The Effect of Significant-Other Involvement in Treatment for Substance Use Disorders: A Meta-Analysis

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Abstract

Objective: Substantial research has accrued in support of a key role for social processes in Substance Use Disorders (SUD). Researchers have developed a range of interventions that capitalize on these social processes to bolster treatment outcomes by involving significant-others (e.g. romantic partners, family, friends) in SUD treatment. Yet dissemination of these treatments to many contexts has been slow, and information on their broad efficacy is lacking. This meta-analysis aims to quantify the effect of significant-other involvement in SUD treatments above and beyond individually-based therapies. **Method:** A total of 4,901 records were screened for randomized controlled trials examining the effect of significant-other involved treatments (SOIT) vs. individually-based active comparator treatments. Our search yielded 77 effect sizes based on data from 2,115 individuals enrolled in 16 independent trials. **Results:** Findings indicated a significant effect of SOIT above and beyond individually-based active comparator treatments for reducing substance use and substance-related problems, d=0.242, $95\%CI$=0.148-0.336, I^2=10.596, Q(15)=16.778. This effect was consistent across SOIT treatment types and endured 12-18 months after the end of treatment. Analyses of raw mean differences indicated that this effect translates to a 5.7% reduction in substance use frequency—the equivalent of approximately 3 fewer weeks a year of drinking/drug use. **Conclusion:** Findings indicate a significant advantage for SOIT in SUD treatment, and hold interesting conceptual implications for theories of SUD maintenance.

Keywords: intervention, substance use disorder, addiction, couples, family

Public Health Significance Statement: We synthesize studies that compare addiction treatments involving significant-others with individual addiction interventions. Results indicate a significant edge for treatments that involve significant others in reducing substance use—an effect that endures beyond 1 year after the end of treatment and translates to a reduction of approximately 3 weeks per year in substance use frequency.

In 1974, in his second special report on alcohol and health to congress, National Institute on Alcohol Abuse and Alcoholism's inaugural director Morris Chafitz referred to couples and family approaches as among the most notable current advances in psychotherapy (p. 116, Chafez, 1974). In the decades since this report was made, substantial empirical research has accrued to support a key role for social processes in the development and maintenance of Substance Use Disorders (SUD; Epstein & McCrady, 1998; Fairbairn & Sayette, 2014; Leonard & Eiden, 2007), and clinical trials have examined the impact of incorporating romantic partners, family members, and other close ones into SUD treatment, adopting a range of modalities spanning those based in Behavioral Couples Therapy to those taking a family systems approach (McCrady, Epstein, Cook, Jensen, & Hildebrandt, 2009; O'Farrell & Clements, 2012). In light of the considerable body of work that has accrued and the compelling potential conceptual implications of this research, it is critical to assess the broad efficacy of integrating significant-others into SUD treatment—an endeavor that can lead to challenges at the level of both patient and institute/provider. The current meta-analysis seeks to aggregate and organize this body of work, quantifying the effect of significant-other involvement (vs. individually-based active comparator treatments) on SUD outcomes in addiction treatment programs.

Basic Close Relationship Processes and Significant-Other Involved SUD Treatments

Both within and outside the sphere of scientific research, the possibility of conceptual connections between processes underlying addiction and those supporting close relationships has long captured the collective imagination. In popular culture, songs comparing addiction to romantic relationships abound, with longing for interpersonal connection being compared to craving for the next drink so often as to enter the realm of cliché (Peele, 2012). Within scientific communities, researchers have reflected on similar patterns of affective, behavioral, and neurobiological responding to addictive substances as to attachment figures (e.g., caregivers,

romantic partners, and other close ones) speculating that, in light of potentially overlapping

substrates underlying addiction and attachment, the rewards and stressors associated with close

relationships may provide a unique context for understanding both the exacerbation of, and also

recovery from, SUD (Burkett & Young, 2012; Fairbairn et al., 2018; Kassel, Wardle, & Roberts,

2007).

While the notion of common underlying substrates for addiction and attachment processes

still exist firmly in the realm of speculation, the strong and reciprocal connection between close

relationship functioning and substance use is well established. Humans are social beings, and thus

human behavior—substance using and otherwise—exists in social context (Baumeister & Leary,

1995). Consistent with this premise, research suggests that close relationship factors predict both

the initial onset and the eventual maintenance of substance use (Fairbairn & Sayette, 2014;

Leonard & Eiden, 2007). In research with both adult and adolescent populations, insecure

attachment relationships with family and romantic partners longitudinally predict substance use

(Fairbairn et al., 2018), and the belief that alcohol enhances social interactions emerges as a robust

predictor of later alcohol problems (Jones, Corbin, & Fromme, 2002). Among treatment seeking

populations, a range of social factors emerge as strong predictors of relapse, including offers to use

substances from friends and family (Eddie & Kelly, 2017; Stout, Kelly, Magill, & Pagano, 2012)

as well as social stressors and relationship conflict (Knight & Simpson, 1996; Leach & Kranzler,

2013). Indeed, longitudinal research with populations of substance users suggests that, above and

beyond the substance users' own behaviors, social behaviors of their close others longitudinally

predict relapse at follow-up (Fairbairn & Cranford, 2016; O'Farrell, Murphy, Neavins, & Van

Hutton, 2000).

In tandem with the burgeoning body of basic correlational research pointing to a key role

for close relationships in SUD, a growing body of randomized clinical trials has accumulated

examining the causal impact of integrating significant-others into SUD treatment. Grounded in

research indicating that most individuals with SUD do maintain regular contact with family and

other close ones (Stanton & Shadish, 1997), these interventions, which we will refer to here

collectively as significant-other involved treatments, feature therapy administered to not only the

individual with SUD but also close others. These interventions have diverged along several

dimensions: significant-others integrated into treatment have ranged from parents to romantic

partners to other family/friends (Dennis et al., 2004; O'Farrell, Murphy, Alter, & Fals-Stewart,

2010), patients targeted have ranged from adolescents to adults (Rigter et al., 2013; Vedel,

Emmelkamp, & Schippers, 2008), and treatments have drawn on therapeutic modalities varying

from Cognitive Behavioral Therapy (CBT) to family systems-based approaches (Liddle,

Rodriguez, Dakof, Kanzki, & Marvel, 2005; McCrady et al., 2016). While varying in certain

elements, significant-other involved treatments are also highly similar along a number of domains,

including a common focus on improving relationship quality and also leveraging social systems to

reduce substance use.

    Although significant-other involved SUD treatments have taken a variety of forms, to date

the most widely researched intervention types are couples-based approaches, family therapy

approaches, and therapies based in the Community Reinforcement Approach. Couples-based

approaches for addiction draw on techniques from Behavioral Couples Therapy to simultaneously

reduce substance use while also working to enhance relationship quality within intimate

partnerships (McCrady et al., 2016; O'Farrell & Clements, 2012). Within such approaches,

patients are taught behavioral techniques aimed at reducing substance use and maintaining

abstinence goals as well as engaging in relationship-building practices with their partners to

improve relationship quality and functioning (McCrady et al., 2016). Similar to couples

approaches, family-focused treatments also aim to reduce substance use by altering elements of the

family dynamic that directly or indirectly support substance use while simultaneously improving

the quality of family relationships. While the majority of these family interventions have been

designed to be implemented with adolescent populations (e.g. Boustani, Henderson, & Liddle,

2016), other variants of family interventions specifically target adult populations and recruit

parents, siblings, or other close family members into treatment to provide social and structural

support for sobriety (O'Farrell et al., 2010). Finally, the Community Reinforcement Approach

differs from couples and family-based approaches in that some iterations of this intervention may

be implemented without the direct involvement of significant-others (Miller, Meyers, & Hiller-

Sturmhofel, 1999). However, significant-other involvement is viewed as an element that enhances

treatment and, in applications of the Community Reinforcement Approach that do involve

significant-others, treatment focuses on increasing positive interactions, decreasing aversive

interactions, and enlisting the significant-other's support to alter contingencies surrounding

substance use (Miller et al., 1999).

Impact and Dissemination of Significant-Other Involved SUD Treatments

While interest in significant-other involved SUD treatments has been apparent for some

time now (Chafez, 1974), attention to these interventions has increased in recent years. This

growing interest has been evident within the addiction research community, as well as within some

applied clinical settings. For example, the Veteran's Health Administration recently recognized

addictions couples therapy as an empirically based practice, taking important strides towards

disseminating couples-based addictions interventions to veterans nationally (O'Farrell et al., 2015).

Meanwhile, family therapy approaches, including Multidimensional Family Therapy, have been

recognized as empirically supported interventions and disseminated across multiple cites

internationally (Rowe et al., 2013; Volkow, 2011). Within the realm of research, there appears to

have been a dramatic surge of interest in significant-other involved SUD treatments since the start

of the 21st century, with almost double the number of studies published from 2001 to 2018

referencing significant-other involved SUD treatments compared to all of the five proceeding

decades (See Figure 1). It's also worth noting that, in light of potentially intriguing conceptual

implications for addiction theory, interest in significant-other involved SUD treatment research has

extended well beyond the applied realm. Specifically, in the context of a basic literature that has

been constrained to correlational methods for examining links between social factors and addiction

(e.g., Fairbairn et al., 2018; Leonard & Eiden, 2007), randomized controlled trials of significant-

other involved SUD treatments featuring individual therapy intervention comparison groups are

prized in that they offer a rare glimpse of potential causal links.

Despite growing interest in significant-other involved SUD treatments, and recent

implementation of these therapies in some contexts, the widespread dissemination of these

treatments has been markedly slow (McGovern, Fox, Xie, & Drake, 2004). Numerous scientists

have remarked that the pace of dissemination for significant-other involved SUD treatments has

not kept pace with empirical research, and have called for the increased dissemination of these

treatments to applied settings (Copello, Templeton, & Velleman, 2006; Klostermann, Kelley,

Mignone, Pusateri, & Wills, 2011; Rowe, 2012). Of note, the implementation of these treatments

into the community is not free of obstacles, and such approaches may involve burden for not only

therapists but also patients and their significant-others (Clark, 2002). For example, regarding

therapists, conducting sessions with SUD patients and significant-others simultaneously can

present providers with new challenges—especially given the level of close relationship distress

commonly associated with SUD—and preparing to deliver such treatments effectively may require

months of didactics and supervision (Liddle et al., 2006). These interventions may also present

challenges for patients, including those associated with scheduling appointments at mutually

convenient times and, in couples/families involving small children, identifying reliable childcare

(Kazdin, Holland, & Crowley, 1997; Mensinger, Diamond, Kaminer, & Wintersteen, 2006).

Lastly, research indicates that some women may be more likely to opt into individual treatment

over couples therapy due to various factors, including personal preferences and concern over

partner support (McCrady, Epstein, Cook, Jensen, & Ladd, 2011).

　　　　In light of widespread interest in significant-other involved SUD treatments, as well as the

potential challenges associated with such approaches, it becomes especially important to gain a

more precise sense of the efficacy of these interventions. In particular, an exact quantification of

the effect for significant-other involved SUD treatment—above and beyond individually-based

treatments—could help providers and also patients make informed decisions about the incremental

utility of implementing such interventions across individual contexts and cases. In addition, such

comparisons, conducted within the context of randomized trials, can also carry intriguing (albeit

broad) conceptual implications for understanding the general role of close relationship processes in

the maintenance of SUD, and thus might ultimately inform addiction theory.

Reviewing Significant-Other Involved SUD Treatments

　　　　Over two decades ago, Stanton and Shadish (1997) conducted a meta-analysis examining

the efficacy of significant-other involved SUD treatments, spanning across modalities ranging

from couples treatment approaches to various family-based therapies. This review included an

analysis of effects from 6 randomized trials comparing the efficacy of significant-other involved

treatments to individually-based treatment as usual. Importantly, however, since the time of this

review's publication, multiple large-scale trials have been published comparing significant-other

involved SUD treatments with "strong" active comparator treatments, increasing the size of this

literature by a factor of several fold (Dennis et al., 2004; McCrady et al., 2009; Rigter et al., 2013).

Also over the course of the past two decades, serious questions have been raised about the research

of scientist William Fals-Stewart[1]—a prolific author whose work was not only represented within

Stanton and Shadish's original meta-analysis, but has also been included in more recent reviews

targeting specific sub-domains of significant-other involved treatments (e.g., Fals-Stewart's work

represented approximately 50% of studies included in Powers, Vedel, & Emmelkamp, 2008 meta-

analysis of Behavioral Couples Therapy). In sum, in light of the burgeoning size of the empirical

literature, along with grave questions raised about some prior research, it is high time for an

updated meta-analysis that quantifies the broad efficacy of significant-other involved SUD

treatments.

In addition to its utility in providing an overall quantification of effect sizes across samples,

an updated meta-analysis might have utility for exploring the consistency vs. variability of effects

across various characteristics of study populations and treatment approaches (i.e., moderators of

treatment efficacy). In particular, while there are commonalities in mechanisms targeted across

family therapies, community reinforcement approaches, and couples-based treatments, there are

also different change processes engaged in some of these treatments that may yield differential

outcomes (Rowe, 2012). Furthermore, given the strain that heavy substance use can put on close

relationships, researchers have called for studies examining whether substance use severity at

baseline is likely to differentially affect treatment outcomes (McCrady et al., 2016). Other factors

of potential interest as moderators of treatment efficacy include type of substance used (e.g.,

alcohol vs. drugs), relationship to significant-other integrated in treatment (e.g., parent vs.

romantic partner), and age group of population targeted (Kraemer, Frank, & Kupfer, 2006).

The Current Review

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[1] The veracity of findings published by William Fals-Stewart is unclear. Thus, and erring on the side of caution, this meta-analysis excludes the work of this researcher.

In sum, within both clinical and research communities, there has been substantial enthusiasm for SUD treatments that involve significant-others. At the same time researchers have noted challenges that can accompany the implementation of these approaches. A review quantifying the broad efficacy of these approaches would help establish the extent to which they produce meaningful changes in substance use and thereby potentially clarify the utility of these approaches and facilitate dissemination. Here we present a meta-analysis of the effect of significant-other involved treatments for individuals with SUD. Note that, in the current review, we chose to target studies comparing significant-other involved treatments with individually-based active comparator treatments. For the purposes of this review, individually-based active comparator treatments are operationalized broadly as active therapy (e.g., evidence-based therapies, treatment as usual/usual care) delivered primarily in a one-on-one setting. This comparison condition was selected as that most likely to be useful to providers seeking to make informed decisions surrounding implementation (i.e., the incremental utility of significant-other involved approaches above and beyond a form of intervention commonly implemented across SUD treatment settings). We also chose this contrast, which permits the isolation of the effect of significant-other involvement, as one with potentially interesting conceptual implications for addiction theory seeking to elucidate the broad role of social factors in the maintenance of SUD.

The primary aim of this review is to quantify the overall effect of significant-other involved treatments for individuals with SUD, examining whether there exists a statistically significant effect of these treatments above and beyond individually-focused usual care. A secondary aim is to examine various potential moderators of this effect, including type of SUD treatment, baseline substance use severity, age and gender of the target population, relationship to significant-other involved, type of substance used, and type of substance use outcome measured.

Methods

Search Strategy

The following strategies were used to search for relevant studies: a) The following database keywords were entered: ("couple* therap*" OR "couple* intervention*" OR "couple* treatment*" OR "conjoint therap*" OR "conjoint intervention*" OR "conjoint treatment*" OR "marital therap*" OR "marital intervention*" OR "marital treatment*" OR "family therap*" OR "family intervention*" OR "family treatment*" OR "community reinforcement") AND ("alcohol" OR "drinking" OR "substance*" OR "addiction" OR "drug*" OR "marijuana" OR "cannabi*" OR "smoking" OR "tobacco" OR "nicotine" OR "cocaine" OR "opioid*" OR "opiate*" OR "heroin" OR "illicit" OR "amphetamine*" OR "benzodiazepine*" OR "prescription drug*" OR "hallucinogen*"). The database searched was PsycINFO. An asterisk (*) was added next to the search terms to capture all variations in the ending of the words (for instance therap*y* or therap*ies*). Search terms were allowed to appear anywhere in the abstract, all subject and indexing, document title, or publication title; b) once a study was identified as meeting inclusion criteria, the reference lists of each eligible study was scanned for other potential candidate studies; c) the reference sections of nine reviews published in the literature on the topic of significant-other involved SUD treatments were scanned for eligible studies (Baldwin, Christian, Berkeljon, & Shadish, 2012; Boustani et al., 2016; Filges, Andersen, & Jørgensen, 2015; O'Farrell & Clements, 2012; O'Farrell & Fals-Stewart, 2003; Powers et al., 2008; Rowe, 2012; Stanton & Shadish, 1997; Tanner-Smith, Wilson, & Lipsey, 2013). The search included studies published prior to January 2019. Together, these search methods yielded a total of 4,901 abstracts, all of which were scanned for potential inclusion in this review.

Inclusion Criteria

Study characteristics. Our search aimed to target studies that compared significant-other involved SUD treatments (SOIT) with individually-based active comparator treatments. Studies

were required to include at least one behavioral treatment that integrated significant-others

(defined as partners, caregivers, or other significant-others such as siblings, or close friends) and at

least one individually-based active treatment comparison condition. Random assignment to

treatment conditions was required. Therapies had to have a clear face-to-face therapy format to be

considered eligible (e.g., text or phone-based treatments were excluded). Studies that recruited

adolescents where parents were only peripherally involved in the individually-based active

comparator treatments (e.g. took part in the assessment or in one psycho-education session) were

considered eligible. Comparator treatments were not required to be time-matched for inclusion in

this review (note that any discrepancies in treatment length between SOIT and comparator

treatments were documented—see below section on data extraction). In order to isolate the effect

of social processes associated with *close* social relationships/attachment relationships, and avoid

confounds, we excluded studies featuring group-based (i.e., not individual) treatments, since social

processes (e.g., the formation of new social bonds) may emerge in the context of group therapy

(Weiss, Jaffee, de Menil, & Cogley, 2004).[2] We also excluded treatment modalities where

significant-others individually sought treatment with the aim of engaging and motivating the

diagnosed individual to start treatment, but the patient him/herself was not involved (e.g.

Community Reinforcement and Family Therapy). Lastly, due to serious questions raised about the

work of William Fals-Stewart (see above), studies that listed Fals-Stewart as a lead author or a

grant receiver on the project were also excluded.

Participant characteristics. Studies were required to recruit individuals with SUD,

defined as individuals identified as meeting specific criteria for use disorders as outlined by the

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[2] Although individually-based therapy remains a common treatment format across many contexts, we wish to
acknowledge that group-based therapy may be a more common form of usual care in some of these settings.
Importantly, the vast majority of studies excluded for this reason included group-based therapy only in the control
comparison and not in the significant-other involved treatment condition—thus introducing a confound. Only 4 of the
excluded samples included group-based intervention across both treatment and control conditions.

Diagnostic and Statistical Manual of Mental Disorders (DSM; e.g., American Psychiatric

Association, 2013) and/or as being identified by study authors as individuals seeking treatment for

alcohol or other substance use. Studies were excluded if they recruited non-clinical samples (e.g.,

heavy drinkers, social drinkers, juvenile offenders not identified as having SUD). Further, studies

were excluded if they exclusively recruited a substance using population that presented with co-

morbid psychotic disorders (i.e., schizophrenia-related disorders), since the focus of treatment in

these studies was often not on SUD. No age or gender restrictions were placed on participants.

Outcome characteristics. Studies were required to include at least one measure of

substance use (e.g., quantity, frequency, abstinence) or substance-related problems measured at

post-treatment (at the end of treatment) and/or follow-up (N months after the end of treatment).

Data Extraction

All study characteristics and effect sizes were coded by both the first author as well as a

research assistant. The following characteristics of studies were coded: (a) sample size; (b) average

age of participants at study initiation; (c) gender composition of participants; (d) type of substance

used (alcohol, drug, or combined alcohol and drug use); (e) type of SOIT—categories included

couple-focused treatments (e.g. Behavioral Couples Therapy), family-focused treatments (e.g.

Multidimensional Family Therapy, Functional Family Therapy, Ecologically Based Family

Therapy, or other-SOIT approaches) and Community Reinforcement Approach; (f) individually-

based active comparator treatment type (e.g., CBT, MET, 12-Step, and "other" individual

treatment approaches)[3]; (g) type of substance use outcome measure assessed (abstinence, use

frequency, use quantity, substance-related problems, and "other use measure")[4]; (h) drinking

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[3] Two studies (Hedberg & Campbell, 1974; Slesnick, Erdem, Bartle-Haring, & Brigham, 2013) involved more than one individual active comparator, and so effects were aggregated into a single comparator categorized as "other."
[4] Alcohol and substance use related outcomes were coded into four broad categories: Abstinence, frequency, quantity, problems, and "other use". The abstinence category captures variables that code for the number of days that the individual was abstinent. The frequency of use category captures the number of days spent using and/or drinking. The

severity at baseline (evaluated as the average percent days spent using and/or drinking); (i) relationship

to significant-other involved (e.g. partner, caregiver, or "other" which capture studies that involve

a mix of individuals such as parents, siblings, children, and/or partners); (j) treatment length

difference (computed as the total number of sessions required for SOIT subtracted from the total

number of sessions for individually-based active comparator). Effect sizes were coded as Cohen's

d coefficients by both the first author and a research assistant. All effect sizes were coded such that

positive effect sizes indicate that the findings favor SOIT over individually-based active

comparator treatments, whereas negative effect sizes indicate that the findings favor individually-

based active comparator treatments over SOIT. If a report did not include sufficient information

for the calculation of treatment effect sizes for at least one substance use outcome, authors were

contacted directly. Nine different authors were contacted, three of whom communicated the

requested information (Dennis et al., 2004; Liddle, Dakof, Turner, Henderson, & Greenbaum,

2008; Slesnick, Erdem, Bartle-Haring, & Brigham, 2013), two authors mentioned that they no

longer have access to the original data (Kalman, Longabaugh, Clifford, Beattie, & Maisto, 2000;

McCrady et al., 1986; McCrady, Stout, Noel, Abrams, & Nelson, 1991). In the case of one study,

the author did not respond to our request and we had insufficient data to calculate an effect size

(Nattala, Leung, Nagarajaiah, & Murthy, 2010).

The study and effect size calculations of the two coders were compared, and any

discrepancies were resolved through discussion until agreement was reached. The average

intraclass correlation (ICC) between the coders was 1.00 for both variables coded on a continuous

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quantity category captures the amount of alcohol or drugs consumed in a given day or week. The problems category
included variables such as consequences of drinking and/or use behaviors as well as alcohol and/or drug related
problems. Lastly, the "other" category captures studies that reported proportions of individuals that met their treatment
goals and measures of heavy drinking days.

scale (age, gender proportion) as well as for the effect size calculations. Cohen's kappa between the two coders was κ=0.97 for categorical variables.

Study Quality Assessment

We used the "Risk of Bias Assessment Tool" developed by the Cochrane Collaboration to assess the quality of the eligible studies (Higgins et al., 2011). Five domains were evaluated by two research assistants to determine the risk of bias for each eligible study: "random sequence generation," "allocation concealment," "incomplete outcome data," "blinding on outcome assessment," and "selective outcome reporting" (see Higgins et al., 2011 for details of the assessment). Of note, we did not include an assessment of the domain of "blinding of participants and personnel" in the current risk of bias assessment. This is because blinding clients and treatment providers to the kind of intervention delivered is not possible in psychotherapeutic treatments (Munder & Barth, 2018). The risk of bias for each domain was rated as either low, unclear, or high based on the criteria specified in the assessment tool. Subsequently, the overall level of risk of bias for each study was determined based on the following ratings of the five domains: a) low risk of bias if all five domains were assessed as having low risk of bias; b) unclear risk of bias if at least one of the five domains was assessed as having an unclear risk of bias and none presented with a high risk of bias; and c) high risk of bias if at least one domain was assessed as having a high risk of bias (see Table 1 for overall level of risk of bias assessment for each study). The overall interrater agreement was κ=0.48, which is comparable to agreement achieved in past studies (Bilandzic, Fitzpatrick, Rosella, & Henry, 2016; Couto, Pike, Torkilseng, & Klemp, 2015). Differences in ratings were discussed in group until unanimous agreement was reached.

Data Analysis

Comprehensive Meta-Analysis 2.0 software was used to aggregate effect sizes across studies (Borenstein, Hedges, Higgins, & Rothstein, 2005). We used a random-effects statistical

model rather than a fixed-effects model because the studies included in this analysis are not

functionally identical (Hedges & Vevea, 1998).

The results for this meta-analysis are presented in stages. First, we computed an aggregate

effect size for all substance use outcomes across both post-treatment and follow-up time-points.

We then broke down this effect by examining it across specific types of substance use outcome

(e.g., frequency, abstinence, problems, quantity, and other). Next, the overall effect size was

parsed according to time-point –post-treatment vs. follow-up time-points, as well as short-term

(less than 12 months) vs. long-term (12 months or more) follow-up. Lastly, we computed overall

effects subdivided by specific types of SOIT (e.g., Multidimensional Family Therapy, Behavioral

Couples Therapy) across all use measures and all time-points.

In cases where studies reported more than one follow-up point, the last follow-up time-

point was used to compute effect sizes. In cases where more than one time point or substance use

outcome was reported, CMA software was employed to compute the mean value of the relevant

outcomes. This approach accounts for clustering within studies by creating an overall average

effect size for each study. Effect sizes were interpreted following guidelines proposed by Cohen

(1988), with 0.20 indicating a "small" effect size, 0.50 indicating "medium," and 0.80 and above

indicating a "large" effect. A 95% confidence interval (CI) was calculated for each effect size

(Lipsey & Wilson, 2001).

Heterogeneity was assessed by examining both Cochran's Q-statistic and its associated p-

value, as well as the I^2 statistic (Cochran, 1954). Cochran's heterogeneity Q-statistic is a

commonly used indicator of variation across studies. A significant Q-statistic indicates that

heterogeneity is present and that there may be differences between study characteristics. Similarly,

the I^2 index is another index of heterogeneity which can be interpreted as the percentage of total

variability due to between study variation, with 25%, 50%, and 75% representing low, medium, and high heterogeneity respectively (Higgins, Thompson, Deeks, & Altman, 2003).

We then followed-up our analysis with random effects meta-regression models to identify study characteristics that may influence the intervention treatment effect size. In carrying out these moderator analyses, we conducted univariate meta-regression models to examine the bivariate relationships between the various explanatory variables and the substance use outcome variables. Effects that reached significance in bivariate regression models were then entered into multivariate models in order to account for possible covariation across predictors that could account for significant effects. Specifically, we examined the effect of treatment length, type of SOIT, individually-based active comparator treatment type, type of substance used, age, gender, relationship to significant-other involved, baseline use severity, and the type of substance use outcome measure assessed as moderators of the effect of SOIT (see section on data extraction). For the purposes of these analyses, effect sizes were aggregated across post-treatment and follow-up time-points as well as across the substance use outcomes. The Q-statistic was used to test the overall significance of moderating effects for categorical variables whereas the standardized meta-regression coefficients and their corresponding p-values were examined for continuous data.

Lastly, we conducted analyses aimed at gaining a better understanding of the clinical utility of integrating significant-others into treatment. To this end, we examined raw mean differences in the substance use frequency outcome comparing SOIT to individually-based active comparator treatments, aggregated across studies.

Results

Study Selection

Of 4,901 articles reviewed 4,556 were excluded on the basis of titles and abstracts. The remaining 345 full-text articles were further assessed for eligibility. Among the 345 papers, 98

were excluded because the treatments in these studies did not compare SOIT treatments to

individually-based active comparator treatments. Fifty-six studies were excluded for not reporting

any substance use related outcomes at post-treatment or follow-up time-points. Thirty were

excluded because the participants who engaged in the studies were non-SUD samples. One

hundred and four studies were excluded because treatment groups were not randomly assigned.

Fourteen studies were excluded because therapy was not conducted in an individual format (i.e.,

included group-based therapy format—4 involving group therapy in both individual and SOIT

conditions). Thirteen studies listed Fals-Stewart as a lead author on a study or a grant receiver on

the study project. Five studies recruited a substance-using population that presented with co-

morbid schizophrenia and/or schizophrenia-related disorders. Four studies examined treatment

modalities where significant-others alone sought treatment, in the absence of the patient

him/herself. Lastly, four studies were excluded because sufficient information was not available

for effect size calculation: some authors indicated that they no longer had access to the original

dataset, and one author did not respond to queries. As a result, a total of 17 reports, derived from

16 independent samples, were included in the current analyses.[5] The study selection process is

illustrated in Figure 2.

Descriptive Statistics

In total, 77 effect sizes calculated based on data from 2,115 individuals enrolled in 16

independent clinical trials were covered by this review. On average, across all studies, participants

were 65.20% male, with an average age of 22.7 (SD= 13.47, Median= 28.2) at study initiation.

Eight studies in the current review integrated primary caregivers (e.g. parents), five integrated

romantic partners, and three studies integrated a mix of individuals (e.g. parents, siblings, children,

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[5] Two studies in this review reported on overlapping samples (Hendriks, van der Schee, & Blanken, 2011; Rigter et al., 2013). Thus, the number of independent samples is slightly lower than the number of reports.

and/or partners). Four of the studies had a couples therapy focus, eleven studies had a family

therapy focus, and two employed the Community Reinforcement Approach. Nine studies reported

a measure of frequency of use or drinking, six studies reported a measure of abstinence, six studies

reported a measure of alcohol or drug related problems, two studies reported a measure of quantity

of alcohol or drug use, and three studies reported substance use outcomes that fall in the "other"

category (e.g., percentage of individuals who have met their treatment goal). Two studies had a 12-

step focused individual treatment approach, six studies had a CBT-focused individual treatment

approach, three studies had an MET-focused individual treatment approach and lastly, five

treatments fell under the "other" treatment category. Fourteen studies reported substance use

outcomes at post-treatment, and fourteen studies reported substance use outcomes at follow-up

time-points. The average length of follow-up was 9.21 months with follow-ups ranging from 3

months to 18 months. See Table 1 for a full report of study characteristics.

Publication Bias

We used three different strategies to assess for publication bias. First, Rosenthal's fail-safe

N was calculated to determine whether publication bias might have influenced the size of the effect

of addiction treatments on emotion outcomes (Rosenthal, 1979). Results indicated that 78

unpublished null results would be required to offset the significant finding, a figure that is beneath

Rosenthal's criteria of 5*k+10 (5*16+10=90). Second, we visually inspected funnel plots of the

data. Funnel plots depict the effect size for each sample against its standard error. When there is no

publication bias, funnel plots approximate the shape of a funnel, with larger samples clustered

around the average effect size at the top of the graph, and smaller samples being more spread out

along the bottom of the graph. When publication bias is present, the bottom of the plot appears

asymmetrical (Sutton, 2009). Visual inspection of the funnel plot indicated that effects were

reasonably evenly distributed around the mean (Figure 3). Lastly, we used Egger's test of the

intercept to calculate for the possibility of asymmetry (Egger, Davey, Schneider, & Minder, 1997).

Egger's test of the intercept yielded a non-significant result, β_0=-0.709, $t(14)$=1.278, p=0.222. This

non-significant finding indicates that bias is unlikely. Taken together, these tests of publication

bias indicate that, although some minor publication bias may have been present, this bias was

unlikely to have had a major influence on results.

Effect of Significant-Other Involvement in SUD Treatment

  Overall effect size. We first aimed to quantify the overall effect of SOIT relative to

individually-based active comparator treatments. This effect was examined by aggregating all

substance outcomes (frequency, quantity, abstinence, problems, and "other use measure") across

all time-points (post-treatment and follow up time-points examined together). Results indicated a

significant effect of SOIT above and beyond individually-based active comparator treatments that

was small in magnitude, d=0.242, $95\%CI$=0.148 to 0.336, k=16 (See Figure 4). Heterogeneity

metrics indicated relatively little variation in the size of these effects at the level of the study,

indicating that the magnitude of effects tended to be consistent across samples, I^2=10.596,

$Q(15)$=16.778, p=0.332, k=16. These findings suggest that across studies, participants enrolled in

SOIT demonstrated significantly reduced substance use and substance-related problems compared

with those enrolled in individually-based active comparator treatments.

  Type of substance use outcome. Next, we ran follow-up analyses breaking down this

effect by specific substance use outcome. Results indicated that effect sizes were generally

consistent across frequency, d=0.172, $95\%CI$=0.048 to 0.296, k=9, abstinence, d=0.173, $95\%CI$=-

0.004 to 0.349, k=6, problems, d=0.185, $95\%CI$=0.005 to 0.365, k=6, and were somewhat higher

for quantity, d=0.358, $95\%CI$=-0.048 to 0.763, k=2, as well as "other use measure," d=0.396,

$95\%CI$=0.256 to 0.537, k=3. Of note, relatively few studies incorporated "quantity" and "other"

use measures, and so effect size estimations might be interpreted with these small study samples in mind.

Follow-up time-points. We then conducted additional analyses separating post-treatment from follow-up time-points. There was a significant main effect of SOIT on overall substance use outcomes at post-treatment that was small in magnitude, $d=0.265$, $95\%CI=0.154$ to 0.376 ($I^2=18.262$, $Q(13)=15.904$, $p=0.254$, $k=14$). In the analysis looking at follow-up time-points only, there was also a small and significant effect of SOIT, $d=0.171$, $95\%CI=0.068$ to 0.274 ($I^2=0.000$, $Q(13)=10.459$, $p=0.656$, $k=14$). Lastly, a further subdivision of follow-up time-points into short-term (0-12 months) and long-term follow-up (12 month follow-up and beyond) revealed a consistent significant small effect in favor of SOIT at both short-term, $d=0.174$, $95\%CI=0.036$ to 0.313 ($I^2=0.000$, $Q(6)=4.938$, $p=0.552$, $k=7$), and also long-term follow-up, $d=0.167$, $95\%CI=0.013$ to 0.321 ($I^2=0.000$, $Q(6)=5.516$, $p=0.480$, $k=7$). Taken together, these analyses indicate that SOIT led to significantly reduced substance use and substance use problems at post-treatment, above and beyond individually-based active comparator treatments, and further that effects of SOIT endured 12-18 months past the end of treatment.

Treatment Length Difference. It is useful to consider these effects within the context of the relative number of sessions required to administer SOIT vs. individually-based active comparator treatments. In the current review, the modal difference in treatment length between SOIT and individually-based active comparator SUD treatments was 0—with SOIT and individual SUD treatments requiring exactly equal numbers of sessions in most studies. However, some studies covered in this review did implement SOIT in a manner that required more sessions (ranging up to 10 sessions), with the average difference in number of sessions being 1.58. We therefore ran a univariate meta-regression examining the bivariate association between difference in treatment length and the magnitude of the effect size produced by the study. The impact of

treatment length difference (SOIT vs. individually-based active comparator treatments) was non-

significant, β=-0.022, p=0.140. This result suggests that treatment length differences did not relate

to the overall effect size of the study, and increased duration of SOIT vs individually-based active

comparator treatments in some studies did not account for significant effects for SOIT.

      Type of SOIT treatment. Finally, we also examined the overall effects subdivided across

specific types of treatment. Of note, the samples of studies were quite low for several

subcategories of treatment, and thus the effects did not always reach statistical significance.

Nonetheless, effects tended to be relatively consistent in their magnitude across Multidimensional

Family Therapy, Functional Family Therapy, Behavioral Couples Therapy, Community

Reinforcement Approach, and other approaches, with a small overall effect across each subset of

trials with the exception of Ecologically Based Family Therapy. Specifically, Behavioral Couples

Therapy had an overall effect of, d=0.212, *95%CI*=-0.017 to 0.441, k=4; Multidimensional Family

Therapy had an overall effect of, d=0.195, *95%CI*=0.059 to 0.330, k=4; Functional Family

Therapy had an overall effect of d=0.369, *95%CI*=-0.006 to 0.744, k=2; Community

Reinforcement Approach treatment had an overall effect of, d=0.120, *95%CI*=-0.146 to 0.385,

k=2; other-SOIT approaches had an overall effect of, d=0.376, *95%CI*=0.161 to 0.589, k=4; and

Ecologically Based Family Therapy had an overall effect of, d=-0.081, *95%CI*=-0.403 to 0.241,

k=2. Of note, the (small) negative effect in the case of Ecologically Based Family Therapy should

be interpreted in light of the relatively small number of studies contributing to its estimation.

Moderator Analysis

      We next conducted meta-regression models examining associations between moderators

and effect sizes across studies. Of note, the results of heterogeneity analyses reported above

indicated low variation across studies and thus we did not anticipate identifying significant

moderators. However, moderator analyses were conducted as a conservative measure and in light

of recommendations that such analyses may sometimes have utility even given non-significant study-level heterogeneity (Higgins et al., 2003).

The univariate analyses revealed that effects were consistent across most of the moderators examined, with no significant effects for type of SOIT implemented, $Q(2)=1.50$, $p=0.471$; individually-based active comparator treatment type, $Q(3)=0.63$, $p=0.890$; age of participants, $\beta=0.005$, $p=0.240$; gender of participants, $\beta=0.002$, $p=0.295$; relationship to significant-other involved, $Q(2)=4.58$, $p=0.102$; use severity at baseline, $\beta=0.006$, $p=0.189$; and type of substance use outcome measure assessed, $Q(3)=3.94$, $p=0.269$[6]. Two moderators did reach significance in univariate models: level of risk of bias, $Q(2)=6.77$, $p=0.034$,[7] and type of substance used, $Q(2)=7.16$, $p=0.028$ (See Table 2). However, these effects did not reach or approach significance in multivariate models: level of risk of bias, $Q(2)=1.29$, $p=0.525$, and type of substance used, $Q(2)=1.68$, $p=0.432$. Taken together, results indicate that effects of SOITs tend to be consistent across treatment, study, and population characteristics.

Clinical Implications: Analysis of Raw Mean Differences

An enduring challenge for intervention research, particularly for systematic reviews, is the interpretation of effect sizes in terms of their tangible implications for the world of clinical practice (Cuijpers, Turner, Koole, Van Dijke, & Smit, 2014; Jacobson & Truax, 1991). A large effect size might reflect large variation between groups, small variation within groups, or some combination of these two (Blanton & Jaccard, 2006). Even when sufficient numbers of studies employ the same

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[6] An alternative analysis was carried out in which we examined a larger grouping for the active comparator treatment type. Specifically, this variable was dichotomized into evidence-based treatments or usual care individual treatment. Analysis of this alternative active comparator variable also yielded a non-significant effect, $\beta=-0.275$, $p=0.143$. Similarly, we examined larger groupings for the relationship to significant-other variable in which we combined the "caregiver" and the "other" groupings, and this moderator analysis also yielded non-significant effects, $\beta=0.123$, $p=0.171$.

[7] In univariate models including all studies, those categorized as high risk of bias produced significantly larger effect sizes vs. studies categorized as unclear risk for bias, $\beta=0.233$, $p=0.010$. However, there was no significant difference between either low vs. high, $\beta=0.212$, $p=0.212$, or unclear vs. low $\beta=0.020$, $p=0.900$.

outcome variable such that an analysis of raw mean differences is feasible, it is sometimes difficult

to translate these numbers into metrics that would be meaningful to a clinician attempting to make

decisions to enhance the welfare of his/her client (e.g., what are the precise implications of a 2-

point reduction on a negative mood scale for the welfare of a depressed patient?). Although the

interpretation of effect sizes represents a challenge across domains of clinical psychology,

substance use intervention research is somewhat unique in that some specific commonly-reported

substance outcomes (e.g., frequency of use, etc.) are readily interpretable across studies and patient

populations. Of note, in the current meta-analysis, the majority of studies (9 of 16) reported

treatment effects in relation to a frequency of alcohol or drug use metric (i.e., number of days of

recent alcohol/drug use)—a measure that not only carries intrinsic meaning but also reflects the

most common outcome assessed in our sample of studies. As these frequency metrics sometimes

differed in the time interval covered (e.g., #days/6 months, #days/year), we converted frequency

metrics into percentages for the purposes of raw mean difference analysis. Results examining raw

mean differences across these studies revealed that SOIT, compared with individually-based active

comparator treatments, yielded an overall 5.69% decrease in number of days of drug and/or

alcohol use, $95\%CI=1.558$ to 9.828. When considered in terms of monthly intake, these results

translate to approximately 2 fewer days of substance use per month or, in terms of yearly intake,

21 fewer days (about 3 weeks) of substance use a year. Follow-up analyses indicated that effect

sizes for studies incorporating a frequency metric, $d=0.187$, $95\%CI=0.063$ to 0.312 ($k=9$), are

generally comparable to effect sizes for studies that do not include such a metric, $d=0.287$,

$95\%CI=0.134$ to 0.441 ($k=7$)—although effect sizes for studies assessing frequency are slightly

lower, suggesting that our estimate of 5.69% may be a conservative one.

Discussion

Over two decades have passed since the publication of the most recent integrative

quantitative review of significant-other involved SUD treatments (Stanton & Shadish, 1997),

during which time the number of clinical trials assessing the efficacy of these interventions has

grown by a factor of several fold. Aggregating effects across trials that together recruited over two

thousand participants, the current meta-analysis integrated results from studies that have compared

the effects of significant-other involved SUD treatments to "strong" individually-focused active

comparator therapies. Significant-other involved treatments examined in this meta-analysis ranged

from couples therapy to family therapy to Community Reinforcement Approaches, and

individually-focused comparison conditions encompassed a variety of empirically-supported

treatments including CBT, MET, and 12-step approaches. Results indicated that, above and

beyond the effects of individually-based active comparator treatments, significant-other integration

into SUD treatment led to an increased reduction in substance use and substance use problems.

Importantly, improved outcomes for significant-other involved treatments extended beyond the

end of treatment, enduring as long as 12 to 18 months post-treatment. When examined as raw

frequency metrics, the effect of significant-other involvement equates to an approximate 6%

reduction in substance use frequency beyond individually-focused treatments—translating to

approximately 2 fewer days a month or 3 fewer weeks a year of drinking/drug use. The magnitude

of this effect was consistent across treatment types, including couples approaches, Community

Reinforcement Approaches, and various family therapy approaches. Effects for significant-other

involvement also emerged as consistent across a range of population and treatment characteristics

including treatment type, participant age, participant gender, type of substance used, substance use

severity at baseline, and relationship to significant-other involved in treatment.

Substance use disorders have been characterized as chronic disorders with pervasive and

sometimes grave negative consequences for the user (American Psychiatric Association, 2013;

Volkow & Li, 2004). These disorders can be somewhat notoriously difficult to treat, with very high rates of relapse (Brownell, Marlatt, Lichtenstein, & Wilson, 1986). Among individuals whose substance use has progressed into more severe forms, even a single episode of use can lead to major legal, interpersonal, and/or medical problems (e.g., incarceration, hospitalization, family disillusionment). Thus, given the potential severity of the disorder, any treatment that offers the possibility for a few additional substance-free days may be valuable. As noted earlier, numerous researchers have called for the more widespread dissemination of significant-other involved SUD treatments as a useful addition to our arsenal of techniques for treating these challenging disorders (Copello et al., 2006; Karlin & Cross, 2014; Klostermann et al., 2011). But dissemination of these treatments has been markedly slow (McGovern et al., 2004). By providing a precise quantification of effect sizes for significant-other involvement in SUD treatment, this review aims to help practitioners make informed decisions about the usefulness of such treatments and so potentially facilitate their dissemination.

The extent to which significant-other involvement represents a useful addition to treatment will naturally vary depending on the individual case. Personal preferences such as how willing a client is to accept support, levels of perceived support from significant-others, or a desire to work on personal issues may represent barriers to the successful integration of significant-others and family members into treatment (De Civita, Dobkin, & Robertson, 2000; McCrady et al., 2011). Furthermore, although efforts have been made to expand these treatments such that they allow for the possibility of involving a range of significant-others and relationship types (Copello et al., 2002), the majority of such approaches still work specifically with family or romantic partners, making them less relevant for those without strong family/romantic ties. Finally, among individuals with milder forms of substance use disorder, negative consequences of use may be less extreme. In such cases, a 6% reduction in use frequency may carry less significance and so the

benefits of significant-other involvement may not outweigh potential barriers (e.g., identifying childcare). Nonetheless, results of the review indicate that integrating significant-others into treatment can lead to reductions in substance use that endure beyond post-treatment and, in many cases, will be meaningful. Further, although some studies included in our sample did require more sessions for significant-other involved treatments, in most cases significant-other involved treatments required equal time commitments as individual therapy and, importantly, there was no association between effect size and differential session frequency.

In addition to implications for clinical practice, results of this review might also have conceptual implications for theory seeking to understand factors contributing to the progression of SUD. The basic literature examining links between close relationship processes and substance use has been characterized nearly exclusively by correlational studies (e.g., Leonard & Eiden, 2007). Thus, although robust associations have been found between various dimensions of close relationships and substance use (Epstein & McCrady, 1998), and in some cases temporal precedence has been established (Fairbairn et al., 2018), no causal relationships can be captured. In this regard, the randomized trials included in this review offer an invaluable resource for addiction theory seeking to understand factors contributing to addiction maintenance/recovery. Note that it is important not to overstate the specificity of inferences that might be derived from these studies— many significant-other involved treatments incorporated diverse change processes including support for drink refusal, modules targeting structural elements and SUD contingencies, daily trust/commitment discussions, as well as exercises intended to enhance the quality of close relationships. Thus, "close relationship processes," as they are captured within the comparisons provided within studies reviewed here, must be conceptualized extremely broadly. Nonetheless, results of these randomized trials, indicating a positive effect of significant-other integration

beyond individual care, move towards providing converging evidence for a causal connection between broad close relationship processes and substance use recovery.

Limitations and future directions should be noted. Similar to most meta-analytic reviews, here we were limited to examining moderators at the level of the sample. Although such sample-level comparisons are appropriate in some cases, and our meta-analysis was reasonably well powered to address some of these sample-level moderators (e.g., gender), they can nonetheless obscure effects and, in some cases, may be especially likely to lead to confounds. For these and other reasons, researchers are increasingly advocating for reviews that account for within study nesting and incorporate participant-level data. Of note, such participant-level analyses may become increasingly more feasible in the future due to data sharing initiatives, such as that recently introduced by the National Institutes of Health. Future reviews with access to participant-level data might usefully re-examine some of the moderators identified here. Second, in the current study, we chose to focus on studies that have incorporated individually-based active comparator treatments. We chose to focus on individually-based comparator conditions to avoid confounds across experimental and control conditions (with a few exceptions, significant-other involved treatments are not administered in groups) and also because other social processes can develop in groups (e.g., the formation of new social bonds) that we believed might complicate interpretations of our findings as they relate to addiction theory. Nonetheless, group-based therapy represents a common form of usual care, and future reviews might consider examining significant-other involved treatments in comparison to group-based active comparator conditions. Third, although our sample of studies was sufficiently large to examine many of the effects of interest here, in the case of some moderator analyses, sub-samples of studies became quite small (e.g., our comparison of effects across specific subtypes of significant-other involved treatments). More research will need to accrue before such moderators can be productively examined in meta-analysis. Fourth, relatively

few studies in this literature directly examine mechanisms of change and, where results of

mechanistic analyses were reported, measures of mechanism were not consistent across studies. As

a result, we were not able to isolate the specific element of close relationship processes (e.g.

relationship quality, structural support for sobriety) responsible for effects. Thus, as noted above,

the question of the precise close relationship process that is responsible for effects of significant-

other involved treatments is left for future research to address. Finally, while reports of quantity of

use can carry useful information, we did not include a raw mean difference analysis of quantity.

Clinical trials included in this meta-analysis focus on multiple substances aside from alcohol, and

so quantity metrics could potentially vary across studies and substances (e.g., a dollar amount for

cocaine, number of drinks for alcohol). Further, given the limited number of studies that reported a

quantity measure, an analysis of raw mean differences across studies for quantity measures was not

feasible.

In sum, the current meta-analysis provides a long overdue update to our understanding of

the efficacy of significant-other involved SUD treatments. Results carry interesting conceptual

implications for theory seeking to understand factors contributing to the maintenance of addiction,

as well as practical implications for clinicians. Findings highlight that capitalizing on the power of

close social bonds to drive behavior can yield useful tools within the context of SUD treatment,

especially if the diagnosed individual is able and willing to involve close ones.

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Table 1

Study Characteristics

Study (Year)	Sample Size	Age	% Male	Substance Type	Type of SOIT	Type of individual tx	Tx length difference	Substance use measure	Time-point	RoB	Relationship to significant-other involved
Azrin et al. (2001)	56	15.40	82.14	CMD	Family (Other-SOIT)	CBT	0	Freq	PT FU (6 mo.)	Unclear	Caregiver
Dennis et al. (2004)	300	N/R	81.33	CMD	Family (MDFT) CRA	MET	9.5	Abs	FU (9 mo.)	Unclear	Caregiver
Hedberg & Campbell (1974)	49	38.20	91.84	AUD	Family (Other-SOIT)	OIACT	0	Other	PT	High	Partner
Liddle et al. (2008)	224	15.40	81.25	CMD	Family (MDFT)	CBT	0	Freq Prob	PT FU (12 mo.)	Unclear	Caregiver
Liddle et al. (2018)	113	15.36	75.00	CMD	Family (MDFT)	MET	0	Freq Prob	FU (12 mo.)	Unclear	Caregiver
McCrady et al. (2009)	102	45.05	0.00	AUD	Couple (BCT)	CBT	0	Abs Other	PT FU (12 mo.)	Low	Partner
O'Farrell et al. (2010)	29	29.09	55.17	CMD	Family (Other-SOIT)	CBT	0	Abs Freq Prob	PT FU (6 mo.)	Unclear	Other
O'Farrell et al. (2017)	61	38.70	0.00	CMD	Couple (BCT)	12-step	0	Abs Freq Prob	PT FU (12 mo.)	Low	Partner

Rigter et al. (2013)	450	16.30	85.00	CMD	Family (MDFT)	CBT	N/R	Freq	PT FU (6 mo.)	Unclear	Caregiver
Schumm et al. (2014)	105	44.40	0.00	CMD	Couple (BCT)	12-step	0	Abs Prob	PT FU (12 mo.)	Unclear	Partner
Slesnick & Prestopnik (2009)	119	15.13	45.38	CMD	Family (FFT) Family (EBFT)	OIACT	N/R	Freq Quant Prob	PT FU (12 mo.)	Unclear	Caregiver
Slesnick et al. (2013)	179	15.40	47.49	CMD	Family (EBFT)	OIACT	5	Freq	PT FU (18 mo.)	Unclear	Caregiver
Vedel et al. (2008)	64	45.50	85.94	AUD	Couple (BCT)	CBT	0	Quant	PT FU (6 mo.)	Unclear	Partner
Waldron et al. (2001)	120	15.61	80.00	DUD (marijuana)	Family (FFT) Family (Joint FFT/CBT)	MET	6	Freq	PT FU (3 mo.)	Unclear	Caregiver
Walker (2001)	25	34.00	54.64	DUD (stimulants)	CRA	OIACT	0	Abs	PT FU (3 mo.)	Low	Other
Yandoli et al. (2002)	119	28.20	63.00	DUD (opiates)	Family (Other-SOIT)	OIACT	N/R	Other	PT	High	Other

Note. SOIT= Significant-Other Involved Treatment; AUD= Alcohol Use Disorder; CMD= Combined alcohol and drug use disorder, with specific drug-type varying within sample; DUD= Drug Use Disorder; CRA= Community Reinforcement Approach; BCT= Behavioral Couple Therapy; EBFT= Ecologically Based Family Therapy; FFT= Functional Family Therapy; MDFT= Multidimensional Family Therapy; Other-SOIT= Other Significant-Other Involved Treatment; CBT= Cognitive Behavioral Therapy; MET= Motivational Enhancement Treatment; 12-step= 12-step focused individual treatment; OIACT= Other Individual Active Comparator Treatment; Freq= Frequency; Quant= Quantity; Prob= Problems; Abs= Abstinence; PT= Post-Treatment; FU= Follow-up; mo.= month; Tx= Treatment; N/R: information Not/Reported; RoB= Risk of Bias. Of note, the treatment length difference was computed as the total number of sessions required for SOIT subtracted from the total number of sessions for individually-based active comparator treatments.

Table 2. Results of Univariate Meta-Regression Analyses Examining Study-Level Moderators of SOIT vs. Individual Therapy Effect Sizes

|	Moderators	Coefficient	p-value	Q-statistics
Treatment length				
	Treatment length	-0.022	0.140	
Risk of bias				
	High	0.233	0.010*	
	Low	0.020	0.900	*Q*=6.77, df=2, *p*=0.034*
Type of significant-other involved treatment implemented				
	Couple	0.476	0.311	
	Family	0.535	0.242	*Q*=1.50, df=2, *p*=0.471
Individually-based active comparator treatment type				
	CBT	-0.031	0.809	
	12-step	-0.113	0.564	
	MET	-0.100	0.509	*Q*=0.63, df=3, *p*=0.890
Age of subjects				
	Age	0.005	0.240	
Gender of participant				
	Percent male	0.002	0.295	
Relationship to significant-other involved				
	Caregiver	-0.289	0.131	
	Partner	-0.132	0.493	*Q*=4.58, df=2, *p*=0.102
Use severity at baseline				
	Severity at baseline	0.006	0.190	
Type of substance use outcome				
	Abstinence	-0.419	0.090	
	Frequency	-0.332	0.089	
	Quantity	-0.215	0.564	*Q*=3.94, df=3 *p*=0.269
Type of substance used				
	Alcohol use disorder	0.200	0.025*	
	Drug use disorder	0.326	0.057	*Q*=7.16, df=2, *p*=0.028*

*p < 0.05

Note. The Q-statistic offers an omnibus test of overall significance when categorical moderators involve more than two groupings. The reference for the type of SOIT implemented was "community reinforcement approach". The reference group for risk of bias was set as "unclear risk". The reference group for individually-based active comparator treatment type, relationship to significant-other involved, and type of substance use outcome were all set as "other". Lastly, the reference for type of substance used was "Combined alcohol and drug use disorder".

Figure 1. Number of studies referencing significant-other involved SUD interventions displayed according to year of publication.
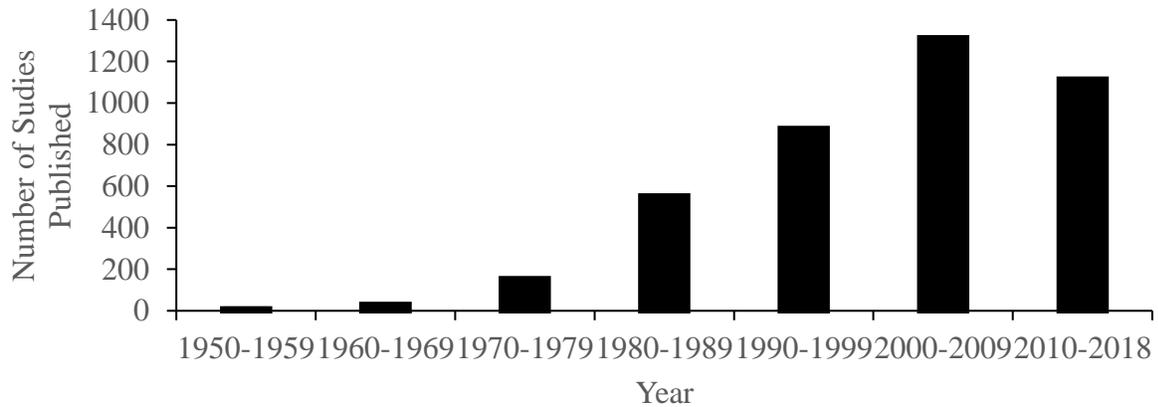
Note. Database search terms used to produce the above results are outlined within the "search strategy" portion of the methods section.

Figure 2. PRISMA flow diagram illustrating the process of identifying eligible studies.
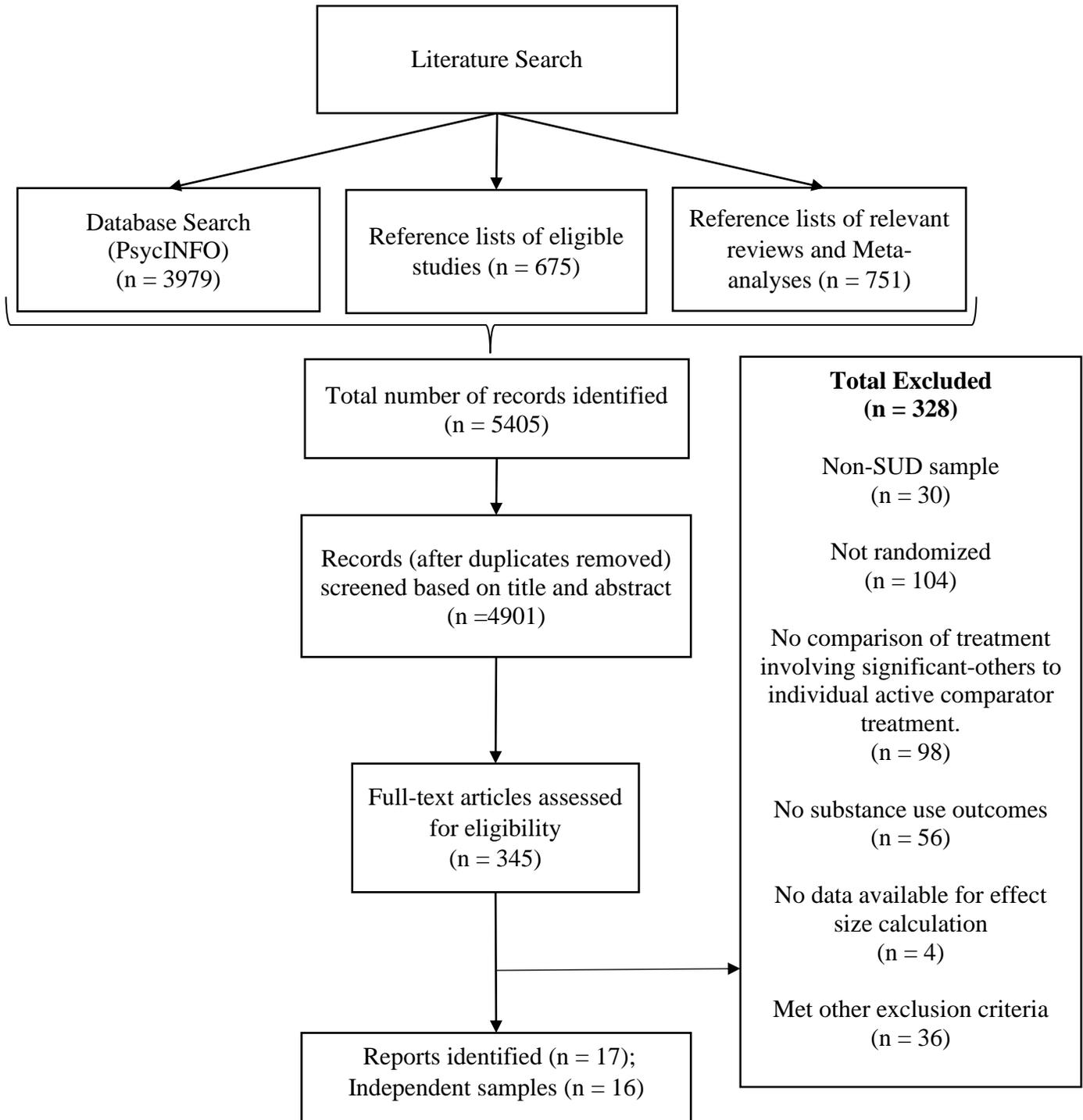
Note. Studies meeting "other exclusion criteria": Fourteen studies did not have an experimental and/or comparison treatment group that had at least one clear face-to-face therapy session component. Four studies included treatment modalities where significant-others sought treatment with the aim of engaging and motivating the diagnosed individual to start treatment. Five studies recruited substance using populations that presented with co-morbid severe mental illnesses. Thirteen studies listed Fals-Stewart as a lead author on a study or a grant receiver on the project.

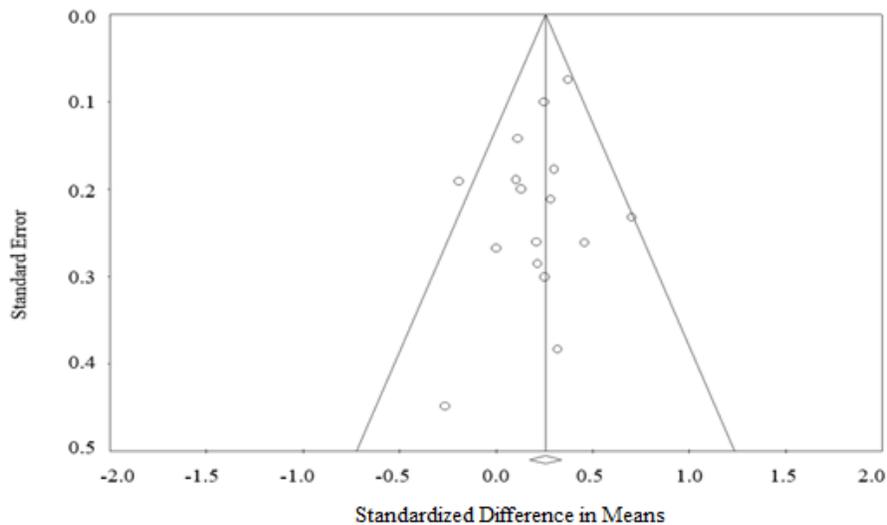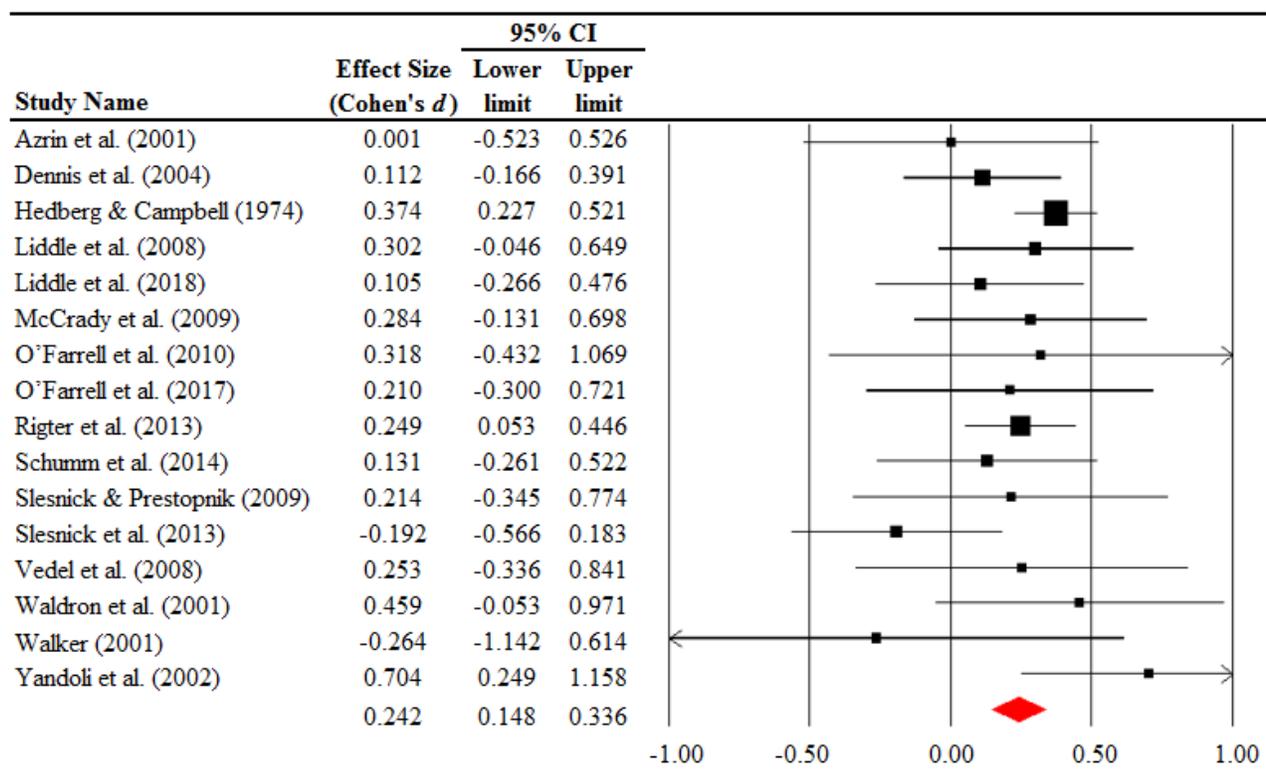*Figure 3.* Funnel plot of studies included in the meta-analysis.

Figure 4. Effect size table with forest plot.

Study Name	Effect Size (Cohen's *d*)	95% CI Lower limit	95% CI Upper limit
Azrin et al. (2001)	0.001	-0.523	0.526
Dennis et al. (2004)	0.112	-0.166	0.391
Hedberg & Campbell (1974)	0.374	0.227	0.521
Liddle et al. (2008)	0.302	-0.046	0.649
Liddle et al. (2018)	0.105	-0.266	0.476
McCrady et al. (2009)	0.284	-0.131	0.698
O'Farrell et al. (2010)	0.318	-0.432	1.069
O'Farrell et al. (2017)	0.210	-0.300	0.721
Rigter et al. (2013)	0.249	0.053	0.446
Schumm et al. (2014)	0.131	-0.261	0.522
Slesnick & Prestopnik (2009)	0.214	-0.345	0.774
Slesnick et al. (2013)	-0.192	-0.566	0.183
Vedel et al. (2008)	0.253	-0.336	0.841
Waldron et al. (2001)	0.459	-0.053	0.971
Walker (2001)	-0.264	-1.142	0.614
Yandoli et al. (2002)	0.704	0.249	1.158
	0.242	0.148	0.336

Note. Cohen's *d* values reported above represent the average of all effects that could be derived from the sample, averaged across all time points (post-treatment and follow-up) and substance use outcomes (frequency, problems, abstinence, quantity, and "other use measure"). Effects subdivided by time point and outcome are presented in the main text.

Appendix

No article has previously been published based on this meta-analytic dataset, nor are there any

articles in press or under review.