

10-1-2015

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Eric B. Lee
Utah State University

Woolee An
Utah State University

Michael E. Levin
Utah State University

Michael P. Twohig
Utah State University

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Recommended Citation

Lee, Eric B.; An, Woolee; Levin, Michael E.; and Twohig, Michael P., "An Initial Meta-Analysis of Acceptance and Commitment Therapy for Treating Substance Use Disorders" (2015). *Psychology Faculty Publications*. Paper 1216.
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An Initial Meta-Analysis of Acceptance and Commitment
Therapy for Treating Substance Use Disorders

Eric B. Lee

Woolee An

Michael E. Levin

Michael P. Twohig

Utah State University

Address Correspondence to:

Eric B. Lee, M.A.

Utah State University

Department of Psychology

1400 Old Main Hill

Logan, UT 84322

Telephone: 435-797-8303

Email: eric.lee@aggiemail.usu.edu

Abstract

Background: In the past decade, multiple studies have examined the effectiveness of Acceptance and Commitment Therapy (ACT) for substance use disorders relative to other active treatments. The current meta-analysis examined the aggregate effect size when comparing ACT to other treatments (e.g., CBT, pharmacotherapy, 12-step, treatment as usual) specifically on substance use outcomes. **Method:** A total of 10 randomized controlled trials were identified through systematic searches. **Results:** A significant small to medium effect size was found favoring ACT relative to active treatment comparisons following treatment. Effect sizes were comparable across studies for smoking cessation ($k = 5$) and for other drug use disorders ($k = 5$). **Conclusions:** Based on these findings, ACT appears to be a promising intervention for substance use disorders. Limitations and future directions are discussed.

Keywords: Acceptance and Commitment Therapy; Mindfulness; Substance use disorder; Smoking cessation; Opioid dependence

1. Introduction

Substance use disorders are characterized by recurrent, maladaptive use of drugs and/or alcohol (American Psychiatric Association, 2013) which often leads to significant distress and impairment in social, interpersonal, and occupational settings (Henkel, 2011; Mueller et al., 2009). In many cases, substance use disorders are chronic problems that tend to be associated with comorbid mental health conditions (Kessler et al., 2005). A number of behavioral treatment approaches have been found to be efficacious in treating substance use disorders including contingency management, traditional cognitive behavior therapy (CBT), skills training, motivational interviewing, drug counseling, and couples and family therapies (Carroll and Onken, 2014; McHugh et al., 2010; Smedslund et al., 2011). However, substance use disorders continue to be difficult problems to treat. Reviews of current treatments indicate that substance abstinence is only seen in approximately 30 to 50 percent of those treated, with a relatively small overall effect size ($g = .30$; Hubbard et al., 2003; Prendergast et al., 2002) and effects that are often not long-lasting (Benishek et al., 2014). Thus, it is evident that while quality treatments exist, there is room for improving treatment for many of those in need.

More recently, contextual CBTs, such as Acceptance and Commitment Therapy (ACT; Hayes et al., 2012), Dialectical Behavior Therapy (DBT; Linehan, 1993), and mindfulness-based relapse prevention (e.g., Witkiewitz et al., 2005) have been utilized to treat substance use disorders. A key difference between contextual CBTs and traditional CBT is the emphasis on mindfulness and acceptance strategies to reduce the impact of internal triggers on substance use behavior (e.g., altering the context and function so cravings, distress, or thoughts of using are less likely to lead to substance use). Other

defining features of contextual CBTs include taking a broad, functional approach to treatment, emphasizing motivation and values-based strategies and also applying these psychological skills to counselors themselves (e.g., targeting burnout, stigma towards clients; Hayes and Levin, 2012).

Mindfulness-based treatment approaches have been the most researched of the contextual CBTs for substance use. While further evidence is needed to better understand mindfulness as a component of treatment for substance use, recent reviews of the evidence indicate its efficacy for promoting abstinence and reducing cravings (Chiesa and Serretti, 2014; Zgierska et al., 2009).

Recently, several randomized controlled trials (RCTs) have suggested ACT is another promising contextual CBT for substance use. While ACT includes mindfulness as a treatment component, its approach differs from other mindfulness-based treatments. Mindfulness within ACT is tightly integrated with other processes of change such as acceptance, values, and behavior change methods and ACT protocols often include a less heavy emphasis on meditative practices.

ACT uses a combination of acceptance, mindfulness, and values-based therapeutic processes to foster psychological flexibility, which involves stepping back and mindfully watching inner experiences (e.g., thoughts, feelings, and bodily sensations) in the service of being able to better engage in a more functional, values-focused life (Hayes and Levin, 2012). As applied to substance use disorders, clients learn more accepting and mindful ways of relating to inner experiences, rather than engaging in substance use (e.g., in response to cravings or escape negative affect), while moving forward in building meaningful patterns of activity that are further inconsistent with

substance use. In addition, because of the transdiagnostic nature of ACT, it can effectively target key psychological problems commonly comorbid with substance use including depression, anxiety, and self-stigma (Batten and Hayes, 2005; Luoma et al., 2008; Petersen and Zettle, 2010). Consistent with this approach, research has found that poorer psychological flexibility predicts a range of psychological problems including substance use disorders (Bond et al., 2011; Levin et al., 2012).

A series of clinical trials have examined the effectiveness of ACT to treat a variety of substance use disorders in the past decade, including, smoking (Bricker et al., 2013; Bricker et al., 2014a; Bricker et al., 2014b; Gifford et al., 2004; Gifford et al., 2011), polydrug use (Luoma et al., 2012; Menéndez et al., 2014), opioids (Hayes et al., 2004; Stotts et al., 2012), and amphetamines (Smout et al., 2010). This evidence base, although relatively small at this time, warrants an initial investigation into the current state of the evidence for ACT as a treatment for substance use disorders. While a recent narrative review qualitatively examined the current literature on ACT for substance use disorders (Stotts and Northrup, 2015), no quantitative review has been published in this area to date.

More generally, a meta-analytic review indicated ACT was more efficacious than wait-list and psychological placebo conditions and comparable to established treatments (e.g., cognitive therapy, CBT; Powers et al., 2009). However, in a re-analysis of this data ACT appeared to outperform some established treatments, but may be comparable to CBT (Levin and Hayes, 2009). This re-analysis was performed, in part, because of conceptual disagreements of what the primary outcomes in treatment were, thus highlighting the problematic nature of comparing modalities when the goals of the

treatments may differ from one another. The area of substance use disorders offers a unique opportunity to further examine the efficacy of ACT to active treatment comparisons for two reasons. First, these represent a unique set of studies in the ACT literature in which every clinical trial for substance use compared ACT to an active control condition. Second, because substance use treatment utilizes a common, specifically defined outcome, the efficacy of treatments can be more specifically and objectively measured compared to many types of treatment outcome research.

Even though a qualitative review of the literature is informative (Stotts and Northrup, 2015), a meta-analytic approach provides additional utility in examining this preliminary research area. A meta-analytic review of the literature avoids some of the potential biases that can be introduced through more subjective, qualitative summaries of research findings. As a result, this approach is recommended by some even in situations where data are limited or possess less than ideal statistical properties (Cohn and Becker, 2003; Garg et al., 2008). Although a meta-analysis in this area is preliminary due to the limited number of studies (some of which were pilot trials), such a review still provides greater perspective to the current state of ACT as a treatment for substance use disorders by examining aggregated effect sizes across the available data.

Thus, the current study employed a meta-analytic approach to examine the comparative efficacy of ACT to active treatment comparisons on substance use abstinence. Even though the use of ACT for treating substance use disorders is still preliminary, enough evidence exists to warrant a systematic review. The current study will aggregate the current state of the therapy in this area in an attempt to observe potential trends in the existing data and guide future clinical and research endeavors.

2. Method

2.1. Inclusion Criteria

In order to be included in the current meta-analysis, manuscripts had to meet the following criteria: (a) use of randomized controlled research design; (b) inclusion of an ACT treatment defined by the authors and clearly stated in the description of the therapy; (c) comparison of ACT to at least one alternative treatment condition; (d) included a measure of substance use and reported substance use outcomes; and (e) included a population of treatment seeking individuals with substance use disorders. Of note, substance use was broadly defined when including studies for analysis as the state of the evidence precluded the ability to fully examine specific substance use types. This is consistent with other meta-analyses in this area (e.g., Prendergast et al., 2002).

2.2. Literature Search

Three databases (PsychInfo, PubMed, and The ETOH Alcohol and Alcohol Problems Science Database) were searched in order to find relevant studies up to May, 2015. Three separate searches were utilized for each database, all limited to peer-reviewed journals. The first included the keyword search terms “Acceptance and Commitment Therapy” and “substance” resulting in 70 articles. The second included the terms “Acceptance and Commitment Therapy” and “smoking” resulting in 45 articles. The third included the terms “Acceptance and Commitment Therapy” and “alcohol” resulting in 52 articles. In total, these search criteria produced 55 unique articles. Additionally, the Association for Contextual Behavioral Science website’s list of ACT publications was searched and requests for articles were made on an ACT research email listserv; however, no additional studies were identified. In total, 55 articles were

identified to be screened. Of these 55 articles, 44 were excluded for not meeting each of the inclusion criteria. Two of the remaining 11 articles utilized the same data examined at different time points. The study that did not include extended follow-up data was therefore excluded (Lanza et al., 2014). Following these exclusions, 10 articles remained, which were included in the current study and are reported in the results section.

2.3. Data Collection

Data from each of the studies were extracted and compiled by the first and second authors. These authors reviewed each article independently and compared the compiled values. No discrepancies were found between the values. When possible, effect sizes were calculated using rates of abstinence or means and standard deviations.

2.4. Statistical Analysis

Once compiled, data were analyzed using Comprehensive Meta-Analysis, software designed for conducting meta-analyses (Borenstein et al., 2005). The primary outcome variable for each of the performed meta-analyses was abstinence from substance use. Because objective, biological measures of substance use provide reliable, unbiased data, they were utilized in the analysis when available, otherwise, self-report assessments were used.

Aggregated effect sizes were examined for treatment effects on substance use abstinence across the 10 included studies. A single study did not include follow-up data, therefore, post-treatment data were utilized in this case. The remaining nine studies included follow-up data wherein the longest available follow-up assessment was utilized in the analysis (2 to 18 months, $M = 7.3$). Next, the six studies that included assessment at post-treatment were examined to assess for outcomes immediately following treatment.

The three studies that compared ACT to CBT specifically were then analyzed separately to assess for differences between the two modalities. Finally, given potential differences between the five clinical trials for smoking and the five for drug use disorders (primarily opioid and polydrug use disorders), analyses examined effect sizes separately for these two problem areas.

Effect sizes were calculated using Hedges' g and a 95% confidence interval. Cohen's (1988) conventional interpretation of effect sizes can be used to interpret Hedges' g effect sizes (i.e., small = 0.2, medium = 0.5, large = .08). Because the included studies were not functionally identical and varied in terms of treatment modality and population among other features, effect size estimates were calculated using a random-effects model rather than a fixed-effects model (Hedges and Vevea, 1998).

3. Results

3.1. Study Characteristics

Characteristics of each study are displayed in Table 1. The 10 trials included a total of 1,386 participants. Across all trials, participants were 57.5 percent female and 83.7 percent White, with a mean age of 39.5. Each of the 10 studies compared an ACT treatment condition to another active treatment condition which were categorized into one of three groups: (1) CBT (three studies), defined as such by the study authors; (2) structured treatment condition (six studies), defined as evidence-based methods other than CBT implemented by researchers utilizing a protocol (e.g., nicotine replacement therapy, smokefree.gov); (3) treatment as usual (one study), defined as standard care not meeting criteria as a structured treatment.

The types of substance abuse treated across the studies included cigarette smoking (five studies), amphetamines (one study), opioids (two studies), and polydrug use (two studies). When possible, substance use was assessed by objective, biological measures (five studies). An additional two studies utilized objective measures of substance use on random participants in order to provide support for the validity of their self-report measures. Three studies did not utilize objective measures and relied solely on self-report assessment. Each of these were smoking cessation studies that utilized novel, web-, app-, or telephone-based treatment approaches with little to no face-to-face contact. The authors of these studies made the case that the novel treatment approaches resulted in low demand characteristics that reduced the probability of false reports (Bricker et al., 2014a). Treatment conditions for the majority of the studies (seven) included traditional face-to-face individual, group, or individual and group therapy.

The average attrition rate from assessment was 33.4% (median = 37.8) from pre- to post-treatment. This rate is relatively low compared to other psychotherapy research that usually sees attrition rates closer to 50% (Roseborough et al., 2015). The ACT and control groups had similar rates of attrition, with means of 32.6% (median = 36.1) and 34.2% (median = 38.2), respectively.

3.2. Meta-Analysis

Of the 10 studies included in the following meta-analyses, nine included follow-up data. All analyses were performed utilizing the longest follow-up period assessed within each given study, except where otherwise noted.

3.2.1. Substance Use Outcomes at Post-Treatment

Six of the 10 studies included post-treatment substance abstinence data. Of these studies, three demonstrated small to medium effect sizes favoring ACT ($g = .36$ to $.52$), two were negligibly positive favoring ACT ($g = .04$ and $.05$), and one displayed a small negative effect size favoring CBT ($g = -.22$). Aggregating across studies, findings at post-treatment demonstrated a significant small effect size that favored ACT over active comparison conditions ($g = .29$, 95% CI = $.08, .49$, $z = 2.76$, $p = .006$, $k = 6$).

3.2.2. Substance Use Outcomes at Follow-up

Figure 1 summarizes treatment effects for substance abstinence at the longest available follow-up assessment for each of the 10 studies. Individually, only two of the 10 studies demonstrated significant findings over the comparison conditions. However, when aggregated, the findings demonstrated a significant small to medium effect size favoring ACT relative to all treatment comparison conditions ($g = .43$, 95% CI = $.25, .61$, $z = 4.72$, $p < .001$, $k = 10$). Of note, all of the studies had a positive effect size above $g = .2$

3.2.3. Substance Use Outcomes: ACT Compared to CBT

Substance use abstinence was examined on the three studies that compared ACT to CBT. There was a nonsignificant, small effect size favoring ACT over CBT at follow-up ($g = .34$, 95% CI = $-.04, .71$, $z = 1.75$, $p = .08$, $k = 3$).

3.2.4. Smoking Cessation and Drug Use Outcomes

In order to assess for potential differences between smoking and other types of drug use, each category was examined individually. When the five smoking cessation outcome studies were examined alone, a small to medium significant effect size favoring ACT was found ($g = .42$, 95% CI = $.19, .64$, $z = 3.64$, $p < .001$, $k = 5$). The remaining five

drug use outcome studies also demonstrated a small to medium significant effect size favoring ACT at post-treatment ($g = .45$, 95% CI = .15, .74, $z = 2.95$, $p = .003$, $k = 5$).

3.2.5. Publication Bias

An examination of a funnel plot as well as fail safe N and trim and fill methods were utilized to test for publication bias. Visual inspection of the funnel plot for precision (displayed in Figure 2) found a symmetrical distribution, indicating no systematic biases in publishing. Fail safe N estimates indicated that 46 studies finding null results would be required to reduce the overall effect size to levels of statistical nonsignificance. Trim and fill analyses were then utilized and did not indicate the need for any adjustments to the effect size estimate.

3.2.6. Homogeneity Analysis

The Cochran's Q statistic (Cochran, 1954) and the I^2 index (Higgins and Thompson, 2002) were examined to assess for potential heterogeneity across studies. Cochran's Q was nonsignificant ($Q = 3.32$, $P = .95$), indicating that the variance in the effect size distribution across studies may be attributed to sampling error. However, the Q statistic has poor power to comprehensively detect heterogeneity when the meta-analysis utilizes a small number of studies (Gavaghan et al., 2000). Therefore, while a significant result likely indicates problems related to heterogeneity, the nonsignificant result found in the present study does not necessarily mean that heterogeneity is of no concern. The I^2 index indicated that the vast majority of the variability in effect size estimates was due to sampling error within studies, rather than heterogeneity ($I^2 = .00$).

4. Discussion

This meta-analysis examined the efficacy of ACT on substance use outcomes relative to active treatment conditions. It appears that the majority of the current studies in this area tend to be underpowered as only two of the 10 individual studies found significant effects over the comparison conditions. However, the utilization of meta-analytic procedures provided a more stable, aggregated effect size across the studies. When aggregated, results from the 10 included RCTs provide evidence that ACT is likely at least as efficacious as active treatment comparisons (e.g., CBT, nicotine replacement therapy, smokefree.gov, drug counseling, 12-step therapy). This finding was consistent for both smoking and broad drug use populations. Moreover, the results indicate that substance use abstinence is better maintained at follow-up when treated with ACT over other active conditions.

The meta-analysis found a significant small effect at post-treatment for ACT over the control conditions. This effect size increased when follow-up data were utilized in the analysis, indicating either that the positive effects of ACT increase with time or that they at least deteriorate at a slower rate than other active treatments. While these findings are preliminary, they could have important implications for the treatment of substance use if they can be replicated and examined in future studies, as frequent relapse is one of the common problematic characteristics of these disorders (Hsu and Marlatt, 2011). Furthermore, the potentially larger effect at follow up relative to post-treatment is consistent with the theorized “sleeper effect” in ACT in which increasing psychological flexibility post treatment may lead to continued positive behavior change and growth over time (e.g., Gifford et al., 2004). There is a great need to provide treatments for

substance use that maintain outcomes over time and it appears that ACT, at least initially, shows promise in this area.

The final analyses examined smoking separate from other drug use, because smoking creates substantially higher risk for relapse, morbidity, and mortality (General, 2014). When examined alone, both groups demonstrated significant small to medium effect sizes favoring ACT over the active treatment conditions. These findings indicate that ACT might be an effective treatment for reducing various types of substance use disorders. Of note, there is currently only one published RCT that has examined ACT as a treatment for alcohol use disorders, however, they did not report substance use outcome, only treatment dosage, and was therefore not included in the present study (Peterson et al., 2009). The researchers found the average treatment length in the ACT group to be 68% shorter than the TAU group, which was a significant, large effect ($d = .97$). Given these promising results and the initial positive findings in the current study of ACT for smoking and drug use, there is need for additional RCTs examining ACT for alcohol use as well as other types of addictions.

A notable limitation of the current research on ACT for substance use is the lack of process of change data. In general, ACT clinical trials typically include measures of psychological flexibility, the primary process of change, but notably few trials (40%) did so in the area of substance use disorders. This limits the ability to test the psychological flexibility model in treating substance use disorders and to determine how ACT improves substance abstinence over time. Recently, a substance use specific version of the Acceptance and Action Questionnaire (a commonly used ACT-consistent measure of psychological flexibility) was developed (Luoma et al., 2011). Future substance use

related ACT research should utilize this resource in order to better understand this potentially important process of change and the role that it plays in promoting valued living and the reduction of substance use. Furthermore, few of the trials (30%) included measures of quality of life or psychosocial functioning. Fundamentally, the goal of ACT is not to simply reduce substance use, rather it is to improve overall levels of functioning (e.g., living a meaningful, valued life). While a reduction in substance use might sufficiently lead to improved functioning for many, ultimately, it should not be the only focus of treatment and should, therefore, not be the only measure of treatment success. Future research on ACT for substance use disorders should assess ACT-consistent secondary outcome measures such as quality of life, psychosocial functioning, and values consistent living. Given the breadth of psychological problems effectively treated by ACT (Powers et al., 2009), more information is needed on secondary outcomes such as depression and anxiety when treating substance use disorders.

Limitations of the current study include a lack of ethnoracial diversity among each of the studies, which reduces the generalizability of the findings. Also, due to the preliminary state of the research at this time, many of the included studies were pilots, which were generally underpowered, did not include both post-treatment and follow-up assessment, and included only minimal measures of outcome and processes of change. Additionally, per protocol and the more conservative intent to treat outcomes were combined for analysis, which may have increased the variability of the effect size estimates. Finally, although each of the 10 studies had respectable sample sizes, the overall number of studies and participants is relatively low. However, despite the preliminary nature of the studies, they appeared to be methodologically sound. Of the

studies that included therapists, all reported that their therapists were well trained, and all but one included separate therapists for each of the treatment conditions, reducing bias. Additionally, only two studies failed to systematically measure and report treatment fidelity.

The issue of how many studies are required to perform a meta-analysis is worth considering. Unfortunately, there is no clear, objective answer; although, most agree that very few studies are needed in order for a meta-analysis to provide data that can be meaningfully interpreted (Sharpe, 1997; Valentine et al., 2010). Some argue that the heterogeneity introduced when comparing few studies is too great and therefore precludes the use of meta-analytic methods in these cases (Bailar, 1995; Thompson, 1994). Conversely, Ioannidis et al. (2008) state that “statistical heterogeneity alone is a weak and inconsistently used argument for avoiding quantitative synthesis” (p. 1413). They go on to point out that there is no quantitative measure of clinical heterogeneity and argue that meta-analysis is a better tool for examining heterogeneous data than narrative interpretation alone. Moreover, despite the small number of studies, the utilization of multiple pilot studies, and the wide range of substance use and treatment delivery types, the performed tests of homogeneity indicate that statistical heterogeneity is likely not of great concern in the current meta-analysis. This resulted in data that while preliminary in nature, were not premature to be subjected to a qualitative analysis. With these limitations in mind, it is important to recognize the exploratory nature of the analyses, to be cautious when drawing inferences and to note that the effect size estimates are preliminary.

Despite these limitations, the results provide a promising, albeit, preliminary case for ACT as a treatment for substance use disorders. ACT's transdiagnostic model has the potential to effectively treat the broad, complex, and often comorbid populations found in substance use treatment, such as been done in areas of depression (Petersen and Zettle, 2010) and self stigma (Luoma et al., 2012). Additionally, while not exclusive to ACT, novel delivery methods (e.g., telehealth, computer, and phone applications) of ACT are rapidly being explored and have shown promise (e.g., Bricker et al., 2014b).

In conclusion, the results of the current meta-analysis, while exploratory in nature, provide a plausible estimate of the efficacy of ACT as a treatment for substance use. Further study is needed that moves beyond pilot studies, incorporates ACT-appropriate outcome measures, and better examines mechanisms of change that affect substance use and the role that ACT plays in promoting valued living and substance abstinence. While this meta-analysis suggests that ACT for substance use disorders is promising, well-powered randomized trials with long term follow-up and processes of change analysis are now needed.

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Table 1. Characteristics of studies

Study	Problem Area	Treatment Format / Setting	Control Condition (s)	Intention to Treat or Per Protocol		Sample Size	Mean Age (SD)	% Female	Ethnicity % White	Attrition %
				Follow-up	Protocol					
Bricker et al. (2014a)	Smoking	Mobile app and email	QuitGuide app	PP	2 month	196	41.5	52	89.5	ACT: 18.4
							5 (12.9)			TAU: 14.3
							39.0			ACT: 32.2
Bricker et al. (2014b)	Smoking	Telephone	CBT	ITT	3 and 6 month	121	8 (9.80)	69	73	TAU: 35.5
Bricker, Wyszynski, Comstock, & Heffner (2013)	Smoking	Web-based	Smokefree.gov	PP	3 month	222	45.0	62	92.5	ACT: 46.0
							5 (13.3)			TAU: 46.9
							43.0			ACT: 21.0
Gifford et al. (2004)	Smoking	Smoking Cessation Clinic	Nicotine Replacement Treatment	PP	6 and 12 month	76	0 (11.6)	59	72	TAU: 16.0
Gifford et al. (2011)	Smoking	Face-to-face Clinic	Bupropion	ITT	6 and 12 month	303	45.9 (9)	58.7	86.8	ACT: 40.8

							(12.5			TAU:
							0)			48.0
			Intensive							
Hayes et al. (2004)	Opiates	Face-to-face Clinic	12-Step Facilitation Therapy	ITT	6 month	138	0	51	87	ACT: 42.9 ITFS: 40.9
Luoma, Kohlenberg, Hayes, & Fletcher (2012)	Polydrug abuse	Face-to-face Residential program	12-step process groups, skill training	ITT	4 month	133	0	45.86	86	ACT: 11.8 TAU: 18.5
Menéndez et al. (2014)	Polydrug abuse	Face-to-face group Women's prison	CBT	ITT	6, 12, and 18 month	37	0	100	NA	ACT: 0 TAU: 0
Smout et al. (2010)	Methamphetamine	Face-to-face Clinic	CBT	ITT	3 month	104	0	40	NA	ACT: 72.5 TAU: 67.9
Stotts et al. (2012)	Opiates	Face-to-face Clinic	Drug counseling	ITT	None	56	5	37	82.5	ACT: 40.0 TAU: 53.9

Fig. 1. Treatment effects for substance abuse abstinence at the longest available follow-up assessment.

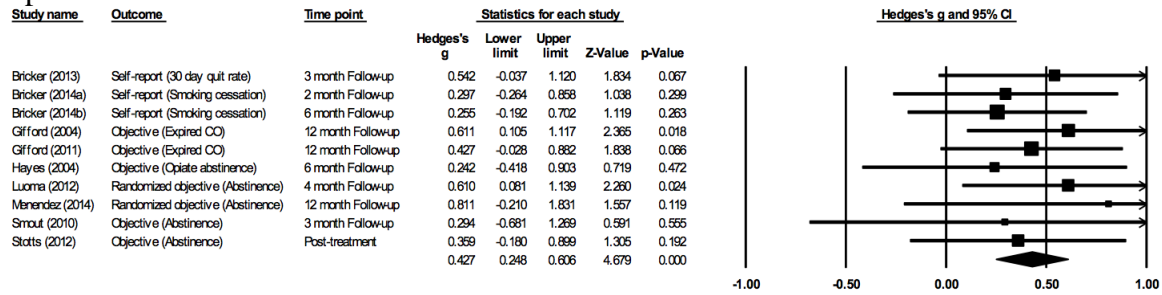


Fig. 2. Funnel plot of precision by hedge's g for measures of substance abstinence at the longest available follow-up assessment.

