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Review

The efficacy of spiritual/religious interventions for substance use problems: A systematic review and meta-analysis of randomized controlled trials

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ABSTRACT

Background: Spiritual/religious (S/R) interventions are commonly used to treat substance use problems, but this is the first systematic review and meta-analysis to examine their efficacy for these problems.
Methods: Ten electronic databases were searched to identify eligible studies (i.e., randomized controlled trials) published between January 1990 and February 2018 that examined S/R interventions' efficacy for substance use or psycho-social-spiritual outcomes. Two reviewers independently screened studies, extracted data, and assessed risks of bias. Robust variance estimation in meta-regression was used to estimate effect sizes and conduct moderator analysis.
Results: Twenty studies comprising 3700 participants met inclusion criteria. Four studies used inactive controls, 14 used active controls, and two used both inactive and active controls and were therefore included in estimating both absolute and relative effect sizes. The absolute effect of S/R interventions (compared with inactive controls such as no treatment) was moderate but non-significant (six studies, d = .537, 95% confidence interval [CI] = −.316, 1.390), possibly due to low power. The relative effect of S/R interventions (compared with other interventions) was statistically significant (16 studies, d = .176, 95% CI = .001, .358). Because only 12-step-oriented interventions were compared with other interventions, this finding does not apply to the relative effect of non-12-step-oriented S/R interventions. Moderator analysis showed that relative effect sizes differ significantly by country.
Conclusion: We found evidence of S/R interventions' efficacy in helping people with substance use problems. More high-quality efficacy studies of non-12-step-oriented S/R interventions for substance use problems are needed.

1. Introduction

Substance use disorders (SUDs) are serious public health problems. Of the global adult population aged 15 years and older, approximately 283 million (5.1%) had an alcohol use disorder in 2016 (World Health Organization, 2018), and 29.5 million (0.6%) had a drug use disorder in 2015 (United Nations Office on Drugs and Crime [UNODC], 2017). Moreover, 28 million healthy life years were estimated to be lost due to premature death and disability from substance use in 2015 (UNODC, 2017). The negative health consequences of excessive substance use include heart disease (Kaye et al., 2007), cancer (Aldington et al., 2008; Bahorik et al., 2017), premature mortality (Chen and Lin, 2009), chronic pain, hypertension, injuries, poisonings, overdoses (Bahorik et al., 2017), infectious diseases (e.g., hepatitis, HIV, tuberculosis), and injury-associated disability (Chen and Lin, 2009). In addition, mental health consequences extend from short-term emotional, perceptual, or cognitive disturbances (Zeller, 2007) to full-blown episodes of psychiatric disorders such as methamphetamine and cannabis psychosis (Moore et al., 2007). Social consequences include violence (Boles and Miotto, 2003; Sommers et al., 2006); lower educational attainment (Macleod et al., 2004; Silins et al., 2014), income, and life satisfaction; and greater welfare dependence, unemployment, and criminal behavior (Fergusson and Boden, 2008; Brook et al., 2013).

Given the wide range of problems associated with substance use, interventions to prevent or buffer these significant harms to individuals, families, communities, and society at large are needed. Spirituality/religiosity (S/R) has been identified as a protective factor against substance use (Koenig et al., 2012; Walton-Moss et al., 2013), and S/R is

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commonly employed in substance use interventions.

1.1. Spirituality/religiosity

We define spirituality as the universal and fundamental human quality of searching for meaning, well-being, and profundity through connections with oneself, others, and the universe, and religion as an institutionalized system of beliefs, values, and practices oriented towards spiritual concerns and transmitted over time by a community (Canda and Furman, 2010), i.e., religiosity refers to membership and participation in an organized religion (Cohen et al., 2012). Spirituality and religiosity are both multidimensional constructs that can include behavioral, cognitive, existential, ritualistic and social components (Connors et al., 1996; Laudet et al., 2006; Miller and Thoresen, 2003). This review considers spirituality and religiosity as overlapping but distinguishable constructs that share some characteristics but retain non-overlapping features (e.g., Miller and Thoresen, 2003; Zinnbauer et al., 1997). However, since the terms spirituality and religiosity are often used interchangeably in the literature (Hill et al., 2000), S/R in this review includes both spirituality and religiosity. We define S/R interventions as treatment and prevention efforts that include a key S/R component (Hodge, 2006; Stoltzfus, 2007). Examples of S/R interventions include spiritually modified cognitive behavioral therapy [CBT], 12-step-oriented interventions (e.g., Twelve Step Facilitation [TSF]), prayer, and Rites of Passage (an Africentric intervention used for preventing substance use among African-American adolescents, which includes a spiritual component adapted from traditional African spirituality) (Harvey and Hill, 2004; Stoltzfus, 2007).

1.2. Previous reviews on S/R interventions for substance use

Five related reviews on S/R interventions (Emrick et al., 1993; Ferri et al., 2006; Kownacki and Shadish, 1999; Stoltzfus, 2007; Tonigan et al., 1996) yielded mixed findings, have methodological limitations, and none included evidence generated after 2006. Stoltzfus's narrative review (2007) provided preliminary information on S/R substance use interventions' effectiveness. However, Stoltzfus's review (2007) has some weaknesses that this study aims to improve upon. For example, the review did not use systematic search or screening procedures necessary to identify all relevant studies, nor did it include a meta-analysis to aid in understanding the range of treatment effects. In addition, it was not selective in terms of the designs of the primary studies reviewed (e.g., use of experimental designs) and thus may be biased by evidence from low-quality studies. The other four reviews focused exclusively on Alcoholics Anonymous (AA) and did not examine the effects of non-AA S/R interventions (Emrick et al., 1993; Ferri et al., 2006; Kownacki and Shadish, 1999; Tonigan et al., 1996). Three of the four reviews were meta-analyses and provided effect sizes for AA, but causal inferences cannot be drawn because two were based entirely on correlational studies (Emrick et al., 1993; Tonigan et al., 1996) and the other review's evidence came from only three randomized controlled trials (RCT) and nine quasi-experimental studies before 1995 (Kownacki and Shadish, 1999).

1.3. The present study

This is the first systematic review and meta-analysis examining the efficacy of S/R interventions for substance use problems. It improves on and updates similar reviews' findings by: (1) using a systematic approach to ensure the inclusion of most, if not all, relevant studies on S/R (both AA and non-AA) interventions' efficacy for substance-use-related problems; (2) synthesizing the best evidence from studies with RCT designs, the gold standard for causal inference; (3) including studies published/completed from 1990 to 2018; (4) providing a quantitative synthesis of the literature by estimating effect sizes on the magnitude of S/R interventions' efficacy and examining potential moderators of S/R interventions' efficacy; (5) presenting clearer clinical implications by separately synthesizing effect sizes from studies that compared S/R interventions with (a) inactive control conditions (no treatment, waiting list controls, or standard care) and (b) active controls (other interventions). Karlsson and Bergmark (2015) found that Cochrane and Campbell reviews on psychosocial treatments for SUDs paid little attention to use of different types of control groups. In the present review, effect sizes from studies with inactive controls can inform decisions about whether to employ S/R interventions when no other intervention is available or whether to add S/R interventions to standard care; whereas, effect sizes from studies comparing S/R interventions with active controls should be considered when making decisions about whether to choose S/R interventions over other interventions.

2. Method

2.1. Eligibility criteria

To examine S/R interventions' efficacy in reducing substance use and enhancing participants' psycho-social-spiritual wellbeing, the studies included had to meet the criteria described below.

2.1.1. Study participants

Study participants had to have substance use and misuse problems but could be of any age. A formal SUD diagnosis was not required because (1) many people receiving substance use treatment may have problems that do not rise to the level of SUD diagnostic criteria, (2) many who met SUD criteria might not receive a formal diagnosis, and (3) SUD classification and criteria have changed between 1990 and 2018 (Rehm et al., 2013).

2.1.2. Interventions

Studies had to examine S/R interventions' effectiveness and/or efficacy for treating or preventing substance use problems. Since interventions had to be S/R, studies of interventions designed to increase 12-step fellowship (e.g., AA and Narcotics Anonymous [NA]) attendance through referral were excluded. Given a recent systematic review and meta-analysis of mindfulness-based interventions for substance use problems (Li et al., 2017), and since there is no consensus on whether these interventions are S/R, mindfulness-based interventions were excluded.

2.1.3. Control conditions

Control conditions were defined as inactive controls (no treatment, waiting list control, standard care) or active controls (non-S/R interventions). We defined standard care as a treatment received by both the experimental group (S/R intervention + standard care) and the control group (standard care) and therefore considered standard care an inactive control (Higgins and Green, 2011; Karlsson and Bergmark, 2015).

2.1.4. Study outcomes

Studies had to focus on substance use outcomes (e.g., use frequency, abstinence rate), S/R outcomes (e.g., spiritual wellbeing, daily spiritual experience, religious practice, spiritual coping), psychological outcomes (e.g., depression, anxiety, self-efficacy), and/or social outcomes (e.g., employment, relationship status). Studies that measured psycho-social-spiritual outcomes but not substance use outcomes were included because psychological (e.g., Booth et al., 2010; Buckner et al., 2007), social (e.g., Fleming et al., 2010; Walton and Hall, 2016), and S/R (e.g., Chitwood et al., 2008; Walton-Moss et al., 2013) outcomes are important contributors and potential mediators to recovery and are consistently found to be associated with reduced substance use. Studies measuring only treatment retention or AA attendance were excluded.

2.1.5. Study design

Studies had to employ a RCT design.

2.1.6. Publication date

In 1990, the U.S. Institute of Medicine (1990) called for more rigorous research on AA, and this resulted in more federally funded studies on AA (Kelly, 2017). A scoping review by the present review's authors found that most efficacy/effectiveness studies of non-AA S/R interventions were also conducted after 1990. Thus, studies in this review had to be published or completed (e.g., unpublished studies or dissertations) between January 1990 and February 2018.

2.1.7. Other criteria

Studies from any country were included, but they had to be written in English and include sufficient data for calculating effect size.

2.2. Search strategy

The Cochrane recommendations for identifying RCTs were followed (Higgins and Green, 2011). Ten electronic databases were searched: PsycINFO, SocINDEX, Religion and Philosophy Collection, MEDLINE, CINAHL Plus with Full Text, PsycARTICLES, Psychology and Behavioral Sciences Collection, Dissertations and Theses Global, National Registry of Evidence-based Programs and Practices (https://www.samhsa.gov/nrepp), and Specialized Register of Trials of the Cochrane Group on Drugs and Alcohol (http://cda.cochrane.org/). Database-specific strategies were used for each database. An example of the search terms used is (religio* OR spiritual* OR faith OR Buddhis* OR Christian* OR Muslim OR Jewish OR native OR indigenous OR holistic OR alternative OR pray* OR script OR shaman* OR exorcis* OR church OR twelve step OR Alcoholics Anonymous OR Narcotics Anonymous OR Rites of Passage OR Sweat Lodge Ceremony OR Celebrate Recovery OR Salvation Army Adult Rehabilitation Center OR Teen Challenge) AND (intervention OR program OR treatment OR center OR therapy) AND (substance OR drug OR alcohol OR tobacco OR marijuana OR cannabis OR cocaine OR heroin OR prescription OR addict* OR chemical dependency OR recovery OR abstinence OR sobriety), with an * on some words to include multiple variations of that term. We also reviewed the reference lists of relevant studies and reviews to identify potentially eligible studies.

2.3. Study selection

All identified articles were exported into Covidence.org, a platform for Cochrane Reviews where reviewers can independently vote for each study during the screening process and which automatically removes duplicates. Two reviewers independently conducted title and abstract screening and full-text review. Inter-rater agreement (i.e., number of studies with reviewer consensus divided by total number of studies screened) was 96%. Disagreements during screening were resolved through discussion.

2.4. Data extraction

A data extraction form was used to summarize and analyze study information based on Cochrane's recommendations (Higgins and Green, 2011). The form was pilot-tested and modified before formal data extraction. Two reviewers coded the studies separately and discussed areas of discrepancies until they achieved agreement.

2.5. Risk of bias assessment

Two reviewers independently conducted risk of bias assessment using the Cochrane Collaboration's risk of bias tool. Studies were rated high, low, or unclear risk in seven domains: sequence generation (whether randomization method used to generate participants' group assignment can produce comparable groups), allocation concealment (whether concealment method used can prevent participants' group assignment from being identified before or during enrollment), blinding of participants and personnel (whether measures were used to prevent participants and researchers from knowing participants' group assignment), blinding of outcome assessment (whether measures were used to prevent outcome assessors from knowing participants' group assignment), incomplete outcome data (completeness of data for each main outcome, including attrition and exclusions from analyses), reporting bias (whether selective outcome reporting was present), and other sources of bias (e.g., baseline characteristics of treatment groups being compared differed systematically) (Higgins and Green, 2011).

2.6. Data analysis

Data analysis consisted of four steps: (1) calculating descriptive statistics of study participant characteristics using Microsoft Excel, (2) estimating individual effect sizes using IBM SPSS, (3) synthesizing effect size estimates and conducting moderator analysis using robust variance estimation in meta-regression via the R software robumeta package, and (4) assessing publication bias using Macro (Vevea and Hedges, 1995). Effect sizes of continuous study outcomes were estimated using Hedges's *g* effect size (Cooper et al., 2009). Dichotomous outcomes were transformed to odds ratios and then into Hedge's *g*, and *F*-statistics were also converted into Hedge's *g*. Effect sizes were adjusted using Hedge's small sample size correction for unbiased estimates (noted as d) (Hedges and Olkin, 1985). Effect sizes from studies with inactive controls and from studies with active controls were synthesized separately. In addition to overall effect sizes of the overall efficacy of S/R interventions, effect sizes for substance use outcomes (e.g., days of use in previous 90 days, days to relapse) and for psychosocial-spiritual outcomes (e.g., religious practice, spiritual coping, depression, anxiety, self-efficacy, self-esteem, employment, relationship status) were also calculated separately. Attempts to investigate intervention effect sizes by specific measure were unsuccessful given degrees of freedom < 4 leading to untrustworthiness (Tipton, 2013).

Moderator analyses were conducted for inactive and active control studies separately in order to investigate the potential moderating effects of report type (published or unpublished), 12-step orientation (12-step based or not), manualization (manualized or non-manualized intervention), country, delivery personnel (professional, peer, self, researcher, other), treatment format (individual, group, individual plus group, other), fidelity measurement (measured fidelity or not), gender (percent male participants), race/ethnicity (percent White participants), and treatment length (total number of sessions). However, low variability of some potential moderators prohibited conducting such analyses. For inactive control studies, report type, country, delivery personnel, and treatment format lacked variability; for active control studies, 12-step orientation and delivery personnel lacked variability. Statistical significance was set at 0.05 when degrees of freedom associated with the moderators were ≥ 4, and at 0.01 when degrees of freedom were < 4 (Tanner-Smith et al., 2016; Tipton, 2015). Publication bias was assessed visually using a funnel plot of effect size estimates graphed against their standard errors and via a sensitivity analysis using the Weight Function Model (Vevea and Woods, 2005).

3. Results

3.1. Search results

Fig. 1 contains a PRISMA diagram of the search and selection processes (Moher et al., 2009). After removing duplicates, 2306 articles remained for screening; 2100 articles were excluded based on titles and abstracts; and 186 articles were excluded in full-text review. In total, 20 studies from 20 articles met inclusion criteria and were included in the final review.

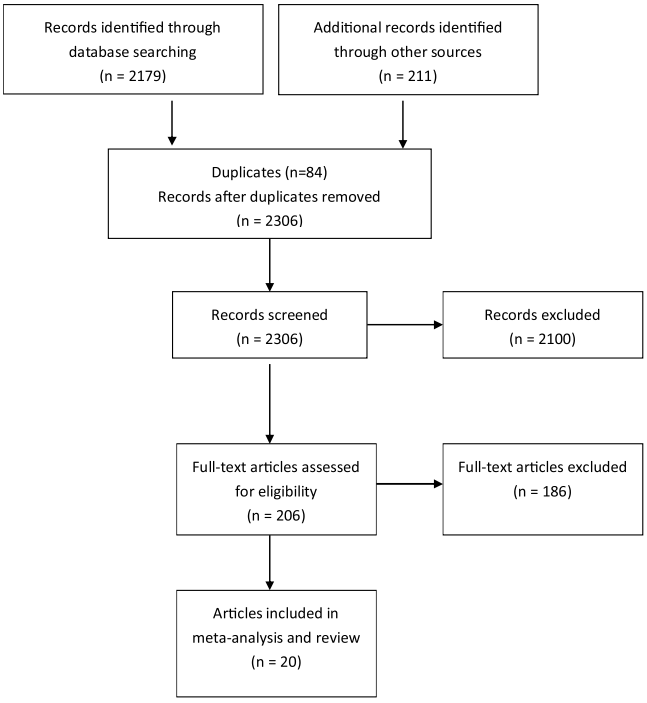

Fig. 1. Flow diagram of study selection process.

3.2. Study characteristics

Table 1 presents characteristics of the 20 studies. All employed an RCT design with participants randomized at the individual level. A total of 3700 participants were included. Individual study samples ranged from 30 to 952. Sixteen studies (80%) were published and four studies (20%) were dissertations or theses. Ten studies (50%) were conducted between 1990 and 1999, six (30%) between 2000 and 2009, and four (20%) between 2010 and February 2018. Sixteen studies (80%) were conducted in the United States, one in Nigeria, two in Iran, and one in Canada. Four studies (20%) used inactive controls, 14 (70%) used active controls, and two (10%) used both. Comparison interventions include CBT, integrated CBT, Acceptance and Commitment Therapy, methadone maintenance treatment, family-of-origin therapy, clinical management, group drug counseling, minimal treatment approach, guided imagery, Motivational Enhancement Therapy, and the Community Reinforcement Approach. Of the 15 studies that measured substance use outcomes, four relied solely on self-reports, while 11 used methods considered more reliable (e.g., laboratory tests, collateral- plus self- reports). All 12 studies that measured psycho-social-spiritual outcomes used standardized self-report measures.

3.3. Participants' characteristics

Seventeen of the 20 studies reported participants' average age, ranging from 17.6 to 49. Of the 18 studies that reported gender, 15 were primarily composed of male participants, ranging from 59% to 100% of the sample (four studies had male participants only), while one study included only women who were pregnant or had young children. Of the North American studies (16 in the U.S. and one in Canada), ten (59%) had predominately White participants (57.9% to 100%), while seven (41%) had predominantly Black or Latino participants (50% to 80%). The one Nigerian and two Iranian studies did not provide participants' race/ethnicity. Four studies (20%) focused on veterans and one study (5%) on men who had recently received an early prison release, been paroled, or been convicted of a federal crime and placed on probation.

Four studies (20%) focused on individuals with any SUD, two (10%) on substance-dependent adults with co-morbid depressive disorders, five (25%) on people with alcohol dependence/abuse, five (25%) on people with cocaine dependence/abuse, two (10%) on cocaine-dependent people with alcohol or other substance abuse/dependence, one (5%) on people with opiate dependence, and one (5%) on people with psychoactive substance abuse/dependence. Of the 14 studies (70%) that reported diagnostic criteria, 13 were North-American and used the Diagnostic and Statistical Manual of Mental Disorders (DSM-III, DSM-III-R, and DSM-IV), while the Nigerian study used the International Classification of Diseases (ICD) 10 (Adekeye and Sheikh, 2009).

3.4. S/R intervention characteristics

The S/R interventions in 16 studies (80%) were 12-step oriented. Eleven of them (69%) tested TSF or TSF adaptations. TSF, developed to promote active participation in AA fellowship activities (Project Match Research Group, 1993), was originally intended to be implemented by professional counselors as 12–15 sessions of individual counseling based on behavioral, spiritual, and cognitive principles that form the core of 12-step fellowships such as AA and NA (Nowinski, 2000). Two studies adapted the original TSF to group format (Brown et al., 2006; Glasner-Edwards et al., 2007), and another increased the number of individual sessions to 32 and added 16 group sessions (Hayes et al., 2004).

The other five 12-step-oriented intervention studies utilized either AA/NA meetings or group/individual counseling consistent with 12-step content and/or structure and encouragement or requirements to attend AA. The intervention in Brennan's (1998) study was based on application and interpretation of AA/NA's 12 Steps and Twelve Traditions and inspirational guidance offered in the "Big Book." It adopted the three-tier TSF approach and included (1) group counseling sessions for discussing the 12 Steps, Twelve Traditions, and personal challenges to sobriety, (2) mandatory AA/NA meetings, and (3) social/recreational activities which participants planned or participated in with family/friends and program staff (Brennan, 1998). Davis et al. (2002) defined their intervention as standard alcoholism treatment in the United States (a 3-week orientation period consisting of group therapy, education sessions, community meetings, and a minimum of six AA meetings followed by group therapy which incorporated many AA concepts and ongoing encouragement to attend AA). The other three studies lacked details on the intervention's content/structure but used a course of NA (Azkhosh et al., 2016), 18 h of educational lecture based on 12 Steps (Brantley, 1990), and manualized individual drug counseling consistent with 12-step content/structure (Crits-Christoph et al., 1999).

Four studies (20%) investigated the efficacy of non-12-step-oriented S/R interventions. Adekeye and Sheikh (2009) tested CBT with religiosity components but did not describe these components. Khaledian et al. (2017) focused on a spiritual therapy that emphasized Islamic teachings including counseling and debate about spirituality and addiction, Komail prayer, worship, and religious practices, Quran verses and interpretation, forgiveness and repentance, divine grace and compassion, etc. O'Leary (2007) developed Spiritual Direction specifically for her study. This S/R intervention, delivered by trained spiritual counselors using a client-centered style and motivational interviewing techniques, was not linked to any particular religion and was designed to help individuals explore their own spirituality. Content included meditation, prayer, fasting, self-care, attentive awareness, solitude, acceptance, service, reconciliation, worship, gratitude, guidance, and celebration. Walker et al. (1997) conducted a double-blinded RCT study to test the efficacy of intercessory prayer with patients entering alcohol abuse or dependence treatment. Volunteers who reported more than five years of regular intercessory prayer experience and a belief that their prayers were discernably answered, at least on occasion, were recruited from the community. Each was assigned three patients, given their first name and research number only, and agreed to pray daily for them for 6 months. The suggested prayer approach was nondirective

Table 1
Characteristics of studies included in the review (n = 20).

Authors (year), country	Demographic (Mean Age, Race, Gender, Any Special Characteristics)	Substance Use Problem	S/R Intervention	Delivery (modality, length/ frequency)	Manual-ized	Fidelity	Comparison	Outcomes (Measurements)	Main Findings
Adekeye and Sheikh (2009), Nigeria	17.6 yo, racial composition not reported, 100% male	SUDs (ICD 10 diagnostic criteria)	CBT (standard care) + components of self-efficacy and religiosity; treatment content not reported	Modality not reported, 15 sessions	No	No	Inactive control: CBT (standard care)	Self-efficacy (GSE, ASE, SSE), religiosity (ROS)	Self efficacy and religiosity were found to be effective components of CBT in substance use disorders as this led to sustained abstinence over a six month assessment period compared to the control.
Azkhosh et al. (2016), Iran	27.47 yo, racial and gender composition not reported	Opiate dependence	12-step NA, treatment content not reported	Modality and length/ frequency not reported	No	No	1. Active control: methadone maintenance treatment; 2. Active control: acceptance and commitment group therapy	Psychological wellbeing (PWS), psychological flexibility (AAQ-R)	Compared to the methadone maintenance treatment control, NA group showed significantly improvement in psychological well-being, self-acceptance, personal growth, but not in psychological flexibility, autonomy, or purpose in life.
Brantley (1990), USA	28.75 yo, 73.3% White; 26.7% Black, 100% male	Alcohol abuse	18 hours of educational lecture based on the Twelve Steps of AA + standard care	Group format, 3 sessions/ week and 1 h/session for 6 weeks	No	No	Active control: family-of-origin therapy + standard care	Alcohol abstinence (case records), self-esteem (TSCS)	There was no significant difference in outcomes between the 12-step education group and family-of-origin therapy group.
Brennan (1998), USA	36.34 yo; 46% Black, 38.5% White, 14% Latino, 100% male, early release/parole/ probation	Substance abuse	12-step-oriented treatment that borrows the three-tier approach of the Project MATCH's TSF therapy and based on AA/NA's 12-step tradition	Group format; Group Counseling Sessions: 1 hour/session and 2 sessions/week, AA/NA meeting: a minimum of 90 meetings in 90 days for new members, Social Recreation Group: participants and families/ friends and staff attend at least once a month	No	No	Active control: CBT	Heroin use (urine test), abstinence (urine test), employment status (self-report), relationship status (self-report)	Significant group difference was found in relationship status but not in other outcome variables.
Brown et al. (2006), USA	48.8 yo, 74% White, 92.4% male ; veterans	Substance dependence + depressive disorders comorbidity	TSF group intervention (adapted original TSF to group format) + standard pharmacotherapy of	Group format, two consecutive 12-week phases of intervention. Phase I: twice weekly one-hour group sessions	Partially	Yes, assessed through reviewing videotapes of sessions, fidelity	Active control: integrated cognitive behavioral therapy (ICBT) + standard pharmacotherapy of	Substance use (TLFB), depression (HDRS)	Both TSF and ICBT produced improvement in depression and substance use during

(*continued on next page*)

Table 1 (*continued*)

Authors (year), country	Demographic (Mean Age, Race, Gender, Any Special Characteristics)	Substance Use Problem	S/R Intervention	Delivery (modality, length/ frequency)	Manual-ized	Fidelity	Comparison	Outcomes (Measurements)	Main Findings
			monthly medication management	plus monthly medication management; Phase II: once weekly one-hour group sessions plus monthly medication management. In total, 36 sessions, 36 hours, 24 weeks.		assessment results not reported	monthly medication management		treatment, but ICBT may yield more stable outcomes post treatment.
Brown et al. (2002), Canada	38 yo; 92.5% White; 68.7% male	Psychoactive substance abuse/dependence (DSM-III-R)	TSF group intervention	Group format; 1 session/ week for ten weeks, 1.5 hr/session	Partially	No	Active control: relapse prevention	Psychoactive substance use (TLFB), abstinence (TLFB), Addiction severity (ASI), self-efficacy (ADUSE), spirituality (B-PRPI)	Both treatments were associated with significant improvements on all substance abuse outcome measures. But no between-group effects of treatment on any of the outcome variables were detected.
Carroll et al. (1998), USA	30 yo; 61% Black or Latino; 39% White; 73% male	Cocaine dependence + alcohol dependence/abuse (DSM-III-R)	(1) TSF + disulfiram; (2) TSF only.	Individual format; TSF: 2 sessions/week for the first month and 1 session/ week for 2 months.	Yes	Yes, sessions were videotaped for supervision and rated by blind evaluators; fidelity not reported	Active control: TSF vs CBT Active control: TSF + disulfiram vs clinical management (CM) + disulfiram; Active control: TSF + disulfiram vs CBT + disulfiram	Cocaine abstinence and alcohol abstinence (self report, breathalyzer, urine test)	TSF was associated with reduced cocaine use over time compared with clinical management.
Carroll et al. (2012), USA	38.3 yo; 64% White, 22% Black; 14% Latino; 59% male	Cocaine dependence (DSM-IV)	(1) TSF + disulfiram (2) TSF + placebo	Individual format, 1 session/week for 12 weeks	Yes	No	Active control: TSF + disulfiram vs standard counseling (SC) + disulfiram Active control: TSF + placebo vs SC + placebo	Cocaine and alcohol use abstinence (percent days of cocaine use measured by Substance Abuse Calendar + urine test)	TSF was associated with less cocaine use throughout treatment and a higher number of cocaine-negative urines.
Crits-Christoph et al. (1999), USA	33.9 yo; 57.9% White, 39.8% Black; 76.8% male	Cocaine dependence (DSM-IV)	12-step-oriented individual drug counseling + group drug counseling (GDC); individual drug counseling is consistent with philosophy of 12-step-oriented approach in content and structure	Individual + group format; individual counseling: 50 minutes/ session, 6-month active phase and a 3-month booster phase; During the first 3 months, 2 session/ week; during next 3 months, once a week. During booster phase, 1 session per month.	Yes	Yes, audiotape ratings and good fidelity reported	Active control: cognitive therapy + GDC (standard care) Active control: supportive-expressive therapy + GDC Inactive control: GDC (standard care)	Cocaine use (one item from ASI), Addiction severity (ASI)	12-step-oriented individual drug counseling plus GDC showed the greatest improvement on the ASI composite score compared with all three control conditions and on the number of days of cocaine use in the past month compared with cognitive therapy and supportive-expressive therapy.

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Table 1 (*continued*)

Authors (year), country	Demographic (Mean Age, Race, Gender, Any Special Characteristics)	Substance Use Problem	S/R Intervention	Delivery (modality, length/ frequency)	Manual-ized	Fidelity	Comparison	Outcomes (Measurements)	Main Findings
Davis et al. (2002), USA	29–65 yo; 46% Black; 32.6% Latino; 21.3% White; 100% male; veterans	Alcohol dependent/abuse (DSM III)	Standard outpatient alcoholism treatment (with group and individual therapy, and emphasis on AA)	Individual + group format; weekly group therapy while individual session frequency varied for 6 months	No	No	Active control: minimal treatment approach (weekly alcohol education movies).	Alcohol use (self- and collateral-report), abstinence (self- and collateral-report), employment status	At 6 months, standard outpatient alcoholism treatment patients surpassed those in minimal treatment approach in terms of complete abstinence, reduction in amount of alcohol consumed, length of sobriety at follow-up, and improvement in employment status.
Glasner- Edwards et al. (2007) USA	49.0 yo; 75% White; 93.9% male; veterans	SUDs + major depressive disorder (DSM IV)	TSF group intervention (adapted original TSF to group format) + standard pharmacotherapy	Group format; Both conditions comprised two consecutive 12-week phases of intervention. Phase I: twice weekly one-hour group sessions plus monthly medication management; Phase II: once weekly one-hour group sessions plus monthly medication management; 36 total; 1 h/sessions	No	No	Active control: integrated cognitive behavioral therapy (ICBT) + standard pharmacotherapy	Affect regulation (NMRS), social support (SSQ), 12-step involvement (AAAS), self-efficacy (DTCQ)	Both TSF na ICBT produced improvements in self-efficacy, and these changes are associated with substance use outcomes.
Gleason (1996), USA	32.7 yo; 100% White; 64.5% male	Substance abuse/ dependence (DSM III)	AA meetings	Group format; AA meeting at least once a week and one hour of individual psychotherapy per week; 6 weeks in total; 1 h+/meeting	No	No	Active control: Guided imagery	Depression (DBI), anxiety (CAS)	No significant group difference was found in depression or anxiety improvements.
Hayes et al. (2004), USA	42.2 yo, 13% ethnic minorities; 51% female	Cocaine dependence + substance abuse/dependence for at least one other substance (DSM-IV)	Intensive TSF + Methadone Maintenance (Intensive TSF: four times as intensive as the original TSF)	Individual + group format; 3 sessions/week: Total of 32 individual 1 -h sessions (16 weekly sessions with therapist, and 16 with a sponsor (a member of a 12-step organization such as AA, NA, or CA) and 16 90-minute group sessions. In total, 16 weeks, 48 sessions, 56 hours	Yes	Yes, sessions videotaped and rated by raters; fidelity was reported to be good	Inactive control: Methadone Maintenance alone (standard care); Active control: Acceptance and Commitment Therapy + Methadone Maintenance (standard care),	Opiate use abstinence (urine test), drug use abstinence (urine test), addiction severity (ASI), social adjustment (SAS), depression (BDI), psychological symptom (SCL)	ITSF reduced objective measures of total drug use during follow-up but not in the intent-to-treat analyses. Most measures of adjustment and psychological distress improved in all conditions, but there was no evidence of differential improvement across conditions in these areas.

(*continued on next page*)

Table 1 (*continued*)

Authors (year), country	Demographic (Mean Age, Race, Gender, Any Special Characteristics)	Substance Use Problem	S/R Intervention	Delivery (modality, length/ frequency)	Manual-ized	Fidelity	Comparison	Outcomes (Measurements)	Main Findings
Khaledian et al. (2017), Iran	Not reported	Cocaine use	Islamic-based spiritual therapy (includes Komail prayer, worship, Quran verses and interpretation, reciting the divine names, forgiveness and repentance, divine grace and compassion, etc.) + standard care	Group format, 9 2 h/ session	No	No	Inactive control: standard care	Mental health (GHQ-28), self-esteem (SEI)	Islamic-based spiritual therapy was found to be effective in improving mental health and self-esteem compared to standard care.
Maude- Griffin et al. (1998), USA	Age not reported; 80% Black; 98.4% male; veterans	Cocaine abuse (DSM-III-R)	TSF	Individual + group format; 3 group sessions/ week and 1 individual session/week for 12 weeks	Yes	No	Active control: CBT	Cocaine use (self-report + urine test), abstinence (self-report + urine test)	Participants in CBT were significantly more likely to achieve abstinence than participants in TSF.
O'Leary et al. (2007); Miller et al. (2008), USA	38.69 yo; Latino: 50%, White: 35%, or Native American: 12%; 60% female	Substance dependence (DSM-IV)	Spiritual Direction (SD) (includes a session of motivational interviewing, (a) meditation, (b) prayer, (c) fasting, (d) self-care, (e) attentive awareness, (f) solitude, (g) acceptance, (h) service, (i) reconciliation, (j) worship, (k) gratitude, (1) guidance, and (m) celebration. Walking a labyrinth maze as an option in the discipline of meditation.) + standard care	Individual sessions; 12 1 h/session	Yes	Yes, sessions were audiotaped and coded for fidelity; fidelity rated as good	Inactive control: standard care	Substance use (Form 90-DI and Form 90-DF), drug use consequences (InDUC-2 L), depression (BDI), anxiety (STAI), self-esteem (SEI), spirituality/religiosity (BMMRS)	The addition of SD to standard care yielded no effect on drug use outcomes or spiritual outcomes. Depression and anxiety decreased significantly in the standard care group over the course of treatment but increased slightly in the SD group.
Project MATCH research group (1997): 1) inpatient study and 2) aftercare study. USA	**Outpatient study**: 38.9 yo; 80% White, 12% Latino 6% Black; 72% male. **Aftercare study**: 41.9 yo; 80% White, 15% Black, 3% Latino; 80% male	Alcohol abuse/dependence with no other drug dependence (DSM-III-R)	TSF: grounded in the concept of alcoholism as a spiritual and medical disease with stated objectives of fostering acceptance of the disease of alcoholism, developing a commitment to participate in AA, and beginning to work through the 12 steps.	Individual format; one session/week for 12 weeks	Yes	Yes, sessions videotaped and rated by independent reviewer; good fidelity reported	Active control: Cognitive Behavioral Coping Skills Therapy; Active control: Motivational Enhancement Therapy	Alcohol use (Form 90, Collateral informants, laboratory tests), drinking consequences (DIC), addiction severity (ASI), employment (self-report), social behavior (PFI), depression (BDI)	In both outpatient and aftercare studies: Significanat and sustained improvements in drinking outcomes were achieved from baseline to 1-yearp posttreatment by the clients assigned to each of the treatment. There was little difference in outcomes by type of treatment.
Schottenfeld et al. (2011), USA	31.1 yo, 78% Black, 100% female, either	Cocaine dependence (DSM IV)	(1) TSF + monetary vouchers provided contingent on cocaine-negative urine tests (CM);	TSF: individual format; twice weekly individual sessions for the first 12 weeks and once weekly	Yes	Yes, sessions videotaped and rated by independent	Active control: TSF + CM vs Community Reinforcement Approach (CRA) +CM;	Cocaine abstinence (urine test, WSUI), other drug use (urine test, WSUI)	The differences between CRA and TSF were not significant for any of

(*continued on next page*)

Table 1 (*continued*)

Authors (year), country	Demographic (Mean Age, Race, Gender, Any Special Characteristics)	Substance Use Problem	S/R Intervention	Delivery (modality, length/ frequency)	Manual-ized	Fidelity	Comparison	Outcomes (Measurements)	Main Findings
	pregnant or with young children		(2) TSF + monetary vouchers provided non-contingently but yoked in value (voucher control [VC]);	for the next 12 weeks. 36 sessions total		reviewer; fidelity assessment results not reported	Active control: TSF + VC vs CRA + VC		the outcome measures.
Walker et al. (1997), USA	34.34 yo; 73% Latino, 16.1% White; 65% male	Alcohol abuse/dependence	Intercessory prayer by blinded volunteers: volunteers prayed daily for 6 months, assigned three clients and given their first names and research number only. Suggested approach for prayer was nondirective (general, positive intentions as opposed to specific requests)	Once a day for 6 months	No	No	Inactive control: no intervention	Substance use (Form 90)	No differences were found between the intercessory prayer intervention and the control group on alcohol consumption.

yo = years old. ICD = International Classification of Diseases. DSM = Diagnostic and Statistical Manual of Mental Disorders.
GSE General Self Efficacy Scale. ASE Alcohol Self Efficacy Scale. SSE Smoking Self Efficacy Scale. ROS Religious Orientation Scale. PWS Psychological Wellbeing Scale. AAQ-R Acceptance and Action Questionnaire-Revised. TSCS The Tennessee Self-Concept Scale. TLFB Time Line Flow Back. HDRS Hamilton Depression Rating Scale. ASI Addiction Severity Index. ADUSE Alcohol and Drug Use Self-Efficacy Scale. B-PRPI Brown–Peterson Recovery Progress Inventory. NMRS Negative Mood Regulation Scale. SSQ Social Support Questionnaire. AAAS Alcoholics Anonymous Affiliation Scale. DTCQ Drug Taking Confidence Questionnaire. DBI Beck Depression Inventory. CAS Clinical Anxiety Scale. SAS Social Adjustment Scale–Self Report. SCL Symptom Checklist-90-R. GHQ-28 General Health Questionnaire-28. SEI Self-Esteem Inventory. Form 90 DI Drug Use Assessment -Intake. Form 90-DF Drug Use Assessment Follow-up version. InDUC-2l Inventory of Drug Use Consequences. STAI State-Trait Anxiety Inventory. BMMRS Brief Multidimensional Measure of Religiousness/ Spirituality. DIC Drinker Inventory of Consequence. PFI Social Behavior Scale of the Psychosocial Functioning Inventory. WSUI Weekly Substance Use Inventory.

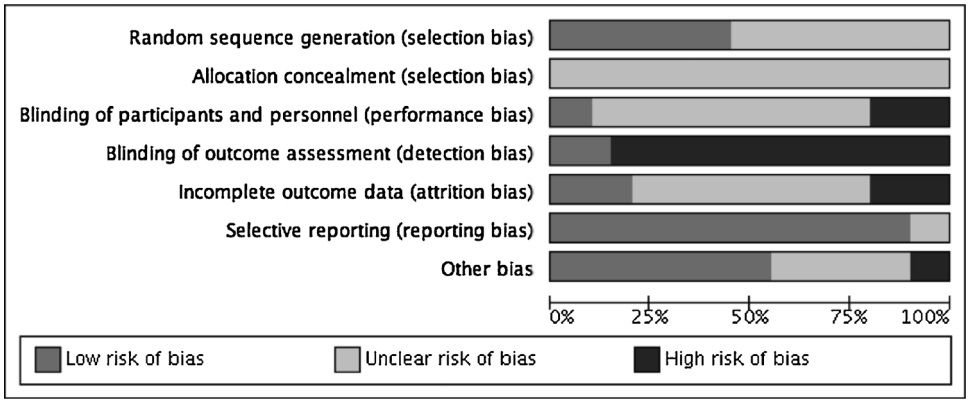

Fig. 2. Percent of studies exhibiting degrees of bias.

(i.e., general positive intentions as opposed to specific requests). Volunteers were free to pray as they chose but were asked not to pray for patients' religious conversion (Walker et al., 1997).

Seven S/R intervention studies (35%) were implemented in group format, six (30%) in individual format, four (20%) in group and individual format, and three (15%) did not report format. Treatment length ranged from six to 60 sessions and frequency from one to three sessions per week. The S/R interventions in nine studies (45%) were manualized and two (10%) were partially manualized. Eight studies (40%) assessed intervention implementation fidelity, all by rating audiotapes/videotapes of intervention sessions. Five studies reported "good" fidelity while three did not report fidelity results.

3.5. Risk of bias assessment results

Figs. 2 and 3 present risk of bias assessment results graphically. Nine studies (45%) described a proper method of random sequence generation; the others did not provide sufficient information and were rated as having unclear risk of random sequence generation bias. Since no study reported on allocation concealment, all 20 were considered as having unclear risk of concealment. Two studies (10%) were rated as low performance risk because personnel were blinded to group assignment, and although participants were unlikely to be blinded, active controls were used. Performance bias of 14 studies (70%) was rated as unclear because (1) although participants were unlikely to be blinded, active controls were used (n = 13), or (2) personnel were not blinded but participants were (n = 1). Four studies (20%) were rated as high risk of performance bias because blinding was not feasible and inactive controls were used.

Most studies (n = 17, 85%) were rated as high risk of detection bias because they relied solely on self-report measures. The four studies (20%) which had low attrition (< 20%) and used intention-to-treat analysis were rated as low risk of attrition bias. Four studies (20%) that had more than 20% attrition and failed to use intention-to-treat were rated as high risk of attrition bias. Twelve studies (60%) either had low attrition but did not use intention-to-treat or used intention-to-treat but had high attrition and were rated as having unclear risk of attrition bias. Most studies (n = 18, 90%) reported all outcomes listed in the methods section and were rated as low risk of reporting bias. Two studies (10%) were rated as unclear risk of reporting bias because they stated that additional outcomes measured in the study would be reported in the future.

Eleven studies (55%) were rated as low risk of other bias because they were not cluster RCTs and either achieved baseline balance or adjusted for imbalanced variables in primary analyses. Two studies (10%) were rated as high risk of other bias as experimental and control group characteristics were not balanced at baseline and they failed to adjust for imbalanced variables. Seven studies (35%) were considered to have unclear risk of other bias because they failed to provide adequate information on baseline balance or whether cluster randomization was used.

3.6. Meta-analysis results

Four studies used inactive controls, 14 used active controls, and two used inactive and active controls and therefore were included in estimating both absolute effect size and relative effect size. The average overall effect size representing the absolute efficacy of S/R interventions (when compared with inactive controls), with 37 effect sizes from 6 studies, is d = .537, but was not statistically significant (95% CI = -.316, 1.390). This null finding may be due to low power, as evidenced by low degrees of freedom (df = 4.90) (Tanner-Smith et al., 2016). The average overall effect size representing the relative efficacy of S/R interventions (when compared with active controls), with 92 effect sizes from 16 studies is d = .176 with a 95% confidence interval (.001, .358), which was statistically significant. Because only 12-step-oriented intervention studies used active controls, this indicates that these 12-step-oriented S/R interventions are more efficacious than the comparison interventions. Because no effect size estimate in this review was three or more SDs from the mean value, sensitivity analysis was not needed (Lipsey and Wilson, 2001).

For inactive control studies, the average effect size for substance use outcomes, with 37 effect sizes from 6 studies, was d = .260 (95% CI = -.125, .645). The average effect size for psycho-social-spiritual outcomes was d = .788 (95% CI = -1.176, 2.751). However, neither was statistically significant, possibly due to low power since degrees of freedoms were less than 3 (Tanner-Smith et al., 2016). For active control studies, the average effect size for substance use outcomes was d = .205, which was statistically significant (95% CI = .019, .392), while the average effect size for psycho-social-spiritual outcomes was d = .144, which was not significant (95% CI = -.104, .391). This suggests that the S/R interventions tested were more efficacious than comparison interventions for substance use outcomes and may be equally efficacious for psycho-social-spiritual outcomes.

3.7. Moderator analyses results

Absolute effect size estimates (from inactive control studies) did not differ significantly (p > .05) as a function of any moderator tested. For active control studies, effect size estimates differ significantly only by country, i.e., the Canadian study had significantly smaller effect sizes than the studies conducted in other countries (b = -.07, p < .001). Subgroup analysis revealed that the Canadian study had a significant effect size estimate of -.070 (95% CI = -.070, -.070), indicating that in Canada, S/R interventions tested might be slightly less efficacious than other interventions. In contrast, effect size estimates of U.S. (d = .196, 95% CI = -.006, .398) and Middle Eastern (d = .314, 95% CI = .314, .314) studies were positive, suggesting that these S/R interventions

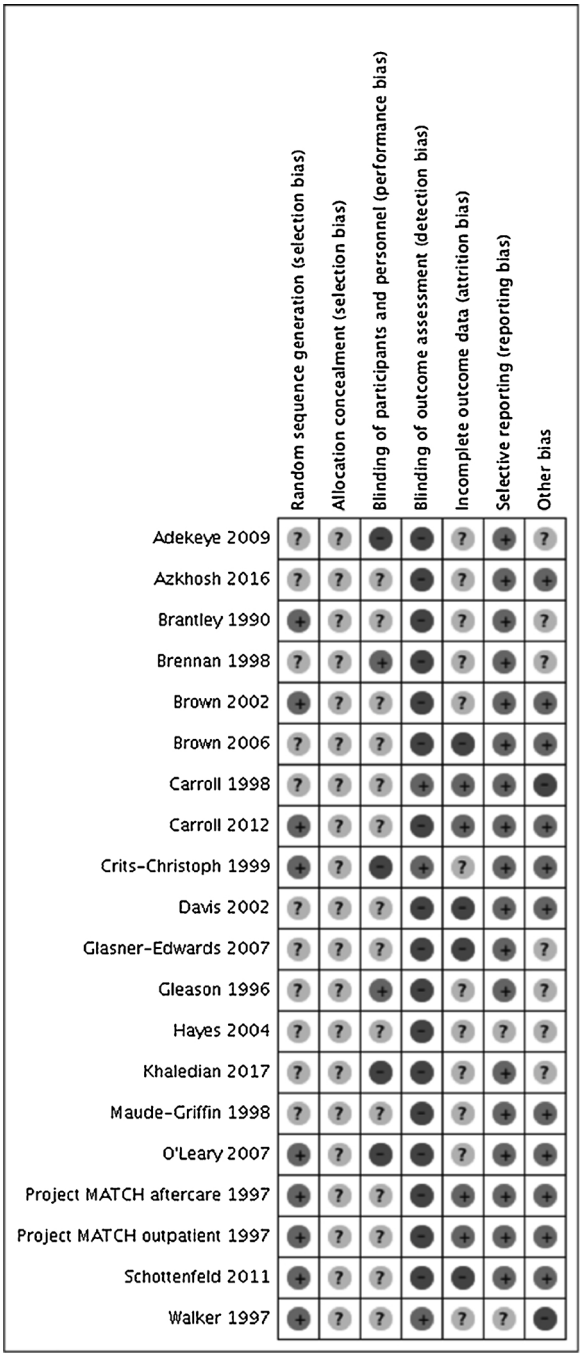

Fig. 3. Risk of bias summary.
Notes: + indicates low risk;? indicates unclear risk; - indicates high risk.

were more efficacious than other interventions in these countries.

3.8. Publication bias assessment results

Sensitivity analysis using Vevea and Woods' Weight Function Model are presented in Figs. 4 and 5 (the thin line is the unadjusted effect size estimate and the heavy line is the effect size estimate adjusted for publication bias). The unadjusted and adjusted effect size estimates were identical in inactive and active control studies ($d_{inactive}$ = .283 and d_{active} = .046), indicating an absence of publication bias in this review.

4. Discussion

While the literature generally supports that S/R protects against substance abuse and highlights S/R's importance in recovery, high quality studies and reviews on S/R interventions for substance use problems are scant. The present review is the first to systematically and quantitatively synthesize empirical evidence on the efficacy of S/R interventions for substance use problems. Previous meta-analyses have focused exclusively on 12-step-oriented interventions and were based on studies with low causal inference power conducted before 2005, whereas the present review included studies on both 12-step-oriented and non-12-step-oriented S/R interventions and updates the literature by incorporating evidence from RCT studies conducted between 1990 and 2018. It also provides clearer implications by examining S/R interventions' absolute efficacy (compared with inactive controls) and relative efficacy (compared with other treatment) separately.

This meta-analysis suggests that S/R interventions are more efficacious than non-S/R comparison interventions for people with substance use problems (d = .176). More specifically, S/R interventions seem to be more efficacious than comparison interventions for substance use outcomes (d = .205) and may be equally efficacious for psycho-social-spiritual outcomes (d = .144) that have been shown to be associated with improved substance use outcomes (e.g., Booth et al., 2010; Fleming et al., 2010; Walton-Moss et al., 2013). However, statistical power was insufficient to test the significance of S/R interventions' effect sizes when compared to inactive control conditions. Future research should identify the absolute efficacy of S/R interventions by comparing them with inactive control conditions (e.g., no treatment and waitlist controls).

4.1. Relative efficacy of S/R interventions

Since 12-step-oriented interventions were the only S/R interventions that were compared to other interventions (n = 16), findings regarding S/R interventions' relative efficacy cannot be generalized to all S/R interventions for substance use. More studies of non-12-step-oriented S/R interventions are needed. In addition, these findings do not represent the efficacy of 12-step fellowships such as AA and NA because most active control studies tested either professionally delivered TSF or 12-step-oriented treatments in the context of formal recovery programs. Professionally-delivered programs are distinct from 12-step fellowships in community settings and therefore are not comparable. Emrick et al.'s (1993) review notes the "near desert of high quality research into AA" (p. 41), and Kownacki and Shadish's (1999) review found only three RCTs on AA between 1953 and 1993. The dearth of rigorous quantitative studies on 12-step fellowships remains. We found no RCTs conducted between 1990 and 2018 on 12-step fellowships' efficacy for substance use or psycho-social-spiritual outcomes. The obstacles Miller and McCrady noted in 1993 (i.e., established researchers' negative attitudes toward 12-step fellowships, the self-help nature of 12-step fellowships, which may make using RCT designs difficult or undesirable) may still be responsible for the lack of RCTs on 12-step fellowships.

The current review's findings about 12-step-oriented interventions' relative efficacy are generally consistent with those of the only past systematic review on this topic by Kownacki and Shadish (1999), which found that AA-based residential programs did not perform differently than non-AA-based residential treatments. However, their study was based on only two RCTs. The current systematic review synthesizing 16 RCTs adds to this finding by showing that 12-step-oriented interventions outperformed comparison interventions for SUDs. More specifically, 12-step-oriented interventions reduced substance use significantly more than comparison interventions and may improve psycho-social-spiritual outcomes as much as comparison interventions. Comparison interventions generally included those commonly utilized in substance use treatments, such as CBT, Motivational Enhancement Therapy, Community Reinforcement Approach, and family of origin

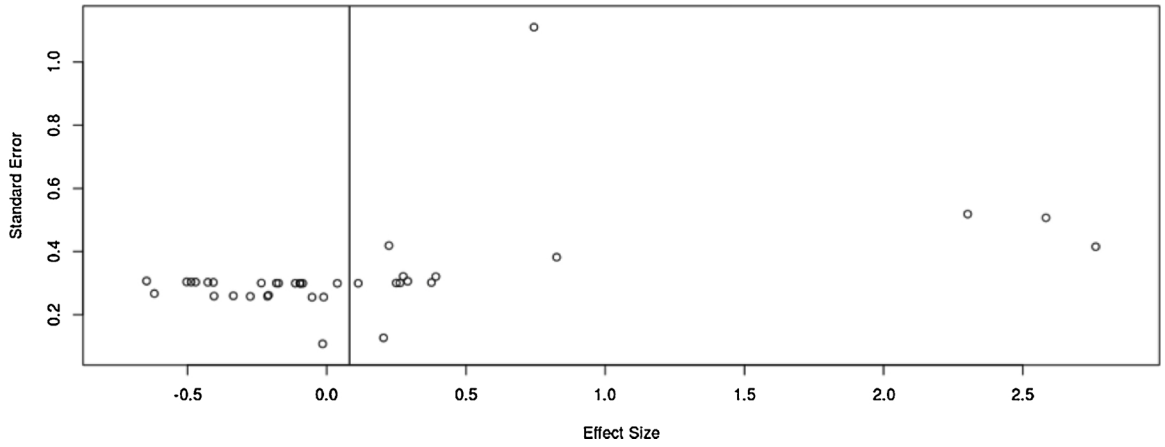

Fig. 4. Funnel plot for inactive control studies.
Notes: The thin line is unadjusted effect size estimate; the thick line is effect size estimate adjusted for publication bias. The two lines completely overlap in this graph.

therapy. Recovery programs should consider this finding when adopting interventions. However, it is unclear what mechanisms or active components are responsible for 12-step-oriented interventions' advantages over comparison interventions for substance use included in this review. Studies show that AA's effects occur through both S/R (e.g., Kaskutas et al., 2003; Kelly et al., 2011; Krentzman et al., 2013; Robinson et al., 2007; Tonigan et al., 2013) and psychosocial (Bond et al., 2003; Kaskutas et al., 2002; Kelly et al., 2009; Morgenstern et al., 2002) mechanisms. Therefore, though they may differ from AA in some ways, the 12-step-oriented interventions reviewed were more efficacious than comparison interventions perhaps because they have S/R mechanisms/components in addition to the effective psychosocial components commonly found in comparison interventions. The possible mechanisms of change for these 12-step-oriented interventions should be studied.

Of the moderators examined, only country moderated S/R interventions' relative effects. S/R interventions were slightly less efficacious than other interventions in Canada, while more efficacious in the United States and Middle East. However, this finding is preliminary because only one Canadian study was included in the review versus several studies conducted in other countries. Researchers should explore the potential moderating effects of the social/cultural environment where S/R substance use interventions are implemented. Participants' gender and race/ethnicity did not moderate intervention effects, providing preliminary support that 12-step-oriented interventions' relative efficacy does not differ by patients/clients' gender or race/ethnicity. This differs from literature suggesting that the relationship between AA attendance and favorable drinking outcomes is stronger for women than men (Krentzman et al., 2012; Timko et al., 2002). The discrepancy may be due to differences between the 12-step-oriented interventions under review and AA fellowships or because most studies reviewed used samples that primarily consisted of men. Additionally, the length of the intervention and whether the intervention was manualized, fidelity was monitored, and the format was group or individual were not found to significantly influence 12-step-oriented interventions' relative efficacy. However, these null moderator analyses findings should be interpreted cautiously given the relatively small sample sizes in the studies reviewed. Future reviews should investigate the potential moderation effect of these factors when there are more RCTs on this topic.

4.2. Absolute efficacy of S/R interventions

The meta-analysis's null finding regarding S/R interventions' absolute efficacy is likely due to limited statistical power. Only six RCTs compared S/R interventions with inactive control conditions. More studies are needed before any conclusion can be drawn about S/R interventions' absolute efficacy. In particular, RCTs on non-12-step-oriented S/R interventions are needed. We identified only four such RCTs, all of which employed inactive controls.

Findings from these four RCTs were mixed. Two yielded positive results. Adekeye and Sheikh (2009) compared CBT with additional

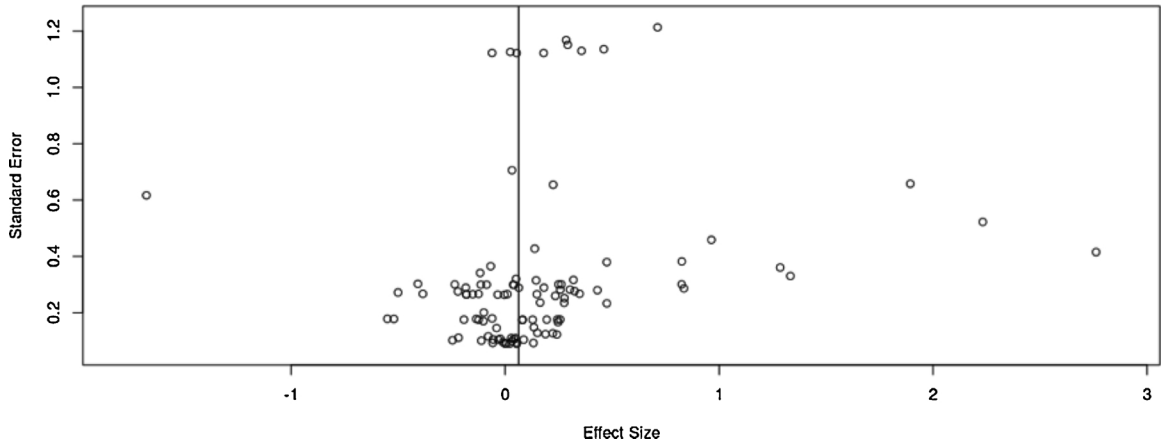

Fig. 5. Funnel plot for active control studies.
Notes: The thin line is unadjusted effect size estimate; the thick line is effect size estimate.

religiosity and self-efficacy components to regular CBT and found that these components contributed to increased compliance and sustained abstinence over six months among patients with SUDs in Nigeria. Khaledian and colleagues' RCT indicated that Islamic-based spiritual therapy was efficacious in improving self-esteem and mental health among patients attending a methadone-therapy treatment center in Iran (Khaledian et al., 2017). The other two studies yielded null or negative findings. O'Leary found that her Spiritual Direction intervention had no effect on substance use outcomes or spiritual practices at any follow-up point, and participants who received Spiritual Direction in addition to standard care showed significantly less improvement on depression and anxiety relative to participants who received standard care only (Miller et al., 2008; O'Leary, 2007). Walker et al. (1997) found no difference in alcohol consumption between those who received intercessory prayer from blinded volunteers and those who received no intervention. These results on efficacy are preliminary since only one RCT with a small sample size ($N < 60$) was conducted on each of these four non-12-step-oriented S/R interventions. Research in this area is still in its infancy. More high-quality studies are needed before conclusions can be drawn about the efficacy of non-12-step-oriented S/R interventions for substance use problems.

4.3. Quality of the evidence

The overall quality of evidence based on 3700 participants in 20 studies was low. One possible source of bias inherent in research in this field is that blinding study participants to treatment conditions is difficult, if not impossible. Results of this study should also be viewed cautiously given other sources of bias, including risk of attrition bias. Risk of detection bias due to sole reliance on self-report measures for psycho-social-spiritual outcomes is another concern even though all were based on standardized measures that are appropriate for people with substance use problems. Moreover, few studies clearly reported on important aspects of study design, e.g., random sequence generation, concealment of treatment allocation, baseline balance, and handling missing data, making it difficult to assess the risk of bias. Future studies should employ intention-to-treat designs to reduce risk of attrition bias, use other sources to corroborate self-reports, and clearly report study design.

4.4. Limitations

This study has several limitations. First, despite the comprehensive and systematic search and screening methods employed, some studies that met inclusion criteria may not have been identified. Second, excluding non-RCT studies and studies that failed to report sufficient effect size data limited the evidence gathered for this review and neglected potentially valuable information that studies with other research designs may provide. Though this weakness is inherent in the quantitative meta-analytic approach used in the current review, RCTs are deemed the most rigorous research designs. Results are therefore based on the best quantitative evidence regarding S/R interventions' efficacy.

Third, effect size estimates were aggregated on the generic construct level (substance use outcomes and psycho-social-spiritual outcomes) rather than on specific measures, despite the diverse measures used in the primary studies for each outcome construct. This approach was necessary due to the small number of effect size estimates per measure, which resulted in low degrees of freedom ($df < 4$) and inadequate statistical power to deem analytic results trustworthy (Tanner-Smith et al., 2016). Finally, this review examined only the efficacy of S/R interventions and not the mechanisms through which S/R interventions exert their effects due to limited information provided in the primary studies. Findings supporting certain S/R interventions' efficacy do not imply that the S/R mechanism is the only mechanism operating or that it is operating at all.

5. Conclusion

This is the first systematic review and meta-analysis of the efficacy of S/R interventions for substance use. We found evidence of S/R interventions' efficacy in helping people with substance use problems. Most RCTs have focused on 12-step-oriented interventions, while RCTs on non-12-step-oriented S/R interventions are scant. Of the interventions studied, 12-step-oriented interventions were more efficacious than non-S/R comparison interventions for people with substance use problems. The review has valuable implications for practice and future research. Most importantly, more high-quality studies on the efficacy of non-12-step-oriented S/R interventions for substance use problems are needed.

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Contributors

Audrey Hang Hai contributed to study design, literature review, data collection, analysis and interpretation of data, drafting the manuscript and revising it critically for important intellectual content. Cynthia Franklin contributed to study design and revising the manuscript critically for important intellectual content. Sunyoung Park contributed to data collection and analysis and interpretation of data. Diana DiNitto contributed to study design and revising the manuscript critically for important intellectual content. Norielle Aurelio contributed to data collection. All authors read and approved the final manuscript.

Declaration of Competing Interest

No conflict declared.

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