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REVIEW ARTICLE

Dropout from psychological therapies for post-traumatic stress disorder (PTSD) in adults: systematic review and meta-analysis

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ABSTRACT

Background: Despite the established efficacy of psychological therapies for post-traumatic stress disorder (PTSD) there has been little systematic exploration of dropout rates.
Objective: To ascertain rates of dropout across different modalities of psychological therapy for PTSD and to explore potential sources of heterogeneity.
Method: A systematic review of dropout rates from randomized controlled trials (RCTs) of psychological therapies was conducted. The pooled rate of dropout from psychological therapies was estimated and reasons for heterogeneity explored using meta-regression.
Results:: The pooled rate of dropout from RCTs of psychological therapies for PTSD was 16% (95% CI 14–18%). There was evidence of substantial heterogeneity across studies. We found evidence that psychological therapies with a trauma-focus were significantly associated with greater dropout. There was no evidence of greater dropout from therapies delivered in a group format; from studies that recruited participants from clinical services rather than via advertisements; that included only military personnel/veterans; that were limited to participants traumatized by sexual traumas; that included a higher proportion of female participants; or from studies with a lower proportion of participants who were university educated.
Conclusions: Dropout rates from recommended psychological therapies for PTSD are high and this appears to be particularly true of interventions with a trauma focus. There is a need to further explore the reasons for dropout and to look at ways of increasing treatment retention.

El abandono de las terapias psicológicas para el trastorno de estrés postraumático (TEPT) en adultos: Una revisión sistemática y meta-análisis

Antecedentes: A pesar de la eficacia establecida de las terapias psicológicas para el trastorno de estrés postraumático (TEPT), la exploración sistemática de las tasas de abandono se ha estudiado poco.
Objetivo: Determinar las tasas de abandono a lo largo de las diferentes modalidades de terapia psicológica para el TEPT y explorar las fuentes potenciales de heterogeneidad.
Método: Se llevó a cabo una revisión sistemática de las tasas de abandono de ensayos controlados aleatorios (RCTs en su sigla en inglés) de terapias psicológicas. La tasa combinada de abandono de las terapias psicológicas fue estimada y las razones para la heterogeneidad fueron exploradas usando meta-regresión.
Resultados: La tasa combinada de abandono en RCTs de terapias psicológicas fue 16% (95% IC 14%–18%). Hubo evidencia de una heterogeneidad importante a lo largo de los estudios. Se encontró evidencia de que las terapias psicológicas con un foco en el trauma se asociaron con el mayor abandono. No hubo evidencia de mayor abandono en las terapias implementadas en un formato grupal; en los estudios que reclutaron participantes desde servicios clínicos en vez de vía anuncios; que incluyeron solo personal militar/veteranos; que se limitaron a participantes traumatizados por traumas sexuales; que incluyeron una proporción más alta de participantes mujeres; o en estudios con una proporción más baja de participantes que tenían estudios universitarios.
Conclusiones: Las tasas de abandono de las terapias psicológicas recomendadas para el TEPT son altas y pareciera ser particularmente aplicable a las intervenciones con un foco en el trauma. Existe una necesidad de explorar en más detalle las razones para el abandono y buscar formas de aumentar la retención en el tratamiento.

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PALABRAS CLAVES
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关键词
创伤后应激障碍 (PTSD); 心理治疗; 中途退出; 系统综述; 元分析

HIGHLIGHTS

- Dropout data from 116 Randomised Controlled Trials (RCTs) of psychological therapies for adults with PTSD was meta-analysed.
- The pooled rate of dropout was 16% (95% CI 14–18%).
- Meta-regression was conducted to explore possible predictors of dropout.

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成人创伤后应激障碍（PTSD）心理治疗的中途退出：系统综述和元分析

背景：尽管心理治疗对创伤后应激障碍 (PTSD) 具有确定的功效, 但鲜研究有对其退出率进行系统性探究。
目标：确定创伤后应激障碍的不同心理治疗方法的退出率, 并探究异质性的潜在来源。
方法：系统地回顾了对来自随机对照试验 (RCT) 的心理疗法退出率。估计了心理治疗的合并退出率, 并使用元回归分析了异质性的原因。
结果：RCT的PTSD心理疗法合并退出率为16% (95%CI置信区间为14%-18%) 。证据表明各研究间存在很大的异质性。我们发现的证据表明，聚焦创伤的心理治疗法与高退出率显著相关。没有证据表明以下治疗或研究有更多的退出者:以团体形式进行的治疗；参与者来自临床服务而非通过广告招募的研究；仅包括军事人员/退伍军人的研究；参与者仅限于性创伤遭遇者的研究；参与者中女性比例更高的研究；或参与者中受过大学教育比例较低的研究。
结论：PTSD推荐心理治疗的退出率很高, 尤其是聚焦创伤的干预措施。有必要进一步探究中途退出的原因, 并探寻提高治疗维持率的方法。

1. Introduction

Post-Traumatic Stress Disorder (PTSD) is a debilitating psychiatric disorder with a lifetime prevalence of approximately 8% (Kessler, 2000). In addition to the requirement of exposure to a major traumatic event, the diagnostic criteria for PTSD specify the presence of symptoms including re-experiencing the traumatic event; avoiding reminders of the trauma; alterations in arousal and reactivity; and changes in cognition and mood (American Psychiatric Association, 2013).

Despite decades of research converging on support for the efficacy of psychological therapy for PTSD (Bisson, Roberts, Andrew, Cooper, & Lewis, 2013; Bradley, Greene, Russ, Dutra, & Westen, 2005; Jonas et al., 2013), we know remarkably little regarding dropout from these interventions (Foa et al., 2005; Resick, Nishith, Weaver, Astin, & Feuer, 2002; Schnurr et al., 2007; Schottenbauer, Glass, Arnkoff, Tendick, & Gray, 2008). Many psychological therapies have been applied to the treatment of PTSD and these have fundamentally different components and proposed active ingredients (Foa, Keane, Friedman, & Cohen, 2008; Schnyder et al., 2015). It follows that these variations may have some influence on differential rates of dropout. Despite this likelihood, there have been few attempts to systematically determine dropout rates from the psychological therapies commonly applied to the treatment of PTSD.

Among the evidence-based therapies for PTSD, a major distinction can be drawn between the therapies that focus on the traumatic event and those that aim to reduce traumatic stress symptoms without directly targeting the trauma memory or related thoughts, with the strongest evidence for the effect of those with a trauma-focus (Bisson et al., 2013; Bradley et al., 2005; Jonas et al., 2013). Trauma-focused Cognitive Behaviour Therapy (CBT) and Eye Movement Desensitization and Reprocessing (EMDR) are currently recommended as first-line interventions for PTSD (American Psychological Association, 2017; International Society of Traumatic Stress Studies (ISTSS), 2018; National Institute for Health and Care Excellence (NICE), 2018). These trauma-focused psychological therapies rely on confrontation of traumatic images, which can be difficult to tolerate and may result in the potential for greater dropout (Pitman et al., 1991; Tarrier et al., 1999a). Psychological therapies omitting a role for trauma-focused work may be more tolerable, potentially leading to better retention. However, there is evidence that the absence of a trauma-focus results in poorer outcomes (Bisson et al., 2013; Bradley et al., 2005; Jonas et al., 2013).

The issue of treatment tolerability and symptom exacerbation resulting from trauma-focused psychological therapies has been one of contention in the literature (Devilly & Foa, 2001; Hembree et al., 2003; Tarrier et al., 1999a). It is uncertain whether dropout rates vary as a function of treatment modality or whether those with a trauma-focus are associated with poorer retention. To date, a small number of meta-analyses have compared drop-out rates across different modalities of psychological therapy for PTSD (Bradley et al., 2005; Goetter et al., 2015; Hembree et al., 2003, Imel, Laska, Jakupcak, & Simpson, 2013). One of these studies reported no differences between therapies with and without exposure-work, however, the review is now dated and includes a far smaller number of studies than currently available (Hembree et al., 2003). Another review reported a trend towards greater dropout from exposure-based treatment, but did not analyse this statistically (Bradley et al., 2005). A more recent review reported that dropout was not associated with trauma-focus; however, studies comparing trauma-focused CBT to waitlist or usual care control groups were excluded, restricting the review to 42 studies (Imel et al., 2013). A more recent review found no difference in dropout rates from therapies that included exposure work in comparison to those that did not, but the review only included twenty studies of US military veterans (Goetter et al., 2015).

The aim of the current review was to ascertain rates of dropout across different modalities of psychological therapy and to determine whether some psychological therapies (especially those with a trauma-focus) were associated with higher rates of dropout than others. Since there is no agreed definition of dropout, we took the number of participants that had left the study at the point of post-treatment assessment as a proxy-indicator of dropout in order to allow the inclusion of data from a maximal number of studies. We also aimed to explore potential sources of heterogeneity among the included studies. Our overarching goal was to contribute to a refined understanding of dropout from psychological therapies for PTSD that will inform the development of treatment protocols that maximize retention.

2. Method

2.1. Selection criteria

Data on drop-out were extracted from studies that had been identified for a review of the efficacy of psychological therapies for adults with PTSD, which was undertaken as part of an update of the International Society for Traumatic Stress Studies (ISTSS) Treatment Guidelines (International Society of Traumatic Stress Studies (ISTSS), 2018). Both reviews had the same inclusion criteria. RCTs of any defined psychological therapy aimed at the reduction of PTSD-symptoms in comparison with a control group (e.g. usual care/waiting list); other psychological therapy; or psychosocial intervention (e.g. psychoeducation/relaxation training) were included. At least 70% of study participants were required to be diagnosed with PTSD with a duration of three months or more, according to DSM or ICD criteria determined by clinician diagnosis or an established diagnostic interview. This review considered studies of adults aged 18 or over, only. There were no restrictions based on symptom-severity or trauma-type. The diagnosis of PTSD was required to be primary and studies of comorbid PTSD and substance use disorder were excluded, but there were no other restrictions based on co-morbidity. Studies were only included if they reported data on the number of participants that had dropped out of the study by the point of post-treatment assessment. If multiple studies reported data on the same participants, dropout data were only included once. We also excluded RCTs of single-session interventions.

2.2. Search strategy

A search was conducted by the Cochrane Collaboration, which updated a previously published Cochrane review with the same inclusion criteria, which was published in 2013 (Bisson et al., 2013). The updated search aimed to identify all RCTs related to the prevention and treatment of PTSD, published from January 2008 to the 31 May 2018, using the search terms PTSD or post-trauma* or post-trauma* or 'post trauma*' or 'combat disorder*' or 'stress disorder*'. The searches included results from PubMed, PsycINFO, Embase and the Cochrane database of randomized trials. This produced a group of papers related to the psychological treatment of PTSD in adults. We checked reference lists of the included studies. We searched the World Health Organization's, and the US National Institutes of Health's trials portals to identify additional unpublished or ongoing studies. We contacted experts in the field with the aim of identifying unpublished studies and studies that were in submission. A complementary search of the Published International Literature on Traumatic Stress (PILOTS) was also conducted.

2.3. Data extraction

Study characteristics and dropout data were extracted by two reviewers independently and in duplicate, using a form that had been pre-piloted. Since there is no agreed definition of dropout, taking the number of participants that had left the study at the point of post-treatment assessment allowed the inclusion of data from a maximal number of studies. Study authors were contacted to obtain missing data. Therapy classifications were agreed with the ISTSS treatment guidelines committee and posted on the ISTSS website to allow comment from the membership. Reasons for dropout and adverse events were not universally available or consistently reported by studies and it was not therefore possible to extract or meta-analyse these data.

2.4. Risk of bias assessment

All included studies were assessed for risk of bias at the study level, using Cochrane criteria (Higgins et al., 2011). This included: (1) sequence allocation for randomization (the methods used for randomly assigning participants to the treatment arms and the extent to which this was truly random); (2) allocation concealment (whether or not participants or personnel were able to foresee allocation to a specific group); (3) assessor blinding (whether the assessor was aware of group allocation); (4) incomplete outcome data (whether missing outcome data were handled appropriately); (5) selective outcome reporting (whether reported outcomes matched with those that were pre-specified); and (6) any other notable threats to validity (for example, premature termination of the study). Two researchers independently assessed each study and any conflicts were discussed with a third researcher with the aim of reaching a unanimous decision.

2.5. Data synthesis

Meta-analyses of proportion were conducted using the *metaprop* command in STATA version 13.1 (StataCorp, 2013). The *metaprop* command pools proportions and uses the score statistic and the exact binomial method to compute 95% confidence intervals (Thompson & Higgins, 2002). Data were pooled across all active psychological therapies. Sub-group analyses were also conducted to determine the dropout rate for each psychological therapy. A random effects model was chosen due to the heterogeneity across studies in terms of the inclusion and exclusion criteria of the studies; the populations from which the samples were drawn; the nature and duration of therapy; the predominant trauma type; and the mean age of participants.

Heterogeneity was assessed using both the I^2 statistic (which indicates the proportion of the variance that is due to heterogeneity (Higgins & Green, 2011)) and visual inspection of the forest plots. To explore potential sources of heterogeneity, meta-regression was performed using the *metareg* function of STATA version 13.1 (StataCorp, 2013). Meta-regression assesses the association between study-level variables and the effect size (Thompson & Higgins, 2002). It was hypothesized that a number of study-level variables would result in higher rates of dropout, these being: therapies having a trauma-focus (due to the possibility of these therapies being difficult for some participants to tolerate); therapies being delivered in a group-format (since drop out from group therapies has been found to be greater than from therapies delivered on an individual basis (Imel et al., 2013)); recruitment from clinical services rather than through advertisements (due to the likelihood of more severe symptoms and a possible tendency for these participants to be less motivated to engage in treatment); whether or not the participants were selected from military/veteran populations (due a greater likelihood of complex or severe PTSD); whether the trauma experienced by participants was sexual (due to the possibility of therapy being more difficult to tolerate); and the percentage of participants who were University educated (due to the possibility that more educated participants are better able to grasp the concepts involved in therapy). To explore the possibility of publication bias, we constructed a funnel plot using data on dropout from all active therapy groups.

3. Results

The original Cochrane review included 70 RCTs. The update search identified 5500 potentially eligible studies published since 2008. Abstracts were reviewed and full-text copies obtained for 203 potentially relevant studies. Forty-four new RCTs met inclusion criteria for the review and reported data on dropout at the point of post-treatment assessment. This resulted in a total of 115 RCTs of 7724 participants. Figure 1 presents a flow diagram for study selection.

3.1. Study characteristics

Study characteristics are summarized in Table 1. Twenty-eight defined psychological therapies were evaluated. Eight of these were broadly categorized as CBT with a Trauma Focus (CBT-T) delivered on an individual basis: Brief Eclectic Psychotherapy (BEP); Cognitive Processing Therapy (CPT); Cognitive Therapy (CT); Narrative Exposure Therapy (NET); Prolonged Exposure (PE); Reconsolidation of Traumatic Memories (RTM); Virtual Reality Exposure Therapy (VRE) and CBT-T (not based on a specific model). Thirteen other therapies delivered to individuals were evaluated: EMDR; CBT without a Trauma Focus; Present Centred Therapy (PCT); Supportive Counselling; Written Exposure Therapy; Observed and Experiential Integration (OEI); Interpersonal Psychotherapy; Psychodynamic Psychotherapy; REM Desensitization; Emotional Freedom Technique (EFT); Dialogical Exposure Therapy (DET); Internet-based CBT; and Relaxation Training. There were six different types of group therapy: Group CBT-T; Group Present Centred Therapy (PCT); Group and Individual CBT-T; Group Stabilizing Treatment; Group Interpersonal Therapy; Group Supportive Counselling. There were also RCTs of couples CBT-T. There were six types of control group: psychoeducation; couples psychoeducation; internet-based psychoeducation; waitlist; treatment as usual; and minimal attention/symptom monitoring.

The number of randomized participants ranged from 10 to 360. Studies were conducted in Australia (9), Canada (2), China (2), Denmark (1), Germany (5), Iran (2), Israel (1), Italy (2), Japan (1), the Netherlands (5), Norway (1), Portugal (1), Romania (1), Rwanda (1), Spain (1), Sweden (3), Switzerland (1), Thailand (1), Turkey/Syria (1), Uganda (2), UK (10) and USA (62). Participants were traumatized by military trauma (27 studies), sexual assault or rape (11 studies), war/persecution (4 studies), road traffic accidents (6 studies), earthquakes (2 studies), childhood abuse (3 studies), political detainment (1 study), terrorism (2 studies), physical assault (2 studies), domestic abuse (4 studies), medical diagnoses/emergencies (4 studies), genocide (1 study) and organized violence (3 studies). The remainder included individuals traumatized by various different traumatic events. There were 27 studies of females only and 10 of only males; the percentage of females in the remaining studies ranged from 1.75% to 96%. The percentage with a University education ranged from 4% to 90%.

3.2. Risk of bias

Risk of bias assessments for the included studies are summarized in Table 2. Fifty-two studies reported

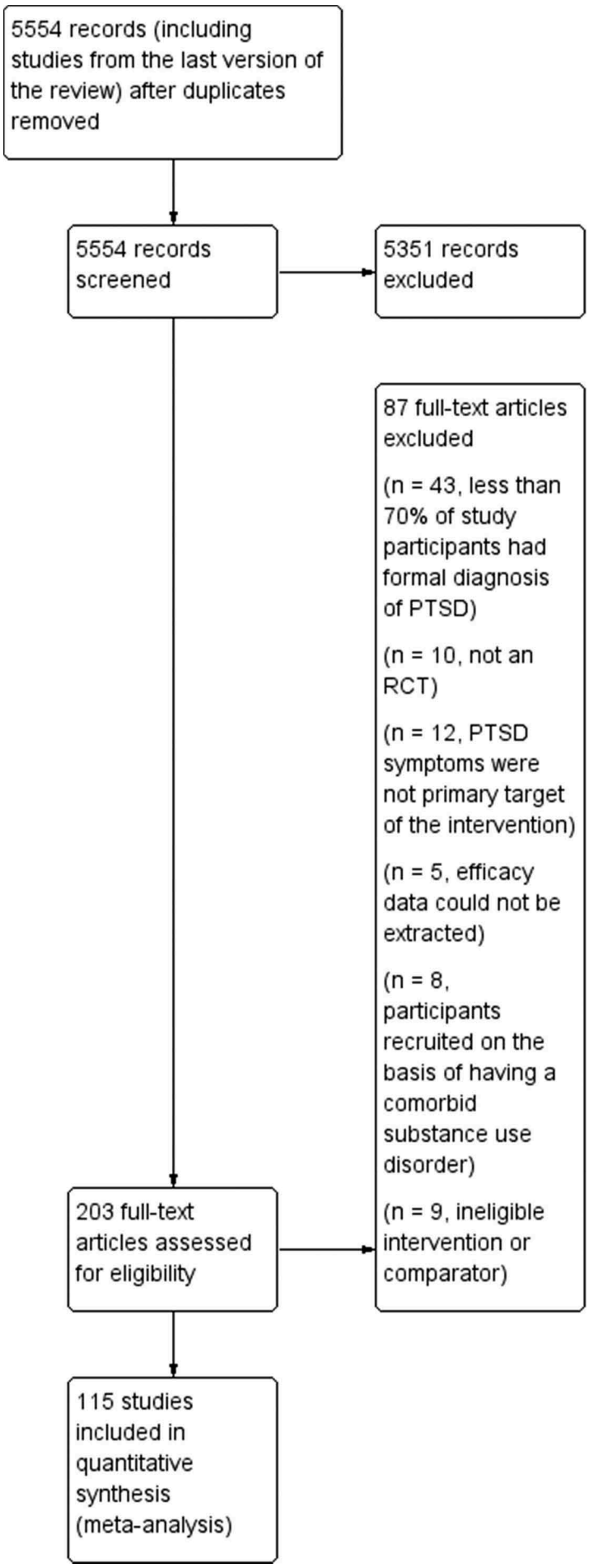

Figure 1. Study flow diagram.

Table 1. Characteristics of included studies.

Study	*N*	Country	Intervention 1	Intervention 2	Intervention 3	Intervention 4	Population	Trauma type	% Female	% Unemployed	% University Educated
Acarturk et al. (2016)	98	Turkey/Syria	EMDR	WL			Refugees	War/Persecution	74	Unknown	4
Adenauer et al. (2011)	34	Germany	NET (CBT-T)	WL			Refugees	War/Persecution	44	Unknown	Unknown
Ahmadi, Hazrati, Ahmadizadeh and Noohi (2015)	48	Iran	EMDR	REM Desensitization	WL		Military Personnel/Veterans	Military Trauma	0	Unknown	33.3
Akbarian et al. (2015)	40	Iran	Group CBT-T	MC/RA			General Population	Various	79	Unknown	Unknown
Asukai, Saito, Tsuruta, Kishimoto and Nishikawa (2010)	24	Japan	PE (CBT-T)	TAU			General Population	Various	88	Unknown	Unknown
Beck, Coffey, Foy, Keane, & Blanchard (2009)	44	USA	Group CBT-T	MC/RA			General Population	Road Traffic Accident	82	54	Unknown
Bichescu, Neuner, Schauer and Elbert (2007)	18	Romania	NET (CBT-T)	Psychoeducation			General Population	Political detainment	94	0	72
Blanchard et al. (2003)	98	USA	CBT-T	SC	WL		General Population	Road Traffic Accident	73	Unknown	Unknown
Bradshaw, McDonald, Grace, Detwiler and Austin (2014)	10	Canada	OEI	WL			General Population	Various	70	0	Unknown
Brom, Kleber and Defares (1989)	83	Netherlands	CBT-T	Psychodynamic Therapy	WL		General Population	Various	79	49	Unknown
Bryant, Moulds, Guthrie, Dang and Nixon (2003)	58	Australia	CBT-T	SC			General Population	Various	52	Unknown	Unknown
(Bryant et al., 2011)	28	Thailand	CBT-T	SC			General Population	Terrorism	96	84%	Unknown
(Buhmann, Nordentoft, Ekstroem, Carlsson, & Mortensen, 2016)	138	Denmark	CBT-T	WL			Refugees	Organized Violence	41	Unknown	Unknown
(Butollo, Karl, König, & Rosner, 2016)	148	Germany	CPT (CBT-T)	DET			General Population	Various	66	Unknown	Unknown
(Capezzani et al., 2013)	21	Italy	EMDR	CBT-T			General Population	Medical Diagnoses/Emergencies	90	Unknown	Unknown
(Carletto et al., 2016)	50	Italy	EMDR	Relaxation Training			General Population	Medical Diagnoses/Emergencies	81	Unknown	Unknown
(Carlson, Chemtob, Rusnak, Hedlund, & Muraoka, 1998)	35	USA	EMDR	Relaxation Training	TAU		Military Personnel/Veterans	Military Trauma	0	62	Unknown
(Castillo et al., 2016)	86	USA	Group CBT-T	WL			Military Personnel/Veterans	Military Trauma	100	44	Unknown
(Chard, 2005)	71	USA	CPT (CBT-T)	WL			General Population	Sexual Assault or Rape	100	Unknown	Unknown
(Cloitre, Koenen, Cohen, & Han, 2002b)	58	USA	CBT-T	WL			General Population	Child Abuse	100	24	52
(Cloitre et al., 2010)	71	USA	CBT-T	CBT without a trauma focus			General Population	Child Abuse	100	31	Unknown
Cooper (1989)	16	USA	EMDR	Relaxation Therapy			Military Personnel/Veterans	Military Trauma	0	Unknown	Unknown
(Devilly, Spence, & Rapee, 1998)	35	Australia	EMDR	TAU			Military Personnel/Veterans	Military Trauma	0	Unknown	Unknown
(Devilly & Spence, 1999)	32	Australia	EMDR	CBT-T			General Population	Various	100	Unknown	Unknown
(Dorrepaal et al., 2012)	71	Netherlands	Group Stabilizing Treatment	TAU			General Population	Child Abuse	Unknown	83	Unknown
(Duffy, Gillespie, & Clark, 2007)	58	UK	CT (CBT-T)	WL			General Population	Various	40	Unknown	Unknown
(Dunne, Kenardy, & Sterling, 2012)	26	Australia	CBT-T	WL			General Population	Road Traffic Accident	50	31	73
(Echeburua, Zubizarreta, & Sarasua, 1997)	20	Spain	CBT-T	Relaxation Training			General Population	Sexual Assault or Rape	100	Unknown	20
(Ehlers, Clark, Hackmann, McManus, & Fennell, 2005)	28	UK	CT (CBT-T)	WL			General Population	Various	50	25	35
(Ehlers et al., 2003)	57	UK	CT (CBT-T)	MC/RA			General Population	Road Traffic Accident	Unknown	Unknown	Unknown
(Ehlers et al., 2014)	91	UK	CT (CBT-T)	SC	WL		General Population	Various	58	23	26
(Falsetti, Resnick, & Davis, 2008)	60	USA	Group CBT-T	WL			General Population	Various	100	Unknown	Unknown
(Fecteau & Nicki, 1999)	20	Canada	CBT-T	WL			General Population	Road Traffic Accident	70	Unknown	Unknown
(Feske, 2008)	21	USA	PE (CBT-T)	TAU			General Population	Various	100	29%	90%

(*Continued*)

Table 1. (Continued).

Study	*N*	Country	Intervention 1	Intervention 2	Intervention 3	Intervention 4	Population	Trauma type	% Female	% Unemployed	% University Educated
(Foa, Rothbaum, Riggs, & Murdock, 1991)	45	USA	PE (CBT-T)	CBT without a trauma focus	Supportive counselling	WL	General Population	Sexual Assault or Rape	100	Unknown	Unknown
(Foa et al., 1999)	66	USA	PE (CBT-T)	CBT without a trauma focus	WL		General Population	Sexual Assault or Rape	100	38	41
(Foa et al., 2005)	179	USA	PE (CBT-T)	WL			General Population	Assault	100	17	34
(Foa et al., 2018)	256	USA	Spaced PE (CBT-T)	PCT	MC/RA		Military Personnel/Veterans	Military Trauma	12	100	66
(Fonzo et al., 2017)	66	USA	PE (CBT-T)	WL			General Population	Various	65	Unknown	Unknown
(Forbes et al., 2012)	59	Australia	CPT (CBT-T)	TAU			Military Personnel/Veterans	Military Trauma	4	36	Unknown
(Ford, Steinberg, & Zhang, 2011)	146	USA	CBT without a trauma focus	PCT	WL		General Population	Various	100	Unknown	22
(Ford, Chang, Levine, & Zhang, 2013)	80	USA	Group CBT-T	Group Supportive Counselling			Incarcerated Women	Various	100	Unknown	Unknown
(Galovski, Blain, Mott, Elwood, & Houle, 2012)	100	USA	CPT (CBT-T)	MC/RA			General Population	Various	69	Unknown	Unknown
(Gamito et al., 2010)	10	Portugal	VRE (CBT-T)	Control Exposure	WL		Military Personnel/Veterans	Military Trauma	0	Unknown	Unknown
(Gersons, Carlier, Lamberts, & Van der Kolk, 2000)	42	Netherlands	BEP (CBT-T)	WL			General Population	Various	Unknown	Unknown	Unknown
(Gray, Budden-Potts, & Bourke, 2017)	74	USA	RTM (CBT-T)	WL			Military Personnel/Veterans	Military Trauma	0	Unknown	Unknown
(Hensel-Dittmann et al., 2011)	28	Germany	NET (CBT-T)	CBT without a trauma focus			Asylum Seekers	Organized Violence	Unknown	Unknown	Unknown
(Hinton et al., 2005)	40	USA	CBT-T	WL			Refugees	Genocide	60	Unknown	Unknown
(Hinton, Hofmann, Rivera, Otto, & Pollack, 2011)	24	USA	Group CBT-T	WL			General Population	Various	100	Unknown	Unknown
(Hogberg et al., 2007)	24	Sweden	EMDR	WL			General Population	Various	38	Unknown	Unknown
(Hollifield, Sinclair-Lian, Warner, & Hammerschlag, 2007)	55	USA	Group trauma-focused CBT	WL			General Population	Various	68	Unknown	40
(Ironson, Freund, Strauss, & Williams, 2002)	22	USA	EMDR	PE (CBT-T)			General Population	Various	77	Unknown	Unknown
(Ivarsson et al., 2014)	62	Sweden	I-CBT	WL			General Population	Various	82	8	65
(Jacob, Neuner, Maedl, Schaal, & Elbert, 2014)	76	Rwanda	NET (CBT-T)	WL			Genocide Survivors	Genocide	92	Unknown	Unknown
(Jensen, 1994)	25	USA	EMDR	WL			Military Personnel/Veterans	Military Trauma	0	68	Unknown
(Johnson, Zlotnick, & Perez, 2011)	70	USA	CBT without a trauma focus	TAU			General Population	Domestic Abuse	100	73	7
(Johnson, Johnson, Perez, Palmieri, & Zlotnick, 2016)	60	USA	CBT without a trauma focus	TAU			General Population	Domestic Abuse	100	77	5
(Karatzias et al., 2011)	46	UK	EMDR	EFT			General Population	Various	57	37	47
(Keane, Fairbank, Caddell, & Zimering, 1989)	24	USA	CBT-T	WL			Military Personnel/Veterans	Military Trauma	0	Unknown	Unknown
(Krupnick et al., 2008)	48	USA	Group IPT	WL			General Population	Various	100	80	13%
(Kubany, Hill, & Owens, 2003)	37	USA	CBT-T	WL			General Population	Domestic Abuse	100	Unknown	Unknown
(Kubany, Hill, & Owens, 2004)	107	USA	CBT-T	WL			General Population	Domestic Abuse	100	Unknown	Unknown
(Laugharne et al., 2016)	20	Australia	EMDR	PE (CBT-T)			General Population	Various	70	Unknown	Unknown
(Lee, Gavriel, Drummond, Richards, & Greenwald, 2002)	24	Australia	CBT-T	EMDR			General Population	Various	46	Unknown	Unknown
(Lewis et al., 2017)	42	UK	I-CBT	WL			General Population	Various	57	19	62
Lindauer	24	Netherlands	BEP	WL			General Population	Various	54	Unknown	Unknown

(*Continued*)

Table 1. (Continued).

Study	*N*	Country	Intervention 1	Intervention 2	Intervention 3	Intervention 4	Population	Trauma type	% Female	% Unemployed	% University Educated
Littleton (2016) (Littleton, Grills, Kline, Schoemann, & Dodd, 2016)	87	USA	I-CBT	I-Psychoeducation			General Population	Sexual Assault or Rape	100	Unknown	Unknown
(Litz, Engel, Bryant, & Papa, 2007)	45	USA	I-CBT	I-SC			Military Personnel/Veterans	Terrorism/Military Trauma	Unknown	Unknown	Unknown
(Marcus, Marquis, & Sakai, 1997)	67	USA	EMDR	TAU			General Population	Various	79	Unknown	Unknown
(Markowitz et al., 2015)	110	USA	IPT	PE (CBT-T)	Relaxation Therapy		General Population	Various	70	21	Unknown
(Marks, Lovell, Noshirvani, Livanou, & Thrasher, 1998)	87	UK	PE (CBT-T)	Cognitive Restructuring	PE (CBT-T) (CBT-T)(CBT-T)and Cognitive Restructuring	Relaxation without PE (CBT-T) (CBT-T)(CBT-T)or CR	General Population	Various	36	54	Unknown
(McDonagh et al., 2005)	74	USA	PE (CBT-T)	PCT	WL		General Population	Sexual Assault or Rape	100	17	Unknown
(McLay et al., 2011)	20	USA	VRE (CBT-T)	TAU			Military Personnel/Veterans	Military Trauma	5	Unknown	Unknown
(McLay et al., 2017)	81	USA	VRE (CBT-T)	Control Exposure Therapy			Military Personnel/Veterans	Military Trauma	4	Unclear	Unclear
(Monson et al., 2012)	20	USA	Couples CBT-T	WL			General Population	Various	25	40	Unknown
(Monson et al., 2006)	60	USA	CPT (CBT-T)	WL			Military Personnel/Veterans	Military Trauma	10	Unknown	Unknown
(Morath et al., 2014)	38	Germany	NET (CBT-T)	WL			Refugees	Organized Violoence	32	Unknown	Unknown
(Mueser et al., 2008)	108	USA	CBT-T	TAU			General Population	Various	79	Unknown	Unknown
(Nacasch et al., 2011)	30	Israel	PE (CBT-T)	TAU			Military Personnel/Veterans	Military Trauma	Unknown	63	Unknown
(Neuner et al., 2010)	32	Germany	NET (CBT-T)	TAU			Refugees	Torture	31	Unknown	Unknown
(Neuner et al., 2008)	277	Uganda	NET (CBT-T)	SC	Monitoring Psychoeducation		Refugees	War/Persecution	51	49	Unknown
(Neuner, Schauer, Klaschik, Karunakara, & Elbert, 2004)	43	Uganda	NET (CBT-T)	SC			Refugees	War/Persecution	60	28	Unknown
(Nijdam, Gersons, Reitsma, de Jongh, & Olff, 2012)	140	Netherlands	BEP (CBT-T)	EMDR			General Population	Various	56	Unknown	30
(Pacella et al., 2012)	66	USA	PE (CBT-T) (CBT-T)	MC/RA			General Population	Medical Diagnoses/Emergencies	37	Unknown	Unknown
(Paunovic, 2011)	29	Sweden	CBT-T	WL			General Population	Various	63	74	11
(Peniston & Kulkosky, 1991)	29	USA	CBT-T	TAU			Military Personnel/Veterans	Military Trauma	Unknown	Unknown	Unknown
(Power et al., 2002)	105	UK	EMDR	CBT-T	WL		General Population	Various	42	Unknown	Unknown
(Rauch et al., 2015)	36	USA	PE (CBT-T) (CBT-T)	PCT			Military Personnel/Veterans	Military Trauma	9	Unknown	Unknown
(Ready, Gerardi, Backscheider, Mascaro, & Rothbaum, 2010)	11	USA	VRE (CBT-T)	PCT			Military Personnel/Veterans	Military Trauma	Unknown	Unknown	Unknown
(Reger et al., 2016)	162	USA	VRE (CBT-T)	PE (CBT-T)	WL		Military Personnel/Veterans	Military Trauma	4	Active duty	7
(Resick et al., 2015)	108	USA	Group CBT-T	Group PCT			Military Personnel/Veterans	Military Trauma	8	0	8
(Resick et al., 2002)	171	USA	CPT (CBT-T) (CBT-T)	PE (CBT-T)	Minimal Attention		General Population	Sexual Assault or Rape	100	Unknown	Unknown
(Resick et al., 2017)	268	USA	CPT (CBT-T) (CBT-T)	Group CBT-T			Military Personnel/Veterans	Military Trauma	9	100	19
(Rothbaum, 1997)	18	USA	EMDR	WL			General Population	Sexual Assault or Rape	100	19	43
(Rothbaum, Astin, & Marsteller, 2005)	60	USA	PE (CBT-T)	EMDR	WL		General Population	Sexual Assault or Rape	100	Unknown	Unknown
(Sautter, Glynn, Cretu, Senturk, & Vaught, 2015)	57	USA	Couples CBT without a trauma focus	Couples Psychoeducation			Military Personnel/Veterans	Military Trauma	1.75	12	75
(Scheck, Schaeffer, & Gillette, 1998)	60	USA	EMDR	SC			General Population	Various	100	Unknown	Unknown
(Schnurr et al., 2003)	360	USA	Group CBT-T	Group PCT			Military Personnel/Veterans	Military Trauma	0	51	Unknown
(Schnurr et al., 2007)	284	USA	PE (CBT-T) (CBT-T)	Group PCT			Military Personnel/Veterans	Military Trauma	100	38	Unknown
(Schnyder, Müller, Maercker, & Wittmann, 2011)	30	Switzerland	BEP (CBT-T)	MC/RA			General Population	Various	46.7	Unknown	Unknown
Shemesh	60	USA	CBT-T	Psychoeducation			General Population	Medical Diagnoses/Emergencies	33	Unknown	Unknown

(*Continued*)

Table 1. (Continued).

Study	*N*	Country	Intervention 1	Intervention 2	Intervention 3	Intervention 4	Population	Trauma type	% Female	% Unemployed	% University Educated
(Sloan, Marx, Bovin, Feinstein, & Gallagher, 2012)	46	USA	WET	WL			General Population	Road Traffic Accident	Unclear	78	41
(Sloan, Marx, Lee, & Resick, 2018)	126	USA	WET	CPT (CBT-T)			General Population	Various	49	Unknown	13
(Spence et al., 2011)	42	Australia	I-CBT	WL			General Population	Various	81	41	Not clear
(Stenmark, Catani, Neuner, Elbert, & Holen, 2013)	81	Norway	NET (CBT-T)	TAU			Refugees	Various	31	Unknown	25
(Suris, Link-Malcolm, Chard, Ahn, & North, 2013)	86	USA	CPT (CBT-T)	PCT			Military Personnel/Veterans	Sexual Assault or Rape	85	43	16
(Taylor et al., 2003)	60	USA	PE (CBT-T)	Relaxation Therapy	EMDR		General Population	Various	75	13	Unknown
(Tylee, Gray, Glatt, & Bourke, 2017)	30	USA	RTM (CBT-T)	WL			General Population	Military Trauma	0	Unknown	Unknown
(Vaughan et al., 1994)	36	Australia	CBT-T	Relaxation Training	EMDR		General Population	Various	64	Unknown	Unknown
(Wells et al., 2015)	32	UK	PE (CBT-T)	CBT without a trauma focus	WL		General Population	Various	38	6	Unknown
(Wells & Sembi, 2012)	20	UK	CBT without a trauma focus	WL			General Population	Various	55	Unknown	Unknown
(Yehuda et al., 2014)	52	USA	PE (CBT-T)	MC/RA			Military Personnel/Veterans	Military Trauma	Unclear	Unknown	Unknown
(Zang, Hunt, & Cox, 2014)	20	China	NET (CBT-T)	WL			General Population	Earthquake	90	Unknown	Unknown
(Zang, Hunt, & Cox, 2013)	22	China	NET (CBT-T)	WL			General Population	Earthquake	77	Unknown	Unknown
(Zlotnick et al., 1997)	48	USA	Group CBT-T	WL			General Population	Sexual Assault or Rape	100	Unknown	33

BEP =Brief Eclectic Psychotherapy; **NET** = Narrative Exposure Therapy
CBT =Cognitive Behavioural Therapy; **OEI** =Observed and Experimental Integration
CBT-T =Cognitive Behavioural Therapy with a Trauma focus; **PCT** =Present Centred Therapy
CPT =Cognitive Processing Therapy; **PE** =Prolonged Exposure
CR =Cognitive Restructuring; **REM Desensitization** =Rapid Eye Movement Desensitization
CT =Cognitive Therapy; **RTM** =Reconsolidation of Traumatic Memories
DET =Dialogical Exposure Therapy; **SC** =Supportive Counselling
EFT =Emotional Freedom Technique; **TAU** =Treatment as Usual
EMDR = Eye Movement Desensitization and Reprocessing**VRE** =Virtual Reality Exposure
I-CBT = Internet-based Cognitive Behavioural Therapy; **WET** = Written Emotion Therapy
I-Psychoeducation =Internet-based Psychoeducation; **WL** =Waiting List
IPT =Interpersonal Psychotherapy
I-SC =Internet-based Supportive Counselling
MC/RA =Medical Checks/Repeated Assessments

Table 2. Risk of bias assessments of the included studies.

	Random sequence generation	Allocation concealment	Incomplete outcome data assessment	Blinding of outcome	Selective reporting	Other sources of bias	Total no. high risk
(Acarturk et al., 2016)	Low	Low	Low	Low	Low	Low	0
(Adenauer et al., 2011)	Low	Low	Low	Low	High	High	2
(Ahmadi et al., 2015)	Unclear	Unclear	High	Unclear	Unclear	High	2
(Akbarian et al., 2015)	Low	High	Low	Low	Unclear	High	2
(Asukai et al., 2010)	Low	Low	Low	Low	Unclear	High	1
(Beck et al., 2009)	Unclear	Unclear	High	Low	Unclear	High	2
(Bichescu et al., 2007)	High	Unclear	Low	Low	Unclear	High	2
(Blanchard et al., 2003)	High	Unclear	Low	Low	Unclear	Low	1
(Bradshaw et al., 2014)	Unclear	Unclear	Low	High	Unclear	High	2
(Brom et al., 1989)	Unclear	Unclear	High	Unclear	Unclear	High	2
(Bryant et al., 2003)	Low	Unclear	Low	Low	Low	High	1
(Bryant et al., 2011)	Low	Low	Low	Low	Unclear	High	1
(Buhmann et al., 2016)	Low	Low	Unclear	Low	Low	Low	0
(Butollo et al., 2016)	Unclear	Unclear	Low	Low	Unclear	High	1
(Capezzani et al., 2013)	Unclear	Unclear	Low	Low	Unclear	High	1
(Carletto et al., 2016)	Low	Low	High	Low	Low	Low	1
(Carlson et al., 1998)	Unclear	Unclear	High	Unclear	Unclear	Low	1
(Castillo et al., 2016)	Unclear	Unclear	Low	Low	Unclear	High	1
(Chard, 2005)	Unclear	Unclear	Low	Low	Unclear	High	1
(Cloitre et al., 2002b)	Unclear	Unclear	Low	Low	High	Low	1
(Cloitre et al., 2010)	Unclear	Low	Low	Low	Low	Low	0
(Cooper & Conklin, 2015)	High	High	High	Unclear	Low	High	4
(Devilly et al., 1998)	Unclear	Unclear	High	Low	Unclear	Low	1
(Devilly & Spence, 1999)	High	Unclear	High	Unclear	Unclear	High	3
(Dorrepaal et al., 2012)	Unclear	Low	Low	Low	High	High	2
(Duffy et al., 2007)	Low	Low	Low	Unclear	Low	High	1
(Dunne et al., 2012)	Unclear	Unclear	Low	Unclear	Unclear	High	1
(Echeburua et al., 1997)	Unclear	Unclear	Low	Unclear	Unclear	High	1
(Ehlers et al., 2003)	Low	Low	High	Low	Unclear	High	2
(Ehlers et al., 2005)	Unclear	Unclear	Low	Low	Unclear	High	2
(Ehlers et al., 2014)	Unclear	Low	Low	Low	Low	Low	0
(Falsetti et al., 2008)	Unclear	Unclear	Low	Low	High	High	2
(Fecteau & Nicki, 1999)	Low	Unclear	High	Unclear	Unclear	High	2
(Feske, 2008)	Unclear	Unclear	Low	Unclear	Unclear	High	1
(Foa et al., 1991)	Unclear	Unclear	High	Low	Unclear	High	2
(Foa et al., 1999)	Unclear	Unclear	Low	Low	Unclear	High	1
(Foa et al., 2005)	Low	Low	Low	Low	Unclear	Low	0
(Foa et al., 2018)	Low	Low	Low	Low	Low	Low	0
(Fonzo et al., 2017)	Low	Unclear	Low	Unclear	Low	Low	0
(Forbes et al., 2012)	Unclear	Low	Low	Unclear	Unclear	High	1
(Ford et al., 2011)	Low	Low	Low	Low	Unclear	High	1
(Ford et al., 2013)	Low	Low	High	Low	Unclear	High	2
(Galovski et al., 2012)	Unclear	Unclear	Low	Low	Unclear	Low	0
(Gamito et al., 2010)	Unclear	Unclear	Unclear	Unclear	High	High	2
(Gersons et al., 2000)	Unclear	Unclear	Low	Low	Unclear	Low	0
(Gray et al., 2017)	Low	Low	Unclear	Unclear	Unclear	Unclear	0
(Hensel-Dittmann et al., 2011)	Low	Low	Low	Low	Unclear	Low	0
(Hinton et al., 2005)	Low	Unclear	Low	Low	Unclear	High	1
(Hinton et al., 2011)	Unclear	Unclear	Low	Unclear	Unclear	High	1
(Hogberg et al., 2007)	Low	Unclear	High	Low	Unclear	High	2
(Hollifield et al., 2007)	Low	Low	Low	Low	Unclear	High	1
(Ironson et al., 2002)	Unclear	Unclear	Low	High	Unclear	High	2

(*Continued*)

Table 2. (Continued).

	Random sequence generation	Allocation concealment	Incomplete outcome data assessment	Blinding of outcome	Selective reporting	Other sources of bias	Total no. high risk
(Ivarsson et al., 2014)	Low	Unclear	Low	Low	Low	High	1
(Jacob et al., 2014)	Low	Low	Low	Low	Unclear	High	1
(Jensen, 1994)	Unclear	Unclear	High	Unclear	Unclear	High	2
(Johnson et al., 2011)	Low	Unclear	Low	High	Unclear	Low	1
(Johnson et al., 2016)	Low	Low	Low	Low	Unclear	Low	0
(Karatzias et al., 2011)	Low	Low	Low	Low	Unclear	High	1
(Keane et al., 1989)	Unclear	Unclear	Unclear	High	Unclear	High	2
(Krupnick et al., 2008)	Unclear	Unclear	Low	Unclear	Unclear	High	1
(Kubany et al., 2003)	Unclear	Unclear	Low	Low	Unclear	High	1
(Kubany et al., 2004)	Unclear	Unclear	Low	Low	Low	High	1
(Laugharne et al., 2016)	Low	Low	Low	Low	Unclear	High	1
(Lee et al., 2002)	Unclear	Unclear	Low	Low	Unclear	High	1
(Lewis et al., 2017)	Low	Low	Low	Low	Low	High	1
(Lindauer et al., 2005)	Low	Low	Low	Low	Low	High	
(Littleton et al., 2016)	Low	Unclear	Low	High	Low	Low	1
(Litz et al., 2007)	Unclear	Unclear	High	Low	Low	High	2
(Marcus et al., 1997)	Unclear	Unclear	Unclear	High	Unclear	High	2
(Markowitz et al., 2015)	Low	Low	Low	Low	Low	High	1
(Marks et al., 1998)	Unclear	Unclear	Low	Low	Unclear	Low	0
(McDonagh et al., 2005)	Unclear	Unclear	Low	Low	Unclear	Low	0
(McLay et al., 2011)	Low	Low	Unclear	High	Unclear	High	2
(McLay et al., 2017)	Low	Unclear	Low	Low	Low	Low	0
(Monson et al., 2012)	Low	Low	Low	Low	Low	Low	0
(Monson et al., 2006)	Low	Low	Low	Low	Unclear	Low	0
(Morath et al., 2014)	Low	Low	Unclear	Low	Low	Low	0
(Mueser et al., 2008)	Low	Low	Low	Low	Unclear	High	1
(Nacasch et al., 2011)	Low	Unclear	Low	Low	Low	High	1
(Neuner et al., 2004)	Low	Unclear	Low	Low	Low	High	1
(Neuner et al., 2008)	Unclear	Unclear	Low	Low	Unclear	Low	0
(Neuner et al., 2010)	Unclear	Unclear	Low	Low	Unclear	High	1
(Nijdam et al., 2012)	Unclear	Low	Low	Low	Low	Low	0
(Pacella et al., 2012)	Low	Unclear	Low	Low	Unclear	Low	0
(Paunovic, 2011)	Unclear	Unclear	Low	High	Unclear	High	2
(Power et al., 2002)	Low	Low	High	Low	Unclear	Low	1
(Rauch et al., 2015)	Unclear	Unclear	Low	Low	Unclear	High	1
(Ready et al., 2010)	Unclear	Unclear	Unclear	Low	Unclear	High	1
(Reger et al., 2016)	Low	Low	Low	Low	Unclear	Low	0
(Resick et al., 2002)	Unclear	Unclear	Low	Low	Unclear	High	1
(Resick et al., 2015)	Unclear	Unclear	Low	Low	Unclear	Low	0
(Resick et al., 2017)	Low	Unclear	Low	Low	Low	Low	0
(Rothbaum, 1997)	Unclear	Unclear	High	Low	Unclear	High	2
(Rothbaum et al., 2005)	Unclear	Unclear	High	Low	Unclear	Low	1
(Sautter et al., 2015)	Unclear	Unclear	Low	Low	Unclear	Low	0
(Scheck et al., 1998)	Low	Low	High	Unclear	Unclear	High	2
(Schnurr et al., 2003)	High	Unclear	Low	Low	Low	Low	1
(Schnurr et al., 2007)	Low	Low	Low	Low	Low	Low	0
Shemesh	Low	Low	Unclear	Unclear	Unclear	Low	0
(Sloan et al., 2012)	Low	Low	Unclear	Low	Unclear	Low	0
(Sloan et al., 2018)	Low	Low	Low	Low	Low	Low	0
(Spence et al., 2011)	Low	Unclear	High	High	Low	Unclear	2
(Stenmark et al., 2013)	Unclear	Unclear	Low	High	Low	High	2
(Suris et al., 2013)	Unclear	Unclear	Low	Low	Low	High	1
(Taylor et al., 2003)	Unclear	Unclear	Low	Low	Unclear	Low	0
(Tylee et al., 2017)	Unclear	Unclear	Unclear	Low	Unclear	High	1
(Vaughan et al., 1994)	Unclear	Unclear	Low	Low	Unclear	Low	0
(Wells & Sembi, 2012)	Low	Low	Low	Low	Unclear	High	1
(Wells et al., 2015)	Low	Low	High	High	Unclear	High	3

(*Continued*)

Table 2. (Continued).

	Random sequence generation	Allocation concealment	Incomplete outcome data assessment	Blinding of outcome	Selective reporting	Other sources of bias	Total no. high risk
(Yehuda et al., 2014)	Unclear	Unclear	High	Unclear	Unclear	Unclear	1
(Zang et al., 2013)	Unclear	Unclear	Low	Low	Low	High	1
(Zang et al., 2014)	Low	Unclear	Low	Low	Low	High	1
(Zlotnick et al., 1997)	Unclear	Unclear	High	Low	Low	High	2

a method of sequence allocation judged to pose a 'low' risk of bias; five reported a method with a 'high' risk of bias; the remainder reported insufficient details and were, therefore, rated as 'unclear'. Forty-one studies reported methods of allocation concealment representing a 'low' risk of bias; two a method with a 'high' risk of bias; with the remainder rated as 'unclear'. The outcome assessor was aware of the participant's allocation in 11 of the included studies; it was unclear whether the outcome assessor was aware of group allocation in 20 studies; with the remainder using blind-raters or self-report questionnaires delivered in a way that could not be influenced by members of the research team. Twenty-three studies were judged as posing a 'high' risk of bias in terms of incomplete outcome data; 79 studies were felt to have dealt with dropouts appropriately ('low' risk of bias); it was unclear in the remaining studies. The majority of studies failed to reference a published protocol, resulting in an 'unclear' risk of selective reporting for 75 studies; risk of bias was judged as 'high' in five studies and low in the remainder. Seventy of the included studies presented a 'high' risk of bias in other areas, for example, in relation to sample size, baseline imbalances between groups, or other methodological shortfalls. We could not rule out potential researcher allegiance, since treatment originators were involved in the evaluation of their own intervention in many of the included studies.

3.3. Dropout

Across the different modalities of psychological therapy, dropout rates from individual studies ranged from 0%-65%. The pooled dropout rate from psychological therapies for PTSD was 16% (95% CI 14–18; k = 116) with substantial heterogeneity across studies (I^2 = 77.3%). The dropout rate for each modality of psychological therapy is presented in Table 3. The heterogeneity in dropout rates indicates differences that may be predicted by the variables entered into meta-regression.

Table 3. Results of the meta-analyses of dropout.

	Number of studies	Mean % drop out (95% CI)	I^2 (%)
1. CBT-T (not based on a specific model)	25	13 (9–18)	64.41
2. Brief Eclectic Psychotherapy	3	17 (0–51)	90.40
3. Cognitive Processing Therapy (CPT)	8	30 (22–39)	75.15
4. Cognitive Therapy (CT)	6	9 (1–23)	82.72
5. Narrative Exposure Therapy	11	12 (3–26)	85.59
6. Prolonged Exposure (PE)	22	22 (16–28)	72.56
7. Reconsolidation of Traumatic Memories (RTM)	1	1 (0–8)	0.00
8. Virtual Reality Exposure (VRE)	5	18 (3–38)	76.32
9. Eye Movement Desensitization and Reprocessing (EMDR)	21	18 (12–24)	62.13
10. CBT without a trauma focus	9	14 (7–23)	61.96
11. Present Centred Therapy (PCT)	6	20 (13–28)	40.85
12. Supportive Counselling	9	15 (3–32)	87.84
13. Observed and Experiential Integration (OEI)	1	0	Not applicable
14. Interpersonal Psychotherapy (IPT)	1	15 (6–30)	Not applicable
15. Psychodynamic Psychotherapy	1	14	Not applicable
16. REM Desensitization	1	38	Not applicable
17. Emotional Freedom Technique (EFT)	1	39	Not applicable
18. Dialogical Exposure Therapy (DET)	1	12	Not applicable
19. Internet-based CBT	3	16 (8–26)	32.12
20. Relaxation Training	8	10 (3–19)	56.80
21. Group CBT with a Trauma Focus (group CBT-T)	9	24 (16–33)	76.29
22. Group Present Centred Therapy (PCT)	3	14 (11–18)	0.00
23. Group and Individual CBT-T	1	22	Not applicable
24. Group Stabilizing Treatment	1	18	Not applicable
25. Group Interpersonal Psychotherapy	1	38	Not applicable
26. Group Supportive Counselling	1	3	Not applicable
27. Couples CBT-T	2	22 (11–36)	0.00
28. Psychoeducation	3	1 (0–7)	0.00
29. Couples Psychoeducation	3	12 (3–25)	64.00
30. Internet-based psychoeducation	1	7	Not applicable
31. Waitlist	53	11 (8–15)	65.43
32. Treatment usual	14	13 (7–19)	61.37
33. Minimal attention/symptom monitoring	8	13 (2–32)	92.30

3.4. Meta-regression

Results of the meta-regressions are presented in Table 4. We found evidence that psychological therapies with a trauma-focus were significantly associated with greater dropout (β = 0.069; CI 0.011–0.127; P = 0.021; dropout rate of 18% (95% CI 15–21%) from those with a trauma focus versus 14% (95% CI 10–18%) from those without a trauma focus). There was no evidence of greater dropout from therapies delivered in a group format; from studies that recruited participants from clinical services rather than via advertisements; that included only military personnel/veterans; that included only participants traumatized by sexual traumas; from studies with a higher proportion of female participants; or from studies with a lower proportion of participants who were University educated.

3.5. Publication bias

A funnel plot (see Figure 2), which was constructed using data on dropout from all active therapy groups, did not show evidence of publication bias.

4. Discussion

4.1. Main findings

Taking the number of participants that had left the study at the point of post-treatment assessment as a proxy-indicator of dropout, the pooled rate from psychological therapies for PTSD was 16% (95% CI 14–18%). This is of a similar magnitude to a previous meta-analysis of 42 studies, which found an average dropout rate of 18% (Imel et al., 2013) using the definition of dropout given by the included studies. This is also similar to the drop-out rate of 17.5% obtained from a meta-analysis of drop-out from RCTs of psychotherapy for depression (Cooper & Conklin, 2015) that defined dropout as unexpected attrition among individuals who were randomized to a treatment but failed to complete it. It was considerably lower than the pooled drop-out rate of 36% found by a more recent review of twenty studies of US military

Table 4. Meta-regression of study-level variables on dropout from all active psychological therapies.

Variable	*β* (95% confidence intervals)	*P*
Trauma focus	0.069 (0.011–0.127)	0.021
Recruitment from clinical services	−0.028 (−0.087–0.030)	0.341
Delivered in a group format	−0.022 (−0.096–0.523)	0.564
Sample drawn from military population	0.032 (−0.023–0.087)	0.251
Sexual trauma	0.040 (−0.049–0.130)	0.376
% Female	0.040 (−0.049–0.130)	0.376
% University educated	0.001 (−0.003–0.001)	0.208

Trauma-focus coded as 0 = non-trauma focused, 1 = trauma focused; recruitment method coded as 0 = not recruited from clinical services, 1 = recruited from clinical services; delivered in a group format coded as 0 = not delivered in a group format, 1 = not delivered in a group format; sample drawn from military population coded 0 = not from a military population; 1 = from a military population; sexual trauma coded 0 = not a sexual trauma; 1 = a sexual trauma.

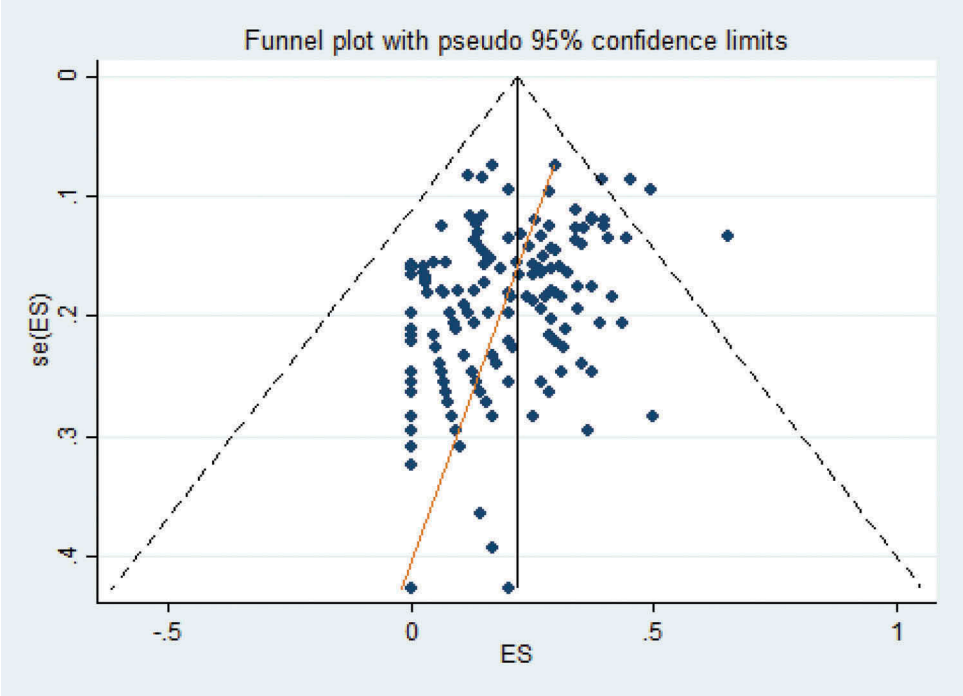

Figure 2. Funnel plot.

veterans (Goetter et al., 2015). This was in comparison to a pooled dropout rate from studies of veterans/military personnel in this review of 18% (95% CI 15–22%). This is likely to reflect the fact that the previous review included a variety of different study designs including naturalistic studies and used the definition of dropout given by the authors of individual studies.

There was no evidence of greater dropout from therapies delivered in a group format. This contradicts the findings of earlier reviews that found group delivery to be associated with a significant increase in dropout (Goetter et al., 2015; Imel et al., 2013). This may be the result of more recent studies evaluating interventions that have been optimized to increase retention or more proactive attempts to retain participants. There was also no evidence of significantly greater dropout from studies that recruited participants from clinical services rather than via advertisements; that included only military personnel/veterans; that included only participants traumatized by sexual traumas; that included only female participants; and from studies with a lower proportion of participants who were University educated. Research looking at factors associated with dropout have yielded inconsistent findings (Bryant et al., 2007; Schottenbauer et al., 2008; Taylor, 2003). Although the findings of the current review contradict some previous studies; they are in agreement with others. Inconsistencies may be the result of difference in study type and design; the types of interventions of interest and the degree to which they are protocolized; or may vary according to the populations of interest.

We found evidence that psychological therapies with a trauma-focus were significantly associated with greater dropout. This challenges the findings of previous, far smaller, meta-analyses, which found no significant differences in dropout rates from therapies with and without a trauma-focus (Goetter et al., 2015; Hembree et al., 2003). However, one of these studies found a significant difference between PCT (a non-trauma-focused intervention) and a group of therapies that had a trauma-focus (Imel et al., 2013). Our findings may be a result of the accumulated data available from a larger number of studies. The results, however, are consistent with the findings of a review of seven studies of treatments specifically targeting child abuse-related or complex PTSD, which found some evidence of greater drop-out from exposure-based therapies (Dorrepaal et al., 2014). Although there are many reasons for dropout from psychological therapies, this finding suggests that difficulties tolerating trauma-focused treatment may be one of these. Adverse events such as the prolonged exacerbation of existing symptoms (for example, an increased frequency of unwanted thoughts or nightmares) or the occurrence of new symptoms (for example, anger or self-blame) may lead to dropout, yet there is a surprising scarcity of research exploring the issue (Berk & Parker, 2009). Psychological therapy is traditionally perceived as safe, presenting a low risk of unwanted effects (Nutt & Sharpe, 2008). In reality, the estimated rate of reported side effects is between 3% and 15%, which is of a similar magnitude to that reported for pharmacotherapy (Linden, 2012). However, it is often difficult to draw a distinction between adverse events and time-limited negative experiences inherent to the process of some psychological therapies. This includes the experience of distress provocation, which is inevitable in the process of trauma-focused work.

A survey of psychologists' attitudes to trauma-focused intervention found that concerns about tolerability and dropout were among the main reasons that psychologists did not use trauma-focused intervention, despite the compelling evidence supporting its use (Becker, Zayfert, & Anderson, 2004). However, only a small number of studies have acknowledged or explored adverse events such as symptom worsening or its influence on dropout in relation to trauma-focused therapy. This is surprising, given that symptom exacerbation has long since been documented in the treatment of PTSD (Pitman et al., 1991; Tarrier et al., 1999b). It also limits our ability to judge how well various therapies were tolerated by PTSD sufferers. An RCT of imagery rehearsal therapy for trauma-related nightmares found that all four participants who actively withdrew from the treatment group had experienced increased negative imagery effects, suggesting a direct relationship between an inability to tolerate the treatment and subsequent dropout (Krakow et al., 2001; Tarrier, Sommerfield, Pilgrim, & Humphreys, 1999). Conversely, a study of 76 individuals found that only 9–21% of participants showed reliable symptom exacerbation, and these individuals were no more likely to drop out of treatment prematurely (Foa, Zoellner, Hembree, & Alvarez-Conrad, 2002). Similarly, an RCT comparing cognitive therapy (without a trauma focus) to imaginal exposure found that symptom worsening affected 10% of participants, with a significantly greater number of these being in the imaginal exposure group; however, this between-group difference was no longer present at follow-up and rates of dropout were similar from both groups (Tarrier et al., 1999).

The studies included in this review usually failed to provide information on adverse events and contained few explanations for dropout, so it is difficult to ascertain the reasons that participants dropped out. It must be acknowledged that symptom improvement is a possible reason for dropout (Szafranski, Smith, Gros, & Resick, 2017). It follows that termination of treatment for this reason would be highest from the most effective treatments (i.e. those with a trauma-focus (Bisson et al., 2013; Bradley et al., 2005; Jonas et al., 2013)). This said, recent studies have found that those who attend more treatment sessions generally obtain more favourable outcomes (Holmes et al., 2019; Rutt, Oehlert, Krieshok, & Lichtenberg, 2018). More transparent reporting of

dropout is required to explore this further. Whatever the cause, dropout is a major health and societal concern, which may result in individuals failing to receive optimal treatment (Craske et al., 2006).

4.2. Strengths and limitations

The review followed Cochrane guidelines for the identification of relevant studies; data extraction; and risk assessment (Higgins & Green, 2011). A wide range of psychological therapies for PTSD were considered, which included participants from different countries and backgrounds, who had been exposed to a variety of different traumatic events. Inevitably, there were some limitations. The majority of studies included in the review excluded individuals with comorbidities of substance dependence, psychosis, and severe depression, who may be more likely to drop out of treatment prematurely, as evidenced by particularly high rates of drop out from studies of participants with co-morbid alcohol dependency (Bothwell, Greene, Podolsky, & Jones, 2016; Roberts, Jones, & Bisson, 2016; Zandberg et al., 2016). All included studies were published, resulting in the possibility of publication bias. However, a funnel plot constructed from the data did not show evidence of this being an issue.

Since there is no agreed conceptualization of dropout, this review extracted and meta-analysed data on the number of participants that had left the study at the point of post-treatment assessment to allow the inclusion of data from a maximal number of studies. There may have been some participants who completed a full course of therapy but failed to attend the post-treatment assessment. Equally, there may have been some participants who failed to complete the course of treatment but attended the post-treatment assessment nonetheless. Although this may bias our findings, there are limitations to all methods that we could have adopted to conceptualize dropout.

The review relied on RCT evidence, which is both a strength and a limitation. The methodology may have excluded some potentially high-quality sources of evidence, such as large observational studies and non-randomized controlled effectiveness studies (Bothwell et al., 2016), which could contribute to a more accurate overall assessment of dropout. It may be the case that dropout from clinical trials underestimates the true extent of dropout in routine clinical care on the basis that study teams are motivated to retain participants and often provide incentives for the completion of treatment. Equally, participants may have been more inclined to drop out on the basis of the additional demands of participation in a trial, such as regular completion of research assessments. However, taking a broader approach would risk diluting higher quality sources of evidence with weaker ones. A major weakness was that reasons for dropout were not reported or were poorly reported by most studies and it was not possible to systematically extract and analyse this information.

4.3. Research implications

Bringing together the available evidence on dropout has always been problematic given that there is no agreed definition and studies have conceptualized the phenomenon differently. Agreeing a definition of dropout would advance the field by encouraging the reporting of data that is comparable across trials. A previous study that compared the application of four operational definitions of dropout (therapist judgement, failure to attend the last scheduled appointment, a median-split procedure, and failure to return to therapy after the intake appointment) found that the rate ranged from 17.6% to 53.1%, depending on the definition that was used (Hatchett & Park, 2003). It follows that a framework to guide the standardized collection and documentation of data related to dropout including information on adverse events is needed. There is currently no theoretical concept to guide the evaluation and reporting of dropout and adverse events that occur during psychological therapy, which is needed and would include a standardized list of reasons for dropout. A first step would be for research ethics committees to mandate that future RCTs of psychological treatments routinely collect and report standardized data on dropout, including the reasons for it. When possible, studies should also report on the severity of symptoms at the point that participants drop out from therapy and whether any adverse events occurred (Hembree et al., 2003). Systematic reviews that analyse individual patient data in relation to dropout enable the application of a standardized definition across studies and would advance the field by moving beyond looking at associations between study-level variables and dropout. As noted by previous reviews, there is also a need for the standardized and consistent measurement of treatment acceptability across trials (Lewis, Roberts, Bethell, Robertson, & Bisson, 2018; Simon et al., 2019). Only when we have sufficient knowledge on the reasons for dropout can we be sure that patients are receiving the best possible intervention.

4.4. Clinical implications

Although we cannot be sure that the reasons for dropout are negative, the findings point to the need for careful assessment of the suitability of patients for trauma-focused work. Since there is evidence for the effect of many different modalities of psychological therapy (American Psychological Association, 2017;

International Society of Traumatic Stress Studies (ISTSS), 2018; National Institute for Health and Care Excellence (NICE), 2018), a 'one-size fits all' approach should be avoided and the evidence-base used to guide shared-decision making between patient and clinician (National Institute for Health and Care Excellence (NICE), 2018, Cloitre, 2015). Enhancing patient choice may improve retention on the basis that individuals are self-selecting treatment approaches that hold personal appeal. Whether or not this ultimately impacts retention and treatment outcomes requires investigation. Since PTSD is a highly heterogeneous condition (Cloitre, 2015; DiMauro, Carter, Folk, & Kashdan, 2014) a greater understanding of dropout has the potential to facilitate the targeted recommendation of existing evidence-based treatments to specific sub-groups of patients. Dropout is clearly a complex phenomenon, which may be best conceptualized as having a multifaceted aetiology that is likely to vary across different therapies and diagnostic groups. A multi-factorial approach is likely to be required to reduce dropout, such as a stepped care approach that is personalized to include stabilization if necessary and addresses the various barriers to remaining in treatment (Dorrepaal et al., 2013; Zatzick, 2012). Although there is evidence to suggest that trauma-focused therapies can be safely used with a wide range of people with PTSD, including those who may be considered to have contra-indications such as psychiatric comorbidities and histories of sexual abuse (Cloitre, Garvert, & Weiss, 2017, van Minnen, Harned, Zoellner, & Mills, 2012, Wagenmans, Van Minnen, Sleijpen, & De Jongh, 2018), further work is needed to determine any possible impact on dropout. Phased therapies have been developed with preparatory work to improve stability before trauma-focused work (Cloitre, Koenen, Cohen, & Han, 2002a). However, there is no consensus as to whether models starting with stabilization are necessary or preferable to directly applying evidence-based trauma-focused interventions (Lahuis, Scholte, Aarts, & Kleber, 2019, Ter Heide, Mooren, & Kleber, 2016; Ter Heide, Mooren, Kleijn, de Jongh, & Kleber, 2011). This approach has been found to result in improved outcomes and greater retention in trauma-focused CBT for PTSD (Bryant et al., 2013). Another option is the introduction of peer support, which has been shown to encourage participants to re-enter treatment and subsequently achieve significant clinical improvement (Hernandez-Tejada, Hamski, & Sánchez-Carracedo, 2017).

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