Research Square

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Psychological interventions for posttraumatic stress injuries among public safety personnel: a systematic review and meta-analysis

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Abstract

Background Public safety personnel (PSP) are exposed to potentially psychologically traumatic events (PPTE) far more often than the general public, which increases the risk for various posttraumatic stress injuries (PTSIs). There are many evidence-based psychological interventions for PTSI, but whether the interventions benefit PSP despite the repeated PPTE exposures remains unclear.

Objectives The current study assessed the effectiveness and acceptability of psychological interventions of PTSI among PSP.

Methods A systematic review and random-effects meta-analysis were performed on the effectiveness and acceptability of psychotherapies for PTSIs (i.e., symptoms of depression, anxiety, posttraumatic stress disorder) among PSP. The review adhered to the PRISMA reporting guidelines and used standardized mean differences (Cohen's *d*) and rate ratios (RR) to measure pooled effect sizes across studies. Heterogeneity was quantified using I^2, and publication bias was evaluated using Egger's test.

Results The analyses included data from eight randomized controlled trials representing 402 PSP (79.4% male, 35.3 years). Psychological interventions included narrative exposure therapy ($n = 1$), cognitive behavioural therapy ($n = 2$), eclectic psychotherapy ($n = 2$), eye-movement desensitization and reprocessing ($n = 1$), supportive counselling ($n = 2$), and group critical incident stress debriefing ($n = 1$). The interventions were associated with statistically significant reductions in symptoms associated with PTSD (d=-1.23), anxiety (d=-0.76), and depression (d=-1.10). There were smaller but statistically significant improvements at follow-up for symptoms of PTSD (d=-1.29), anxiety (d=-0.82), and depression (d=-0.46). There were no statistically significant differences in dropout rates ($RR = 1.00$), suggesting high acceptability across interventions.

Conclusions There is preliminary evidence that psychotherapies help treat PTSIs in PSP; however, the shortage of high-quality studies with PSP indicates a need for additional research into treating PTSI among PSP.

PROSPERO: CRD42019133534.

Introduction

Exposure to potentially psychologically traumatic events (PPTE) can lead to many problematic mental health symptoms associated with various disorders, including but not limited to posttraumatic stress disorder (PTSD). Nearly 10% of Canadians meet the criteria for PTSD at any given time [1,2]. The onset of PTSD in the general population typically occurs for persons in their mid to late twenties [3]. Women appear at twice the risk for PTSD [4,5]. PTSD can involve substantial distress and impairment [6], with nearly 75% of patients with PTSD meeting criteria for one or more comorbid psychiatric disorders [7,8]. PTSD comorbidities exacerbate impairments to quality of life and functioning and are associated with an

increased lifetime risk for attempted suicide [4,7,9]. Annually, PTSD costs the Canadian economy approximately $50 billion [10].

Epidemiologic studies have indicated the risk of developing PTSD and other posttraumatic stress injuries (PTSIs) is higher in populations with greater exposure to PPTEs [11–17]. For example, among military personnel and veterans exposed to combat-related violence, the lifetime prevalence of PTSD is as high as 31% [18–23]. Public safety personnel (PSP) are also exposed to PPTE more frequently than the general population [24–30]. The term PSP refers to several related occupations with professionals dedicated to maintaining public safety and wellbeing, such as border services officers, correctional workers, firefighters, paramedics, police, and public safety communicators (e.g., call centre operators, 911 operators). The increased PPTE exposures among PSP increase their risk for PTSIs [25,26,31–36], including but not limited to PTSD, major depressive disorder, generalized anxiety disorder, and alcohol use disorder [25,37]. PSP are up to four times more likely to experience suicidal behaviours when compared to the general population [35]. The media has increasingly reported mental health risks for PSP, such as responding to the 2014 Moncton shootings [38].

In 2016, the Ministry of Public Safety and Emergency Preparedness at the University of Regina held a national roundtable on PSP mental health. A subsequent pan-Canadian PSP survey estimated that 44.5% of PSP screened positive for at least one PTSI associated with PPTEs [25,37]. Additional risk factors for PTSIs among PSP appear to include increased stigma [39,40], lowered willingness to receive support [33], and difficulties accessing mental health resources [39–41]. The Canadian government has been expanding the scope of tailored mental health programs to serve all PSPs better [42]; however, there are critical knowledge gaps regarding best practices for treating PTSI among PSP. For example, there is a substantial body of literature on PTSD interventions [43–51], but PSP-specific results remain scarce. The current study was designed to conduct a systematic review and meta-analysis of the effectiveness and acceptability of psychotherapies for PTSIs among PSP.

Methods

Protocol and registration

The current study was registered with PROSPERO (CRD42019133534) [52] and reported per the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) [53].

Eligibility criteria

The population-intervention-comparison-outcome-study design (PICOS) model [54] was used to define review eligibility:

- **Population:** Adult (aged 18 and older) police, paramedics and emergency management technicians, correctional officers, dispatchers, 9-1-1 communication officers, fire and safety officers.

- **Intervention:** Any psychological interventions approved by the American Psychological Association to treat PTSD, delivered alone or in combination with medications.
- **Comparison:** Any comparator condition, such as waitlist controls or no intervention.
- **Outcomes:** Self-report measures (e.g., symptom scores on psychopathology measures), remission for PTSIs (e.g., PTSD), and objective indices of functioning (e.g., absenteeism, occupational performance ratings).
- **Study design:** English-language, peer-reviewed, randomized controlled trials (RCTs) of any duration from any geographic location published since 2008.

Information sources and search

A systematic search of Cochrane Central Register, EMBASE, MEDLINE, PsycINFO, PubMed was performed from January 1, 2008, to October 8, 2019 (**Appendix 1**). The search was supplemented by reviewing the reference lists of included studies and searching for ongoing RCTs from trial registries.

Study selection

There were two co-authors (AB and PD) who independently screened all articles by title/abstract and then full-texts, using Cochrane's Covidence, a web-based systematic review manager [55]. After removing duplicate citations, the initial screening selection of papers was verified at the title/abstract stage by having multiple reviewers screen 200 reports, with 99% agreement. All discrepancies were removed by consensus and third-party input (GA).

Data collection process

There were two co-authors (AB and PD) who independently extracted relevant data from the published full-text reports of each included article using Covidence. Data extracted was verified by one other author (AB, PD, or GA).

Data items

The following data items were extracted: sample size, age, sex, comorbidity status, and years of employment in PSP profession; type and duration of psychological intervention; comparator group; all relevant outcome measures (e.g., symptom scores for PTSD and other PTSI on psychopathology measures); author, design, location, and study duration (i.e., timing of follow-up evaluations).

Risk of bias in individual studies

The Cochrane risk of bias tool for RCTs was used to assess study quality [56]. In brief, the Cochrane risk of bias tool appraises randomization, allocation concealment, blinding, selective reporting, attrition bias, and potential bias from funding. There were two co-authors (AB and PD) who independently appraised each included trial against the risk of bias tool, with discrepancies resolved by consensus.

Summary measures and synthesis of results

Random-effects meta-analysis models were created to pool effect sizes for each psychotherapy's effectiveness and acceptability, and the results were graphed using Forest plots. The specific methods have been previously described [57–62]. The I^2 statistic was used to quantify heterogeneity; values greater than 50% indicated high variance [63]. Effect sizes were pooled across RCTs using standardized mean differences (SMD, Cohen's *d*) or rate ratios (RRs) and their 95% confidence intervals (CI), depending on whether the data was continuous or categorical. The SMD was the difference in mean symptom severity scores at the end of intervention between groups divided by the standard deviation of the difference between groups. A negative SMD indicates an improvement in symptom severity relative to the control condition. All confidence intervals containing zero were nonsignificant, given that an SMD of zero is null. RRs greater than 1 indicated that the result favoured the experimental intervention over the control; 95% CIs containing an RR of 1 were nonsignificant.

Risk of bias across studies

Publication bias from the overrepresentation of studies with positive results was assessed using funnel plots [64] and Egger's funnel plot symmetry test [66].

Additional analyses

Random-effects and fixed-effects models were compared to assess sensitivity to heterogeneity. The effect sizes determined from the end-of-intervention were also compared to the end-of-follow-up to determine intervention-time effects.

Results

Study selection

The search strategy identified 1493 unique records. After removing 1427 irrelevant documents during the title/abstract phase, the remaining 66 full-text articles were reviewed. The reviewed articles included 27 that involved an ineligible study design, 13 that used an unsuitable intervention, two from before 2008, and 2 that used incompatible outcomes (i.e., they did not report data compatible with a quantitative meta-analysis). Ultimately, eight RCTs met the inclusion criteria for the current review (**Figure 1**).

Quality assessment

There were three RCTs out of the eight [67–69] that met the criteria for being high quality as per the Cochrane Risk of Bias tool [67–69]. The remaining five RCTs met the criteria for being low to moderate quality (**Appendix 2**). There were three RCTs out of the eight that were double-blinded, while the remaining five were single- or unblinded [67–69]. All but one of the eight RCTs [70] thoroughly reported participant flow and attrition. All eight RCTs adequately randomized participants, but only four concealed

intervention allocation [67–69,71]. All eight studies provided their trial registration numbers and study protocols. Three RCTs out of the eight did not disclose funding sources [70–72].

Study and participant characteristics

There was considerable diversity in terms of the PSP professions, psychotherapies, and outcome measures across the eight RCTs (**Table 1**). PSP professions included emergency service personnel, firefighters, and police officers, totalling 402 individuals across studies (79.4% male, mean age: 35.3 years). The eight RCTs focused on several different interventions, including narrative exposure therapy (*n*=1), cognitive behavioural therapy (*n*=2), eclectic psychotherapy (*n*=2), eye-movement desensitization and reprocessing (*n*=1), supportive counselling (*n*=2), and group critical incident stress debriefing (*n*=1). Comparator conditions included waitlists (*n*=3), psychoeducation only (*n*=2), and non-specific supportive interventions (*n*=1). Follow-up durations across the eight RCTs ranged from one to 12 months.

Psychotherapy effectiveness for PSP

The included RCTs evidenced reduced PTSD symptom severity at the completion of intervention (g = -1.23; 95% CI: -1.81, -0.65; 7 studies; I^2 = 81%) and in sustained follow-up (g = -1.29, 95% CI: -2.31, -0.27; 6 studies; I^2 = 89%; **Figure 2**). The interventions appeared effective for reducing PTSD symptoms at intervention completion (*RR*=1.81, 95% CI: 1.18-2.79; 2 studies; I^2 = 0%) that were sustained at follow-up (*RR*=2.15, 95% CI: 1.13-4.11; I^2 = 29%). There were also statistically significant reductions in anxiety symptoms at intervention completion (g = -0.76; 95% CI: -1.28, -0.24; 3 studies; I^2 = 47%) that were sustained at follow-up (g = -0.82, 95% CI: -1.20, -0.44; I^2 = 0%; **Figure 3**). There were also statistically significant reductions in depressive symptoms at intervention completion (g = -1.10; 95% *CI*: -1.62, -0.58; 5 studies; I^2 = 64%) that were sustained at follow-up (g = -0.46, 95% CI: -0.77, -0.14; I^2 = 15%; **Figure 4**). All meta-analytic estimates are summarized in **Appendix 3**.

Acceptability of psychotherapies

There were no statistically significant differences in retention at intervention completion (RR = 1.00; 95% CI: 0.96, 1.05; 8 studies; I^2 = 0%) or at follow-up (*RR* = 1.00, 95% CI: 0.95, 1.05; I^2 = 0%; **Appendix 4**).

Risk of bias across studies

The overall risk of publication bias appears low because all funnel plots were grossly symmetric, and none of the quantitative tests for publication bias reached statistical significance (**Appendix 5**).

Additional analyses

The low numbers of RCTs eligible for inclusion (n=8) prohibited conducting subgroup and meta-regression analyses. Comparing the fixed-effects to random-effects meta-analyses estimates indicated the impact of heterogeneity was relatively higher at intervention completion for symptoms of PTSD and

anxiety than for symptoms of depression. In contrast, fixed-effects versus random-effects modelling demonstrated minimal impact on the effect sizes for any PTSI at follow-up.

Discussion

The current study is the first meta-analysis of psychotherapeutic interventions for PTSIs among PSP. The results supported the effectiveness of narrative exposure therapy, cognitive behavioural therapy, eclectic psychotherapy, eye movement desensitization and reprocessing, and trauma processing therapy for PSP experiencing symptoms of PTSD, depression, or anxiety. For most interventions, the intervention effects were sustained at follow-up, indicating the durability of benefits. Across the studies, there was minimal attrition, providing support for the interventions' acceptability among participating PSP. The available evidence suggests several effective and acceptable psychotherapies for symptoms of PTSD, depression, and anxiety among PSP.

There are ongoing advances in our understanding of PTSD and trauma-focused interventions occurring alongside increasing recognition that professionals with extensive PPTE exposures (e.g., military, veterans, PSP) are experiencing high levels of PTSI. There are also similarities and occupation-specific needs when managing PPTE sequelae among diverse professional groups. For example, two recent reviews found limited evidence supporting the effectiveness of proactive (e.g., resilience promotion) [73] and post-exposure peer support and crisis-focused psychological interventions (e.g., critical incident stress debriefing, stress management, peer support, psychological first aid, trauma risk management) in mitigating PTSIs among PSP and frontline healthcare personnel [74]. The extant literature for PTSI management among PSP includes multiple therapeutic approaches, study designs (i.e., experimental, observational), and outcome measures (e.g., psychopathology self-report measures, clinician-rated functional assessments, occupational indices such as absenteeism) [74]. Advancements have been made over the past few decades in understanding and treating symptoms of PTSD. Still, the rising number of professionals repeatedly exposed to PPTE continues to be a serious international public health problem, especially in light of operating during the global Covid-19 pandemic [75]. PPTE exposure is nearly ubiquitous [76,77]. Nevertheless, individuals with more frequent PPTE exposures are necessarily at increased risk for PTSIs [78]. For example, approximately 20% of the two million troops deployed to Iraq may have required intervention for PTSD, whereas the population prevalence of PTSD among the deployed troops is less than 10% [79].

Most studies with PPTE exposed participants have focused on military and veteran populations. There are fewer studies exploring PSP. Accordingly, results from military and veterans are often extrapolated to PSP. There is evidence that first-line PPTE-focused interventions (e.g., cognitive processing therapy, prolonged exposure therapy) produce clinically meaningful improvements for military personnel with PTSD; however, nonresponse rates among military personnel appear much higher than civilians [80]. Military participants in PTSD intervention studies who initially respond to intervention report poorer long-term follow-up outcomes than civilian participants [81]. Overall attrition rates appear similar between military and civilian participants receiving intervention for PTSD; however, particular subgroups, such as

persons with PTSD related to combat or assaulted, tend to have poorer intervention outcomes and are more likely to drop out of follow-up [81]. The relatively lower response to interventions for PTSIs among military and veteran populations, coupled with the near absence of RCT evidence with PSP, underscores the need for additional research and intervention development for people repeatedly exposed to PPTE. The knowledge base regarding PPTE exposures and PTSIs is rapidly expanding with novel research and public priorities to support PSP.

Limitations

As with any review, the current work has limitations that contextualize the present results' generalizability and provide future research directions. The eligibility criteria limited the included research results to RCTs to minimize bias from confounding variables. High-quality psychotherapy trials are scarce due to inherent methodological challenges such as patient selection, outcome criteria, lack of controls, and difficulty with blinding [82–84]. Only three of the eight RCTs included in the current meta-analysis met the high-quality criteria as per the Cochrane Risk of Bias tool [67–69]. Pooling outcomes across potentially heterogeneous populations may have violated meta-analytic assumptions; however, most indices of heterogeneity were low, supporting the decision to pool interventions and outcomes across studies. Given the variable trial quality across studies, estimations of intervention effectiveness may have inflated. Publication bias was low, but restricting the search strategy to English-language articles published after 2008 may have excluded relevant studies. Finally, few studies provided measurements of long-term outcomes, the longest of which was at twelve months of follow-up, limiting assessments of sustained impact. PSP who receive intervention is very likely to be re-exposed to numerous subsequent PPTE, which suggests the impact of any single intervention may be offset by one or more new PTSI, which necessarily hampers interpretations of sustained intervention impact.

Future Studies

There is a need for ongoing research on PTSIs among PSP [23,85]. The current review focused on RCTs, but non-RCT designs remain a potentially valuable source of information for advancing the state of knowledge on PTSIs among PSP. For example, a non-randomized study by Berking and colleagues found evidence that police officers who received manualized emotion regulation training demonstrated superior skill application and improved subject mental health ratings [86]. Additional randomized and non-randomized trials are needed to inform further intervention modalities and delivery models that may be particularly beneficial for PSP, such as internet-based cognitive behaviour therapy [31,42].

Conclusions

There is preliminary evidence that psychotherapies help treat PTSIs in PSP; however, the shortage of high-quality studies justifies a need for additional studies investigating the intervention of PTSIs among PSP.

Declarations

Ethical Approval and Consent to participate: not applicable (systematic review).

Consent for publication: not applicable (systematic review).

Availability of supporting data: data will be made available upon request on ResearchGate and Mendeley.

Competing interests: Dr. Bahji is a recipient of the 2020 Friends of Matt Newell Endowment in Substance Abuse through the University of Calgary Cumming School of Medicine.

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Authors' contributions: All authors contributed to the conceptualization of this project. Dr. Bahji registered the review protocol with PROSPERO, conducted the literature review, and wrote the initial draft, coordinating revisions from the co-authors. Dr. Di Nota supported the literature review, serving as the second reviewer. Dr. Anderson secured funding. Drs. Groll and Carleton provided additional supervision and methodological support in addition to providing feedback throughout revisions.

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Table

Table 1. Study characteristics (n=8).

Study	Size	Population	Interventions	Outcomes	Results
Alghamdi et al., 2015 [87]	34	Firefighters	NET (*n*=17) vs. WLC (*n*=17), 6 months	SPTSS, retention, HADS	NET reduced PTSD, anxiety and depression symptoms compared with WLC.
Bryant et al., 2019 [68]	100	First responders	CBT-prolonged (*n*=33) vs. CBT-brief (*n*=33) vs. WLC (*n*=34), 6 months	CAPS, retention, BDI, AUDIT, WHOQOL	CBT is efficacious in reducing PTSD in emergency service personnel.
Chongruksa et al., 2012 [70]	42	Police officers	Group BEP (*n*=20) vs. psychoeducation (*n*=22), one month	SCL, retention, GHQ-30	Those in the eclectic group counselling had significantly lower symptom scores
Gersons et al., 2013 [69]	42	Police officers	BEP (*n*=22) vs. WLC (*n*=20), three months	PTSD remission, retention, SCL, AUD remission	BEP improved PTSD symptoms, work resumption, and some comorbid conditions.
Jarero et al., 2013 [72]	39	First responders	EMDR (*n*=19) vs. supportive counselling (*n*=20), three months	SPRINT, retention	EMDR significantly reduced PTSD scores at the post-test and in the follow-up.
Miller et al., 2019 [88]	71	Police officers	Neuropsychological trauma processing (*n*=43) vs. single session (*n*=28), 11 months	PCL-5, retention	No significant reduction in PTSD scores between groups
Mithoefer et al., 2018 [67]	26	Firefighters and police officers	MDMA-assisted psychotherapy: 125 mg (*n*=12) vs. 75 mg (*n*=7) vs. 30 mg (*n*=7), 12 months	CAPS, retention, BDI, GAF	MDMA-assisted psychotherapy reduced PTSD symptoms in a dose-dependent manner.
Tuckey et al., 2014 [71]	48	Firefighters	Group CISD (*n*=20) vs. education (*n*=28), one month	IES, K10, alcohol use, quality of life	CISD reduced alcohol use and improved quality of life.

CAPS = Clinician Administered PTSD Scale; IES = Impact of Events Scale; K10 = Kessler 10; CISD = Critical Incident Stress Debriefing; SPTSS = Scale of Posttraumatic Stress Symptoms; HADS = Hospital Anxiety and Depression Scale; NET = Narrative Exposure Therapy; WLC = Waitlist Control; CBT = Cognitive Behavioural Therapy; AUDIT = Alcohol Use Disorders Identification Test; BDI-II = Beck Depression Inventory 2nd Edition; WHOQOL = World Health Organization Quality of Life; SCL-90 = Symptom Checklist 90; GHQ-30 = General Health Questionnaire; AUD = alcohol use disorder; BEP = Brief Eclectic Psychotherapy; SPRINT = Short PTSD Rating Interview; EMDR = Eye Movement Desensitization and Reprocessing; PCL-5 = PTSD Checklist for DSM-5; GAF = Global Assessment of Function

Figures

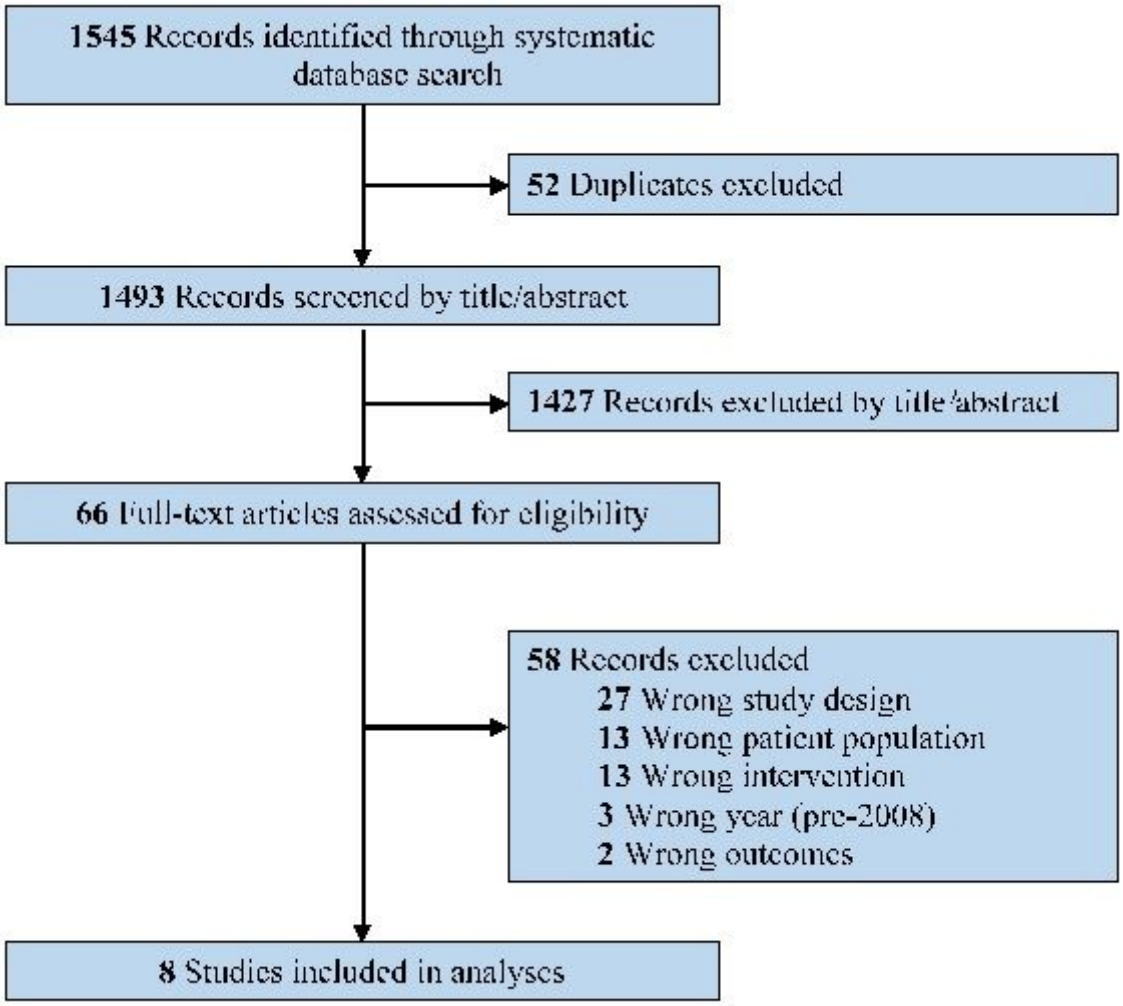

Figure 1

PRISMA flow diagram.

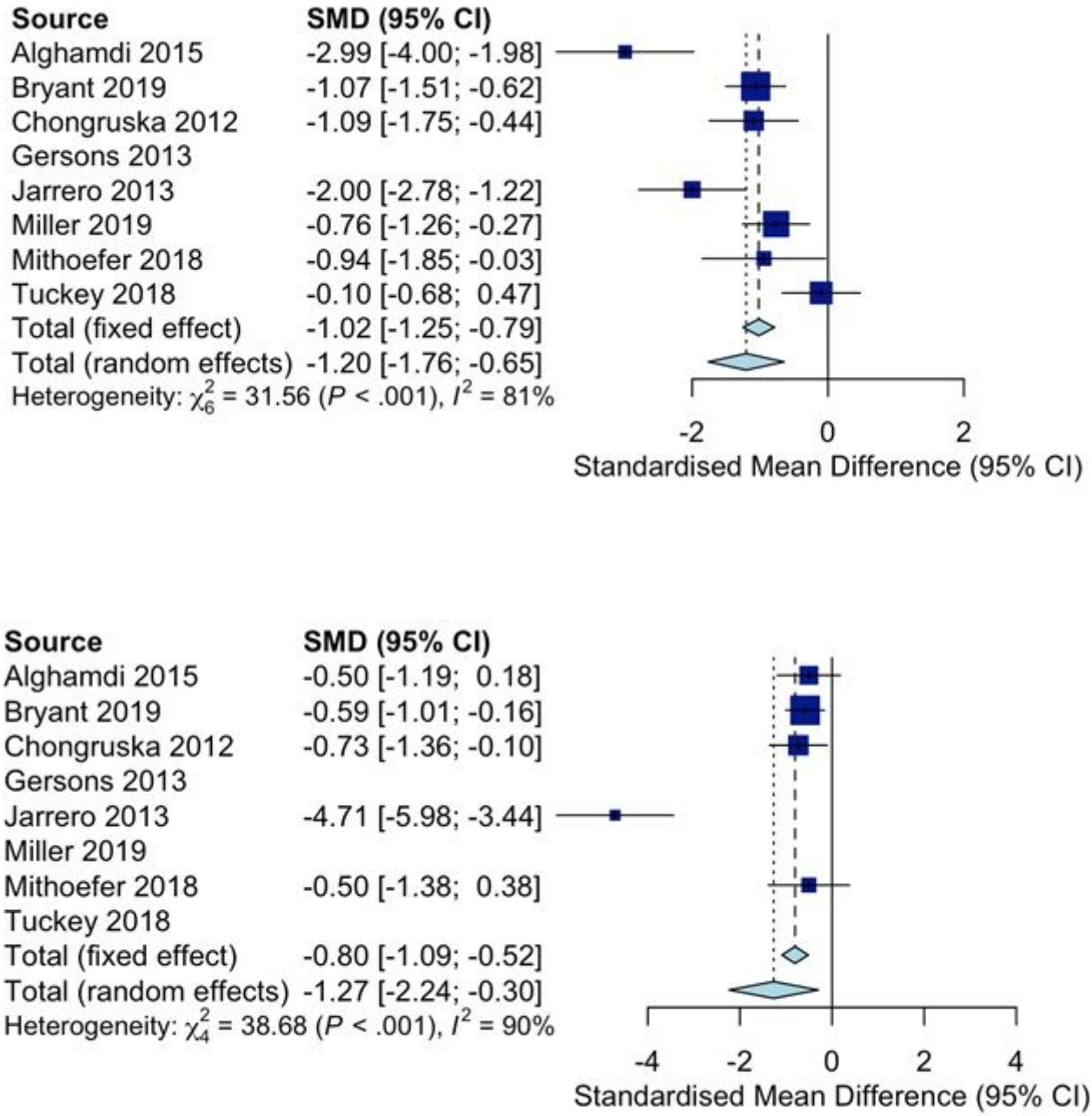

Figure 2

Forest plots for psychotherapies' effectiveness for reducing PTSD symptom severity after the intervention (top) and follow-up (below).

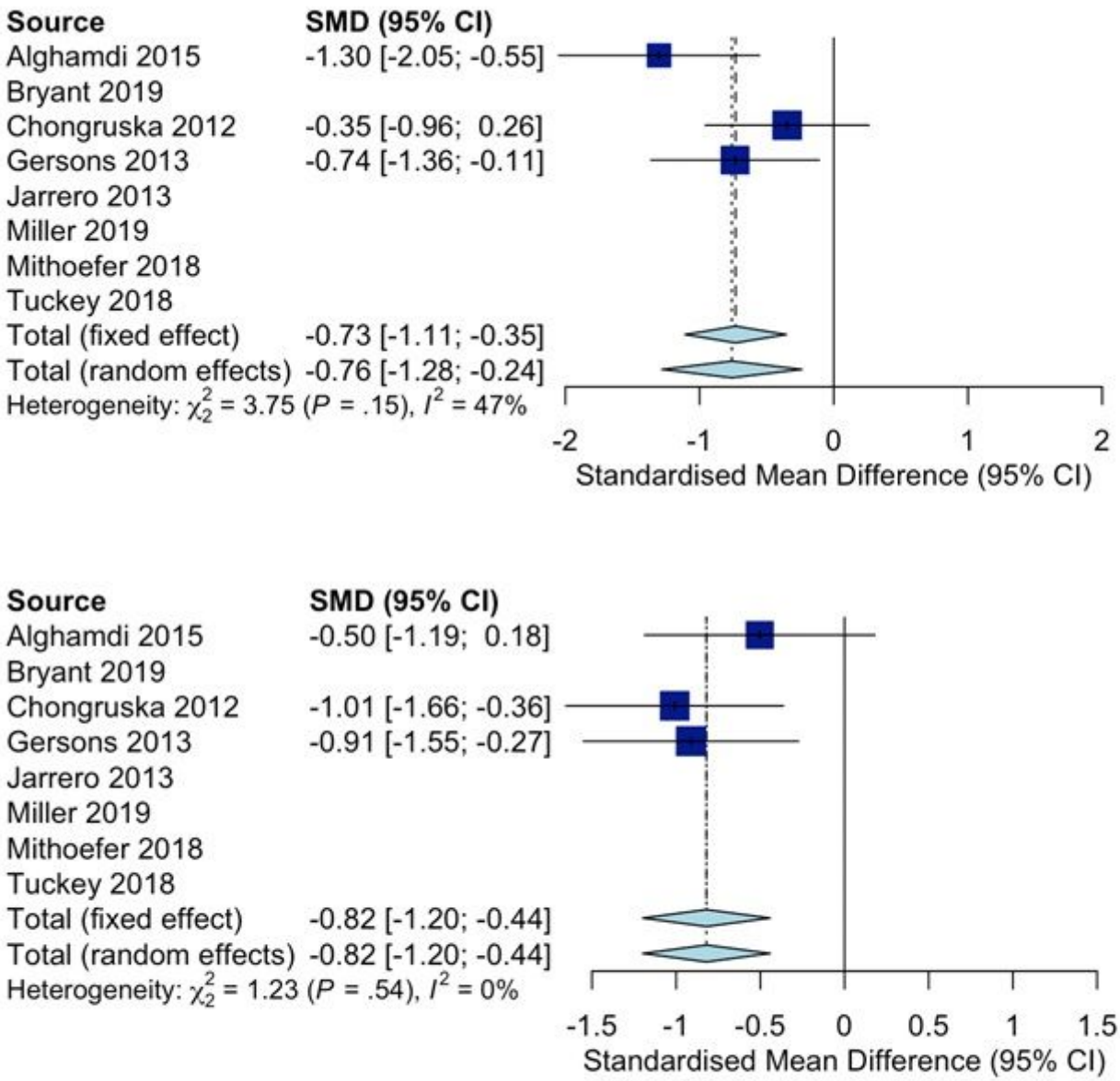

Figure 3

Forest plots for the effectiveness of psychotherapies for reducing anxiety symptom severity after the intervention (top) and in follow-up (below)

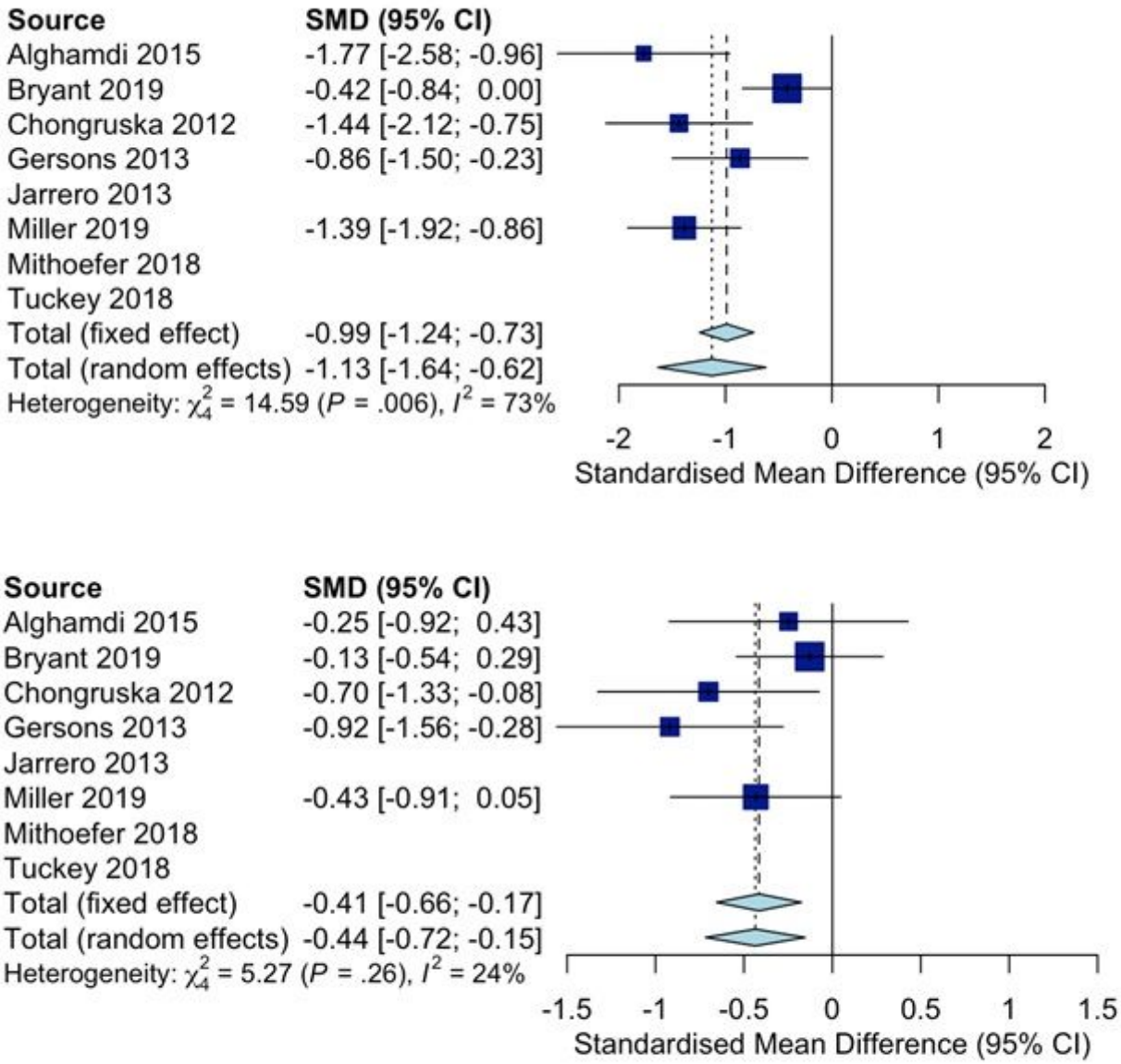

Figure 4

Forest plots for psychotherapies' effectiveness for reducing depression symptom severity after the intervention (top) and follow-up (bottom).

Supplementary Files

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- Appendix.pdf