavior Change Consortium treatment fidelity recommendations (32). Ten therapists administered therapy,

with an average of 28.9 participants per therapist (range=14–88). Study therapists were not involved in any research procedures. All therapy sessions were audiotaped, and clinical supervision was provided weekly across conditions. Adherence forms were completed for all sessions, and 25% of session audiotapes were randomly selected and rated for adherence and competence by a trained independent rater. Rating forms covered content unique to each session, and ratings were made on a 9-point Likert scale ranging from 0 (no adherence/competence) to 8 (complete adherence/competence). Mean ratings across conditions indicate high levels of adherence (LETS ACT=7.1±0.5, SC=7.2±0.3) and competence (LETS ACT=6.8±0.6, SC=7.0±0.5).

Statistical Analysis

Analyses were conducted with SPSS (v24), using an intent-to-treat framework, with participants who were lost to follow-up considered to have used substances (33, 34). Pre-treatment participant characteristics, post-treatment incarceration status and days incarcerated, and pattern of attrition were all tested as covariates in primary and secondary outcome models using backward elimination. The primary outcome, defined as the effect of LETS ACT on the rate of self-reported and biochemically verified abstinence at 3, 6, and 12 months post-treatment, was compared to the control condition using odds ratios (OR), relative rates for LETS ACT, and 95% confidence intervals. Intraclass correlation coefficients (ICCs) for the therapist effect on the primary outcome were calculated using the formula for binary outcomes(35). The effect of therapist and group assignment on the primary outcome were tested in separate logistic regression models at each time point. These models included the main effects of therapist (or group) and condition in step 1 and their interaction term in step 2.

The secondary outcome, the effect of LETS ACT on percent substance use days, was tested on the participants with self-reported substance use, using linear regression models at 3, 6, and 12 months post-treatment. Effect size was estimated with the unstandardized regression coefficient and 95% confidence intervals. Linear mixed (LM) models were used to test the effect of condition on change in the adverse consequences from substance, and the effect of condition and abstinence on changes in depressive symptoms, from pre-treatment through 3, 6, and 12 months post-treatment. Time was specified as a Level 1 predictor and scored according to assessment time point by month (pre-treatment=0). Treatment condition was specified as a Level 2 predictor. All LM models included random effects of the intercept and fixed effects of condition, time, and the condition by time interaction. The depressive symptom model also included the fixed effects of abstinence (Level 2 predictor), time by abstinence, abstinence by condition, and abstinence by condition by time interactions. When significant interaction effects emerged, post hoc comparisons were conducted to test the rate of change over time, as well as mean difference at each assessment time point. Unstandardized effect sizes were estimated with the difference, OR, and 95% confidence intervals.

Results

Primary Outcome

The effect of LETS ACT on the rate of abstinence at 3, 6, and 12 months post-treatment is reported in Table 2 and displayed in Figure 2. Abstinence rates were significantly higher for LETS ACT compared to the control condition at all three time points. Abstinence rates at the 12-month follow-up were equivalent to the percent of participants who maintained continuous abstinence for the entire 12-month follow-up. The models adjusting for covariates had a minimal effect.

Intraclass correlation coefficients (ICCs) for the ratio of the variability in the primary outcome across and within therapists (35, 36) were 0.89, -0.004 and 0.03 at 3, 6 and 12 months post-treatment, respectively. Statistical dependency associated with the therapist was detected at 3 months, whereas more variability within therapist was detected at 6 and 12 months post-treatment. The addition of the therapist by condition interaction term in the models testing the therapist effect on the primary outcome did not improve the model fit at 3 months ($\chi^2(7)=11.51$, $p=0.12$), 6 months ($\chi^2(7)=9.45$, $p=0.22$), or 12 months ($\chi^2(7)=5.60$, $p=0.59$) post-treatment. The models testing the group effect resulted in a failure to converge, likely due to the large number of groups.

Secondary Outcomes

Secondary outcome means and standard deviations are reported in Table 3, and results from the secondary outcome models are reported in Table 4. The models adjusting for covariates for all secondary outcomes did not impact the results. There was no effect of LETS ACT at any follow-up on the percent substance use days among participants with self-reported substance use.

There was a significant time by condition effect on the adverse consequences from substance use, with post hoc comparisons indicating that participants in the LETS ACT condition reported a greater decrease ($B=-0.89$, $SE=0.09$, 95%CI: -1.06 , -0.71) than the control condition ($B=-0.55$, $SE=0.09$, 95%CI: -0.73 , -0.37) from pre-treatment through 12 months post-treatment (Figure 3), and participants in LETS ACT reported significantly fewer adverse consequences at 12-months post-treatment ($B=-4.50$, $SE=2.17$, 95%CI: -8.78 , -0.22). Exploratory analysis of the SIP-AD subscales revealed that total scores were fairly equally divided among the five domain subscales. Further, the statistical outcome pattern seen in the total score was present for all subscales, with the exception that condition and interaction effects narrowly missed significance on the interpersonal scale.

The model examining whether depressive symptoms changed as a function of LETS ACT and abstinence (Table 4) yielded no effect of condition, time or their interaction, yet there was a significant time by abstinence interaction. Post hoc comparisons indicate that participants who remained abstinent from pre-treatment through the 12-month follow-up reported significantly fewer depressive symptoms ($M=4.9\pm9.4$) at 12-months post-treatment compared to those reporting substance use ($M=9.8\pm10.5$) ($B=-5.74$, $SE=1.65$, 95%CI: -9.10 , -2.58), and a significant decrease ($B=-0.43$, $SE=0.11$, 95%CI: -0.65 , -0.22) in depressive symptoms from pre-treatment through 12-months post-treatment, whereas

substance using participants reported a non-significant change ($B=-0.06$, $SE=0.06$, 95% CI: -0.18 , 0.06). The three way interaction of time, condition, and abstinence was not significant (Figure 4).

Discussion

The current randomized controlled trial tested the effect of LETS ACT, a brief behavioral activation treatment, on rates of post-treatment abstinence. Findings indicate a protective effect of LETS ACT, such that participants assigned to LETS ACT were more likely than participants assigned to the control condition to remain abstinent at 3, 6, and 12 months post-treatment. LETS ACT also had a significant effect on reductions in the adverse consequences resulting from substance use over the follow-up period, with fewer reported at 12 months post-treatment compared to the control condition. Contrary to expectation, LETS ACT did not have a significant effect on the percent substance use days among non-abstinent participants or change in depressive symptoms.

Behavioral activation is grounded in reinforcement theory and behavioral economic models of substance use (9), emphasizing an increase in substance-free positive reinforcement as a clinical strategy to sustain abstinence. Accordingly, we would hypothesize that increasing contact with substance free reinforcement and other rewarding activities outside of substance use would buffer against both relapse and the adverse consequences resulting from substance use. The pattern of change in adverse consequences suggests that while both groups experienced a decrease from pre-treatment through the 12-month follow-up, this improvement may have been sustained by individuals in the LETS ACT group to a larger extent compared to those in the SC group, who in turn appear to experience a slight increase in adverse consequences after the 3-month follow-up. Although the inclusion of a quadratic effect of time did not significantly improve the model in the present study; the trend suggests the utility of examining non-linear trends in future research. It is also notable that this effect was observed across the total score and four of the five subscales, suggesting a global, rather than specific, effect of LETS ACT on adverse consequences.

Findings suggest that LETS ACT is useful in maintaining abstinence and reducing the adverse consequences from substance use over time, yet not in reducing the frequency of use among those who have relapsed. LETS ACT focuses on building skills that will minimize the likelihood of relapse in response to negative emotions, with less of a focus on harm reduction or reducing frequency of use, and does not include other relapse prevention strategies (i.e., prolapse; (37)). A closer examination of therapy group content in future research may inform hypotheses for why LETS ACT did not have an effect on substance use frequency.

Contrary to expectation, LETS ACT did not have a significant effect on depressive symptoms, which was somewhat surprising given the robust evidence supporting the effect of behavioral activation on depression. It is notable that individuals assigned to LETS ACT had higher pre-treatment, and lower 12-month post-treatment, levels of depressive symptoms compared to the control condition. This pattern is in the hypothesized direction and suggests more research is needed before ruling out the possibility that LETS ACT is effective at

reducing depressive symptoms. Given the established association between depression and substance use (38), we also expected that reductions in depressive symptoms would correspond with abstinence. Consistent with this expectation, individuals who maintained continuous abstinence reported a greater decrease in depressive symptoms than those who relapsed. Treatment condition did not moderate this interaction, indicating that behavioral activation did not provide additional influence on the reduction in depressive symptoms above that provided from abstinence. Additional research examining the effect of LETS ACT on primary versus secondary depression (39) will aide in determining the impact of behavioral activation on depression among patients with comorbid SUD.

Findings are in line with prior behavioral economic interventions that aimed to reduce substance use by increasing substance-free positive reinforcement (10, 40) and with the community reinforcement approach (CRA; (41)), which is a comprehensive treatment package that aims to increase positive reinforcement in one's environment through a range of components, including behavioral skills training, job skills training, social and recreational interventions, and partner involvement in treatment. Behavioral activation differs from these approaches in its brevity and in placing greater emphasis on the scheduling and tracking of value-driven activities. Future research is needed to determine whether changes in substance use are mediated by changes in activity levels and/or reward derived from activities (42).

This study was designed to mimic the real world setting in which it was being delivered and maximize the likelihood of generalizability to other residential substance use treatment facilities in urban areas. The inclusion of a range of SUD diagnoses supports the applicability of behavioral activation across substances. The format for the intervention was designed to be straightforward and easy for the therapist to facilitate and patient to comprehend (17). Additionally, the session length (5 or 8 sessions, balanced across conditions) occurred based on the variability in contract length of residential treatment common among substance use treatment facilities nationwide. We believe that the brief, straightforward, and flexible features of this intervention speaks to the generalizability of the results and likelihood of later implementation success. Of note, although a strength of the residential setting is the ability to practice behavioral activation skills in an environment void of real-world triggers, an inherent limitation is the lack of opportunity to troubleshoot real-world implementation of value-driven activities with a clinician. Future research is needed to determine the effectiveness of LETS ACT in alternative treatment setting (e.g., outpatient).

It is important to note that this study targeted an underserved, low-income predominantly African American sample. African Americans comprise only 21% of annual admissions to publicly funded substance use treatments compared to 60% for Whites(43), and data on relapse rates following residential treatment for African Americans are sparse. Data from this trial adds to the literature on the effect of community based residential treatment programs on 12-month post treatment abstinence among low income African Americans, as well as the effect of an evidence-based treatment on this sample.

Findings must be interpreted in light of study limitations, including use of self-report measures for substance use frequency, substance use-related consequences, and depressive

symptoms, and the potential lack of generalizability to other patient groups and treatment settings (i.e., outpatient). Further, given the high percentage of individuals who were referred to treatment by the criminal justice system (73%), findings may not generalize to populations without similar criminal justice monitoring requirements. We were also unable to test the potential effect of group assignment and group dynamics on study outcomes, which will be important in future studies. Strengths include a randomized, contact time matched control, the use of biochemically-verified substance use outcomes, and a high retention rate.

Given the tremendous societal cost of SUDs, estimated at \$193 billion dollars for illicit drug use alone(44), identifying new treatment strategies with wide applicability is critical. Behavioral activation has numerous advantages to facilitate future implementation in low income community based substance use settings, including evidence to support paraprofessional delivery(45), low intensity training needs(46), and cost effectiveness(21, 47). Further, the group delivery model tested in this study lends itself well for future implementation and integration into existing substance use treatment models. This study provides important evidence supporting the effectiveness of LETS ACT to reduce the incidence of post-treatment substance use and substance use-related adverse consequences.

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References

1. Organization WH. mhGAP intervention guide for mental, neurological and substance use disorders in non-specialized health settings: mental health Gap Action Programme (mhGAP). Geneva: World Health Organization; 2010.
2. Organization WH. Atlas on substance use (2010): resources for the prevention and treatment of substance use disorders. World Health Organization; 2010.
3. Salwan J, Katz CL. A Review of Substance Use Disorder Treatment in Developing World Communities. *Annals of Global Health*. 80(2):115–21.
4. Key Substance Use and Mental Health Indicators in the United States:Results from the 2015 National Survey on Drug Use and Health. Center for Behavioral Health Statistics and Quality; 2016 Sep.
5. Saloner B, Le Cook B. Blacks and Hispanics are less likely than Whites to complete addiction treatment, largely due to socioeconomic factors. *Health Aff (Millwood)*. 2013; 32(1)
6. McLellan A, Lewis DC, O'Brien CP, Kleber HD. Drug dependence, a chronic medical illness: Implications for treatment, insurance, and outcomes evaluation. *JAMA*. 2000; 284(13):1689–95. [PubMed: 11015800]
7. Rice DP, Kelman S, Miller LS. The economic cost of alcohol abuse. *Alcohol Health & Research World*. 1991; 15(4):307–16.
8. Vuchinich RE, Tucker JA. Contributions from behavioral theories of choice to an analysis of alcohol abuse. *J Abnorm Psychol*. 1998; 92:408–16.
9. McKay JR. Making the hard work of recovery more attractive for those with substance use disorders. *Addiction*. 2016
10. Rogers RE, Higgins ST, Silverman K, Thomas CS, Badger GJ, Bigelow G, et al. Abstinence-contingent reinforcement and engagement in non-drug-related activities among illicit drug abusers. *Psychology of Addictive Behaviors*. 2008; 22(4):544. [PubMed: 19071979]

11. Correia CJ, Carey KB, Simons J, Borsari BE. Relationships between binge drinking and substance-free reinforcement in a sample of college students: A preliminary investigation. *Addict Behav.* 2003; 28:361–8. [PubMed: 12573686]
12. Murphy JG, Correia CJ, Colby SM, Vuchinich RE. Using behavioral theories of choice to predict drinking outcomes following a brief intervention. *Exp Clin Psychopharmacol.* 2005; 13:93–101. [PubMed: 15943542]
13. Correia CJ, Simons J, Carey KB, Borsari BE. Predicting drug use: Application of behavioral theories of choice. *Addict Behav.* 1998; 23(5):705–10. [PubMed: 9768306]
14. Lewinsohn PM, Graf M. Pleasant activities and depression. *J Consult Clin Psychol.* 1973; 41(2): 261–8. [PubMed: 4147832]
15. Lewinsohn, PM. A behavioral approach to depression. In: Friedman, RM., Katz, MM., editors. *The Psychology of Depression: Contemporary Theory and Research.* New York, NY: Wiley; 1974. p. 150
16. Vuchinich RE, Tucker JA. Contributions from behavioral theories of choice to an analysis of alcohol abuse. *J Abnorm Psychol.* 1988; 97(2):181–95. [PubMed: 3133403]
17. Daughters SB, Magidson JF, Lejuez CW, Chen Y. LETS ACT: A behavioral activation treatment for substance use and depression. *Advances in Dual Diagnosis.* 2016; 9(2/3):74–84.
18. Lejuez CW, Hopko DR, Acierno R, Daughters SB, Pagoto SL. Ten year revision of the brief behavioral activation treatment for depression: revised treatment manual. *Behav Modif.* 2011; 35(2):111–61. [PubMed: 21324944]
19. Dimidjian S, Hollon SD, Dobson KS, Kohlenberg RJ, Gallop R, Markley DK, et al. Randomized Trial of Behavioral Activation, Cognitive Therapy, and Antidepressant Medication in the Acute Treatment of Adults With Major Depression. *J Consult Clin Psychol.* 2006; 74(4):658–70. [PubMed: 16881773]
20. Jacobson NS, Martell CR, Dimidjian S. Behavioral activation treatment for depression: Returning to contextual roots. *Clinical Psychology: Science and Practice.* 2001; 8(3):255–70.
21. Richards DA, Ekers D, McMillan D, Taylor RS, Byford S, Warren FC, et al. Cost and outcome of behavioural activation versus cognitive behavioural therapy for depression (COBRA): A randomised, controlled, non-inferiority trial. *The Lancet.* 2016; 388(10047):871–80.
22. Reynolds EK, MacPherson L, Tull MT, Baruch DE, Lejuez CW. Integration of the brief behavioral activation treatment for depression (BATD) into a college orientation program: Depression and alcohol outcomes. *Journal of Counseling Psychology.* 2011; 58:555–64. [PubMed: 21787070]
23. MacPherson L, Tull MT, Matusiewicz AK, Rodman S, Strong DR, Kahler CW, et al. Randomized controlled trial of behavioral activation smoking cessation treatment for smokers with elevated depressive symptoms. *J Consult Clin Psychol.* 2010; 78(1):55–61. [PubMed: 20099950]
24. Daughters SB, Braun AR, Sargeant MN, Reynolds EK, Hopko DR, Blanco C, et al. Effectiveness of a brief behavioral treatment for inner-city illicit drug users with elevated depressive symptoms: the life enhancement treatment for substance use (LETS Act!). *J Clin Psychiatry.* 2008; 69(1):122–9. [PubMed: 18312046]
25. Magidson JF, Gorka SM, MacPherson L, Hopko DR, Blanco C, Lejuez C, et al. Examining the effect of the Life Enhancement Treatment for Substance Use (LETS ACT) on residential substance abuse treatment retention. *Addict Behav.* 2011; 36(6):615–23. [PubMed: 21310539]
26. First, MB., Gibbon, M. The Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) and the Structured Clinical Interview for DSM-IV Axis II Disorders (SCID-II). In: Hilsenroth, MJ.Segal, DL.Hilsenroth, MJ., Segal, DL., editors. *Comprehensive handbook of psychological assessment, Vol 2: Personality assessment.* Hoboken, NJ, US: John Wiley & Sons Inc; 2004. p. 134-43.
27. Sobell, LC., Sobell, M. *Timeline Followback Method (Drugs, Cigarettes, and Marijuana).* 1996.
28. Beck, AT., Steer, R., Ball, G. *Beck Depression Inventory-II.* San Antonio, TX: The Psychological Corporation; 1996.
29. Blanchard KA, Morgenstern J, Morgan TJ, Lobouvie EW, Bux DA. Assessing Consequences of Substance Use: Psychometric Properties of the Inventory of Drug Use Consequences. *Psychology of Addictive Behaviors.* 2003; 17(4):328–31. [PubMed: 14640829]
30. Crits-Christoph P. Control groups in psychotherapy research revisited. *Treatment.* 1997; 1(1)

31. Hill, CE. Helping skills: Facilitating exploration, insight, and action. 4. Washington, DC, US: American Psychological Association; 2014. Skills for attending, listening, and observing; p. 127-48.
32. Bellg AJ, Borrelli B, Resnick B, Hecht J, Minicucci DS, Ory M, et al. Enhancing Treatment Fidelity in Health Behavior Change Studies: Best Practices and Recommendations From the NIH Behavior Change Consortium. *Health Psychol.* 2004; 23(5):443–51. [PubMed: 15367063]
33. Bellack AS, Bennett ME, Gearon JS, Brown CH, Yang Y. A randomized clinical trial of a new behavioral treatment for drug abuse in people with severe and persistent mental illness. *Arch Gen Psychiatry.* 2006; 63(4):426–32. [PubMed: 16585472]
34. Stapleton J, West R, Hajek P, Wheeler J, Vangeli E, Abdi Z, et al. Randomized trial of nicotine replacement therapy (NRT), bupropion and NRT plus bupropion for smoking cessation: effectiveness in clinical practice. *Addiction.* 2013; 108(12):2193–201. [PubMed: 23859696]
35. Zou G, Donner A. Confidence interval estimation of the intraclass correlation coefficient for binary outcome data. *Biometrics.* 2004; 60(3):807–11. [PubMed: 15339305]
36. Baldwin SA, Murray DM, Shadish WR, Pals SL, Holland JM, Abramowitz JS, et al. Intraclass correlation associated with therapists: estimates and applications in planning psychotherapy research. *Cogn Behav Ther.* 2011; 40(1):15–33. [PubMed: 21337212]
37. Witkiewitz K, Marlatt GA. Relapse prevention for alcohol and drug problems: that was Zen, this is Tao. *Am Psychol.* 2004; 59(4):224–35. [PubMed: 15149263]
38. Grant BF, Saha TD, Ruan WJ, Goldstein RB, Chou SP, Jung J, et al. Epidemiology of DSM-5 drug use disorder: Results from the National Epidemiologic Survey on Alcohol and Related Conditions—III. *JAMA Psychiatry.* 2016; 73(1):39–45. [PubMed: 26580136]
39. Cohn AM, Epstein EE, McCrady† BS, Jensen N, Hunter-Reel D, Green KE, et al. Pretreatment Clinical and Risk Correlates of Substance Use Disorder Patients With Primary Depression. *Journal of Studies on Alcohol and Drugs.* 2011; 72(1):151–7. [PubMed: 21138705]
40. Murphy JG, Dennhardt AA, Skidmore JR, Borsari B, Barnett NP, Colby SM, et al. A randomized controlled trial of a behavioral economic supplement to brief motivational interventions for college drinking. *J Consult Clin Psychol.* 2012; 80(5):876. [PubMed: 22663899]
41. Meyers RJ, Roizen HG, Smith JE. The community reinforcement approach: An update of the evidence. *Alcohol Res Health.* 2011; 33(4):380. [PubMed: 23580022]
42. Magidson JF, Robustelli BL, Seitz-Brown CJ, Whisman MA. Activity Enjoyment, Not Frequency, Is Associated With Alcohol-Related Problems and Heavy Episodic Drinking. *Psychology of Addictive Behaviors.* 2016
43. NIDA. Treatment Statistics. 2011. [Available from: <https://www.drugabuse.gov/publications/drugfacts/treatment-statistics>]
44. NIDA. Trends & Statistics. 2015. [Available from: <https://www.drugabuse.gov/related-topics/trends-statistics>]
45. Ekers D, Richards D, McMillan D, Bland JM, Gilbody S. Behavioural activation delivered by the non-specialist: phase II randomised controlled trial. *Br J Psychiatry.* 2011; 198(1):66–72. [PubMed: 21200079]
46. Magidson JF, Lejuez CW, Kamal T, Blevins EJ, Murray LK, Bass JK, et al. Adaptation of community health worker-delivered behavioral activation for torture survivors in Kurdistan, Iraq. *Global mental health (Cambridge, England).* 2015; 2:e24.
47. Ekers D, Godfrey C, Gilbody S, Parrott S, Richards DA, Hammond D, et al. Cost utility of behavioural activation delivered by the non-specialist. *The British Journal of Psychiatry.* 2011; 199(6):510–1. [PubMed: 21947655]

Figure 1.
Study recruitment flow.

Figure 2.
Post-treatment percent abstinent for LETS ACT and SC. SC=supportive counseling,
M=months post-treatment.

Figure 3.

Adverse consequences from substance use for LETS ACT and SC. LETS ACT = Life Enhancement Treatment for Substance Use; SC=supportive counseling, M=months post-treatment; SIP-AD = Short Inventory of Problems – Alcohol and Drugs.

Figure 4.

Depressive symptoms for LETS ACT and SC participants reporting 12-month abstinence or substance use. LETS ACT = Life Enhancement Treatment for Substance Use; SC=supportive counseling, M= months post-treatment, BDI= Beck Depression Inventory.

Table 1

Pre-treatment participant characteristics.

	Total Sample n=263	LETS ACT n=142	SC n=121
Age, mean (SD)	42.7 (11.8)	42.9 (11.9)	42.4 (11.7)
No. (%) African American	249 (95.4)	132 (92.9)	117 (96.7)
No. (%) female	77 (29.5)	39 (27.5)	38 (31.4)
No. (%) completed high school/GED	192 (73.6)	108 (76.1)	84 (69.4)
No. (%) unemployed	213 (81.6)	110 (77.5)	103 (85.1)
No. (%) 30-day contract length/5-session condition	172 (65.9)	92 (64.8)	80 (66.1)
No. (%) court mandated to treatment	191 (73.2)	104 (73.2)	87 (71.9)
No. (%) maintained on psychotropic medication	107 (41.0)	57 (40.1)	50 (41.3)
Prior treatment episodes, mean (SD)	2.4 (2.8)	2.8 (3.3)	2.0 (2.4)
Drug classes used weekly/past year, mean (SD)	1.5 (1.1)	1.5 (1.1)	1.5 (1.1)
No. (%) DSM-IV Cocaine Dependence	90 (34.5)	44 (31.0)	46 (38.0)
No. (%) DSM-IV Opioid Dependence	33 (12.6)	19 (13.4)	14 (11.6)
No. (%) DSM-IV Marijuana Dependence	30 (11.5)	19 (13.4)	11 (9.1)
No. (%) DSM-IV Alcohol Dependence	85 (32.6)	51 (35.9)	34 (28.1)
No. (%) DSM-IV Hallucinogen/PCP Dependence	39 (14.9)	26 (18.3)	13 (10.7)

LETS ACT = Life Enhancement Treatment for Substance Use; SC = supportive counseling; SD=standard deviation; BDI = Beck Depression Inventory; SIP-AD = Short Inventory of Problems – Alcohol and Drugs.

Table 2

Effect of LETS ACT on the primary outcome, post-treatment rate of abstinence.

	LETS ACT <i>n</i>=142	SC <i>n</i>=121	OR (95% CI)	RR (95% CI)
Abstinence (% Yes, <i>n</i>)				
3M	41.5 (59)	24.8 (30)	2.2 (1.3 to 3.7)	1.4 (1.1 to 1.7)
6M	26.8 (38)	12.4 (15)	2.6 (1.3 to 5.0)	1.5 (1.2 to 1.8)
12M	20.4 (29)	8.3 (10)	2.9 (1.3 to 6.1)	1.5 (1.2 to 1.9)

LETS ACT = Life Enhancement Treatment for Substance Use; SC = supportive counseling; OR = Odds Ratio; CI = Confidence Interval; RR = Relative Risk; M=months post-treatment.

Table 3

Means and standard deviations for secondary outcomes.

	LETS ACT	SC
Percent substance use days *		
3M (LETS ACT <i>n</i> =54, SC <i>n</i> =62)	25.3 (30.4)	34.6 (34.9)
6M (LETS ACT <i>n</i> =74, SC <i>n</i> =78)	25.2 (30.5)	27.0 (33.7)
12M (LETS ACT <i>n</i> =79, SC <i>n</i> =80)	24.5 (31.5)	32.4 (31.2)
Adverse consequences from substance use (SIP-AD) **		
Pre-treatment	25.1 (14.0)	21.8 (13.4)
3M	11.8 (14.9)	10.8 (11.7)
6M	10.1 (13.5)	13.3 (14.3)
12M	10.1 (13.3)	14.6 (14.0)
Depressive symptoms (BDI total score) **		
Pre-treatment	11.6 (10.4)	9.1 (9.1)
3M	7.8 (11.0)	9.5 (9.7)
6M	8.2 (11.8)	9.4 (9.1)
12M	7.7 (11.4)	10.2 (9.7)

* Among participants with self-reported substance use;

** Model adjusted means, LETS ACT *n*=142, SC *n*=121; LETS ACT = Life Enhancement Treatment for Substance Use; SC = supportive counseling; M=months post-treatment; SIP-AD = Short Inventory of Problems – Alcohol and Drugs; BDI = Beck Depression Inventory.

Table 4

Effect of LETS ACT on percent substance use days, adverse consequences from substance use, and depressive symptoms.

	B (SE)	p	95% CI
Percent substance use days *			
3M (LETS ACT <i>n</i> =54, SC <i>n</i> =62)	0.09 (0.06)	0.13	−0.03, 0.21
6M (LETS ACT <i>n</i> =74, SC <i>n</i> =78)	0.02 (0.06)	0.74	−0.09, 0.13
12M (LETS ACT <i>n</i> =79, SC <i>n</i> =80)	0.08 (0.06)	0.16	−0.03, 0.19
Adverse consequences from substance use (SIP-AD) **			
Time	−0.54 (0.09)	<.0001	−0.72, −0.36
Condition	3.75 (1.56)	0.02	0.69, 6.82
Time x Condition	−0.36 (0.13)	0.01	−0.61, −0.10
Depressive symptoms (BDI total score) **			
Time	0.124 (0.13)	0.33	−0.13, 0.37
Condition	3.20 (2.30)	0.17	−1.34, 7.74
Abstinence	1.18 (1.48)	0.43	−1.73, 4.08
Time x Condition	−0.14 (0.20)	0.48	−0.53, 0.25
Time x Abstinence	−0.49 (0.20)	0.01	−0.87, −0.10
Abstinence x Condition	−0.78 (0.73)	0.73	−5.30, 3.74
Time x Condition x Abstinence	−0.01 (0.28)	0.96	−0.57, 0.54

* Among participants with self-reported substance use;

** LETS ACT *n*=142, SC *n*=121; Condition: LETS ACT=0, SC=1; Abstinence: abstinence=0, substance use=1; LETS ACT = Life Enhancement Treatment for Substance Use; SC = supportive counseling; M=months post-treatment; SIP-AD = Short Inventory of Problems – Alcohol and Drugs; BDI = Beck Depression Inventory; SE = standard error; CI = confidence interval.