LITERATURE REVIEW:

A Review of Compassion-Facilitating Interventions for Post-Traumatic Stress Disorder

EMPIRICAL PAPER:

The Effects of a Compassion-Facilitating Meditation on Recovery from Experimentally Induced Intrusions and Distress in a Healthy Student Sample

Submitted by Laura Louise Shepstone, to the University of Exeter

as a thesis for the degree of Doctor of Clinical Psychology

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Author's Declaration

The literature review was completed independently by the author, Laura Shepstone. A second trainee, Dr Lewis Pettit was consulted as a second reviewer to inter-rate the papers for inclusion and for quality.

In terms of the empirical work, an assistant psychologist (Beth Camp) and a Masters student (Anna Zinn) were employed to help partially complete the psycho-physiological data pre-processing. All other aspects of the study were completed by the author including data collection, entry, psychophysiological and statistical analysis, and write up. The author does not disclose any actual or potential conflict of interest.

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SCHOOL OF PSYCHOLOGY

DOCTORATE IN CLINICAL PSYCHOLOGY

LITERATURE REVIEW

A Review of Compassion-Facilitating Interventions for Post-Traumatic Stress Disorder

Trainee Name: **Laura Shepstone**

Primary Research Supervisor: **Dr Anke Karl**

Senior Lecturer, Mood Disorders Centre

Secondary Research Supervisor: **Dr Nick Moberly**

Senior Lecturer, Mood Disorders Centre

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Abstract

Background: Compassion-facilitating interventions (CFIs) seek to increase feelings of reassurance, safeness and well-being, and are suggested as a new psychotherapeutic approach to treat post-traumatic stress.

Objectives: This review summarises and synthesises the literature investigating CFIs for post-traumatic stress disorder (PTSD) in clinical adult populations.

Method: A systematic review of the experimental and intervention literature to date was completed using PubMed, PsycINFO, and Web of Knowledge databases.

Results: CFIs show large to medium effect sizes in reducing PTSD in traumatised populations. However, many studies did not compare these interventions to active control conditions, and for the few studies that did, compassion-facilitating interventions were not better at reducing PTSD than the active control conditions. There was also not enough evidence in these studies to indicate a mechanism of change in these interventions.

Conclusions: CFIs may be an effective intervention in PTSD, but more high quality research is needed to establish their efficacy over and above well-established PTSD treatments. More research is also needed to identify the psychological mechanisms at work in decreasing PTSD symptoms.

Keywords: *self-compassion, compassion-facilitating, loving kindness meditation, mindfulness interventions, post-traumatic stress disorder.*

Introduction

Compassion-facilitating interventions (CFIs) work by increasing a person's trait self-compassion (SC) and decreasing their feelings of self-criticism and shame (Gilbert, 2009). Although there are elements of increasing compassion towards others, CFIs primarily facilitate compassion towards the self. Neff (2003) described it as taking a balanced and kindness–orientated perspective on one's situation. SC is negatively associated with shame, self-criticism, rumination, avoidance, thought suppression, anxiety and depression, and positively associated with healthy psychological functioning (Neff, Kirkpatrick, & Rude, 2007). A self-compassionate attitude can buffer individuals against negative feelings when imagining hurtful events (Leary, Tate, Adams, Allen, & Hancock, 2007), and is known to improve wellbeing and resilience (Wei, Liao, Ku, & Shaffer, 2011).

Current research suggests that trait SC may be cognitively protective against negative attitudes because it prevents maladaptive thought processes, leaving attentional resources free to use more adaptive strategies such as mindfulness and self-soothing (Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008). Additionally, unlike enhancing self-esteem-based coping strategies, which may have to use narcissistic responses to cope with stressors, SC instead facilitates more adaptive responses without resorting to a de-evaluation of the threat (Neff & Vonk, 2009) or of the self (Leary et al., 2007), which keeps the concept of self whole and positive.

SC is also suggested to be used as an emotion regulation strategy whereby negative feelings and experiences could be held in awareness with kindness and therefore ameliorated (Gilbert, 2005). In Gilbert's (2009) three

systems model of emotional regulation, CFIs are proposed to boost the relief/safeness system (Figure 2). It is also hypothesised that increased state SC could lead to more balanced autonomic nervous system functioning (Kirschner, 2016), through a “normalisation” of the biological stress axis (Rockliff, Gilbert, McEwan, Lightman, & Glover, 2008).

Compassion-facilitating Interventions

There is emerging evidence that psychological interventions can cultivate state SC in order to increase trait SC. Direct compassion-focussed approaches such as Compassion-Focussed Therapy (CFT), involve training clients in using compassionate imagery and self-soothing as strategies to regulate the threat system (Gilbert, 2010). Loving kindness-meditation training which cultivates SC has also been used as an intervention (Hofmann, Grossman & Hinton, 2011). Alternatively, “third wave” cognitive-behavioural therapy (CBT) approaches such as Mindfulness-Based Cognitive Therapy (MBCT; Kuyken et al., 2010) and Mindfulness-based stress reduction (MBSR; Kabat-Zinn, 1990) have been shown to work through facilitating self-compassion. A study by Kuyken et al., (2010) showed that MBCT treatment effects are mediated by augmented SC and mindfulness, and a study by Birnie, Speca, and Carlson (2009) showed the same effect for MBSR interventions. So for this review all interventions that have been shown to enhance and facilitate individuals’ trait SC have been considered even though the main aim of the intervention may not be compassion-focused.

Self-Compassion and PTSD

In their cognitive model, Ehlers & Clark (2000) focus on the sufferers' increased physiological arousal, hyper-vigilance to threat and the negative appraisals towards the trauma and towards themselves, and hypothesise that these factors maintain the anxiety. A PTSD sufferer may believe these negative appraisals and are more likely to engage in unhelpful avoidance strategies, preventing adaptive processing of the fragmented trauma memory. These appraisals may lead to increased shame, guilt and self-blame (Harmon & Lee, 2010), and are highly threatening to psychological self integrity, self-esteem and social status (Gilbert & Irons, 2005), and may obstruct recovery (Gilbert, 1989).

Increasing trait SC helps sufferers develop kinder attitudes towards themselves when dealing with threatening stimuli, thereby reducing thought suppression (Neff, Hseih & Dejitthirat, 2005) and reducing emotional and experiential avoidance (Neff & Dahm, 2015). Additionally, SC has been hypothesised to increase people's ability to broaden self-awareness and encourage novel, varied, and exploratory thoughts and actions (Fredrickson, 2013). A reduction in these highly self-critical negative appraisals and a facilitation of SC may enhance an individual's stress tolerance, allowing them to face their traumatic memories (Gilmour, 2014) and ultimately contribute to PTSD symptom reduction.

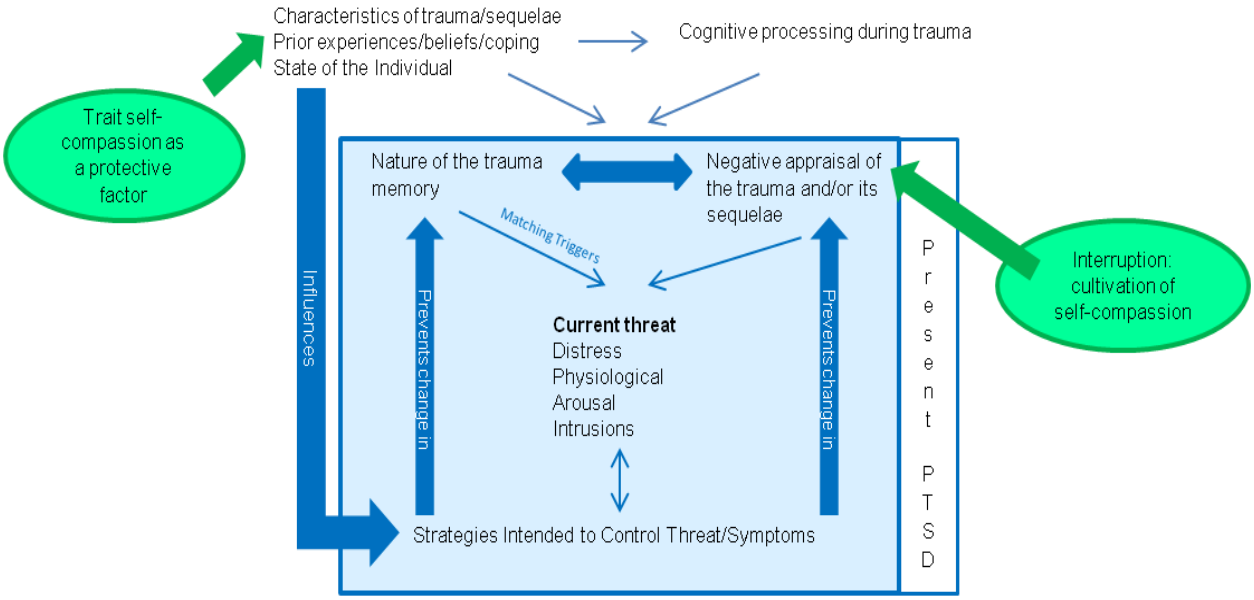

Figure 1. How trait self-compassion may influence PTSD (authors' adaptation from the Ehlers and Clark, 2000 Model of PTSD)

Alternatively, Gilbert's three systems model predicts that by affectively activating a sense of SC an individual would rebalance their relief system in comparison to their over-activated threat system, allowing for better emotional regulation and decreased avoidance, aiding improved recovery from PTSD symptoms (Germer & Neff, 2015). Neuropsychological research shows that PTSD patients fail to extinguish fear responses (Milad et al., 2009) and demonstrate impaired contextual modulation (Garfinkel, 2014) meaning that the fear response can be easily reinstated. CFIs could uniquely contribute to emotional safety learning and thus extend or complement existing effective trauma-focused interventions. CFIs are therefore predicted to reduce PTSD through either the mediating influence of cognitive factors, affective/neuropsychological mechanisms, or both.

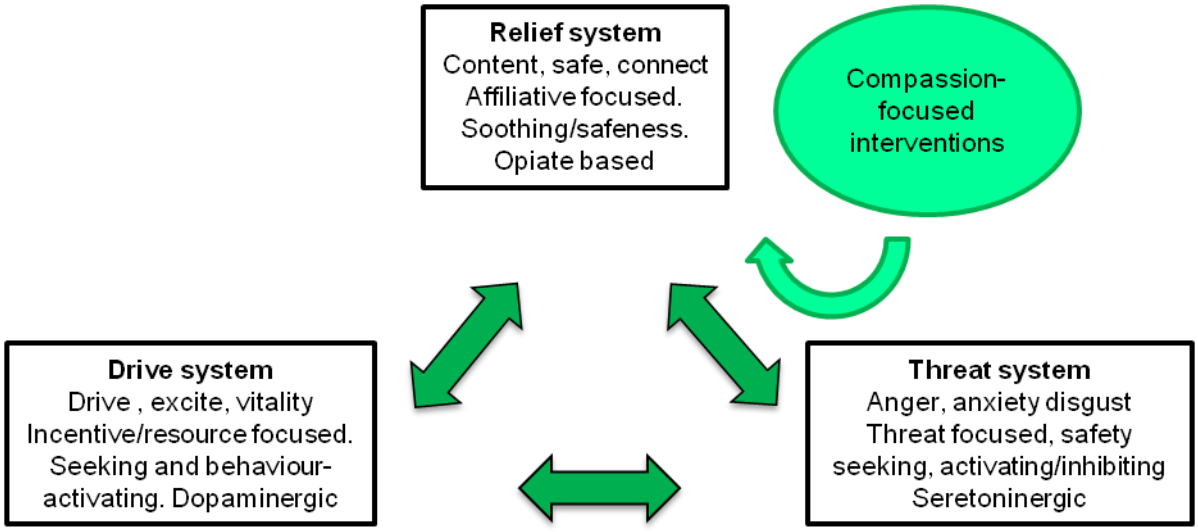

Figure 2. The three systems model of emotional regulation and how this is predicted to be affected by compassion-facilitating interventions in PTSD (adapted by the author from Gilbert, 2009).

The majority of the clinical evidence for a negative association between PTSD and trait SC comes from correlational studies. Trait SC has been found to be associated with lower trauma avoidance in a student non-clinical population (Thompson & Waltz, 2008) and in a non-clinical but trauma-exposed sample (Seligowski, Miron, & Orcutt, 2014) and in a veteran population (Dahm et al., 2015).

However to date, the efficacy of state CFIs inducing trait SC in individuals with PTSD has not been established and the mechanisms via which it exerts it therapeutic effects have not been well understood. A range of CFIs have been tested but few compared to other established treatments or the respective effect sizes compared. Therefore, a systematic review is required to establish the evidence of efficacy for these interventions and the mechanisms by which they work.

Aims and Objectives

Previous reviews have looked at the association between SC and psychopathology (MacBeth & Gumley, 2012) and at the evidence of using CFIs for treating a range of psychological disorders (Leaviss & Uttley, 2014; Gilmour, 2014). One review looked at purely-mindfulness-based interventions (Banks, Newman & Saleem, 2015) for PTSD, and found that the most studies indicated positive outcomes, particularly in reducing avoidance.

This review appears to be the first to look directly at CFIs for PTSD alone and aims to summarise and evaluate the relevant literature which has looked at using CFIs to treat PTSD. The studies included in this review have aimed to enhance trait SC by training individuals to behave compassionately towards themselves in order to alleviate post-traumatic symptoms and thereby improve wellbeing.

This review addresses the following questions:

- Does the available evidence show that PTSD symptoms can be reduced using CFIs?
- What is the evidence for the proposed mechanisms for how CFIs alleviate PTSD symptoms?

Methodology

This review used explicit, pre-defined criteria to identify and evaluate the outcomes of multiple studies in order to answer the research question. Studies were selected based on the inclusion criteria and critiqued based on their design quality and their evidence weighted on design quality, and lastly

synthesised to answer the research question. The Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) guidelines were followed to aid the identification, screening, eligibility and synthesis of studies (Moher, Liberati, Tetzlaff, Altman, & PRISMA Group, 2009).

Inclusion and Exclusion Criteria

Characteristics of studies included in this review were based on PICOS (Population, Intervention, Comparator, Outcomes and Study Design) criteria.

Population. All included studies had to be sampling from adult (over the age of 18 years) human participants. Included studies needed to use a clinically defined population, diagnostically assessed using a defined measure of PTSD with demonstrated diagnostic validity (Orsillo, 2001). Such measures included the Structured Clinical Interview for DSM-IV (SCID; Elhai, Franklin & Gray, 2008), the Clinician administered PTSD scale (CAPS; Blake et al, 1995), a medical diagnosis, or self-report measures such as the PTSD checklist (PCL; Weathers, Litz, Huska, & Keane, 1994; Forbes, Creamer, & Biddle, 2001), the Modification of the PTSD Symptom Scale (PSS; Foa, Riggs, Dancu, & Rothbaum, 1993), and Harvard Trauma Questionnaire (HTQ; Mollica et al., 1992). An exception to this were studies that use the Impact of Event Scale (IES-R; Horowitz, Wilner, & Alvarez, 1979), which was not designed as a measure of PTSD (Weiss, 2007) but has been shown to be clinically valid for PTSD diagnosis and is widely used in the literature (Sundin & Horowitz, 2002). Studies that did not use any of the measures described were excluded. Additionally, articles that include a heterogeneous sample in terms of diagnosis with the exception of depression (which appears almost always co-morbid in the

literature, Flory & Yehuda, 2015) were excluded. In all cases, PTSD had to be the primary diagnosis.

Intervention. A range of treatment interventions, one-off experimental SC induction methods and measures were included in the review, from compassion-facilitating CBT to loving-kindness meditation (LKM). Individual and group interventions were included. MBCT and MBSR interventions were also included: although MBCT and MBSR are not explicitly CFIs, in the past studies have shown that both interventions work partly by enhancing SC in other clinical populations (Birnie et al., 2009; Kuyken et al., 2010) and can therefore be seen as being CFIs. This is due to the overlapping constructs and techniques used in mindfulness and SC, such as LKM. Mindfulness interventions other than MBCT or MBSR were excluded.

Comparator. Treatment as usual or waiting list control groups were included as were any active control interventions (such as CBT). Because of the scarcity of the literature in this area, designs that did not employ a control group were also included.

Outcome. Studies had to measure PTSD as the main outcome by measuring symptoms both pre- and post- intervention, either through clinician report or self-report. Studies were also included that measured proposed mechanistic outcome measures such as mindfulness through self-report such as the Five-Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2008) or manipulation check measures e.g. the Self-compassion Scale (SCS; Neff, 2003).

Study Design. Methodologies including prospective, retrospective, experimental, and quasi-experimental designs were included. Randomised control trials were under-represented in the literature so repeated measures

studies were also included. Cross-sectional and qualitative studies were excluded. Only studies published in English and from peer-reviewed journals were included in the review, due to a lack of translation and time resources. Doctoral theses or conference publications were excluded due to quality restrictions.

Information Sources

Three key academic search engines were examined; Web of Science®, PubMed, and PsycInfo. Because of the relative recent interest in SC interventions, the research lists of both the websites of Kirsten Neff (www.self-compassion.org) and Paul Gilbert (www.compassionatemind.co.uk) were also searched. Furthermore, the reference lists of all included publications from the full-text search were screened for further relevant studies that may have been missed in the initial search.

Search Strategy

The search terms were selected (Table 1.) based on the search terms listed in prior systematic reviews (MacBeth &Gumley, 2012). This review considered all studies which conducted SC, compassion or third-wave CBT interventions which were designed to increase SC with clinical populations identified as having PTSD. The search terms were combined using operator "OR" to unite terms within each section and the operator "AND" was employed to intersect search terms across each section.

Table 1
Individual Search Terms (in title or abstract)

Self-Compassion "OR"	"self-compassion*", "self-kindness", compassion*" "loving-kindness", mindfulness-based cognitive therapy", "MBCT", "mindfulness based stress reduction", "MBSR"

'AND'	
Post-Traumatic Stress Disorder "OR"	trauma*", "post-traumatic*", ""post-traumatic stress disorder", "post traumatic stress disorder", "traumatic stress" "PTSD",

Results

Study Selection

From the initial search from both the databases and the research websites using the above criteria, 773 publications were selected (Figure 3). The publications were then further screened by title, and 657 publications were excluded leaving 116 papers. These were further screened for duplicates and a further 39 publications were removed from the total. The abstracts of the remaining 77 articles were read and screened against the inclusion criteria, resulting in the removal of a further 43 articles. Finally three conference papers and unpublished doctoral theses were excluded.

The full-text versions of the remaining 34 studies were then read and screened, from which screening 13 studies were considered to meet all criteria for the review by the researcher and 21 excluded. Of the 34 studies in the full-text search, 25% of the selected studies (*n*=9) were cross-checked against the inclusion/exclusion criteria by another clinical psychology trainee, in order to reduce errors and bias (Edwards et al., 2002). All study methodologies were checked to confirm that compassion-facilitating training was part of the treatment interventions. There was 100% inter-rater reliability and therefore no third researcher was needed to arbitrate the results. It was therefore decided to include these 13 studies in the review.

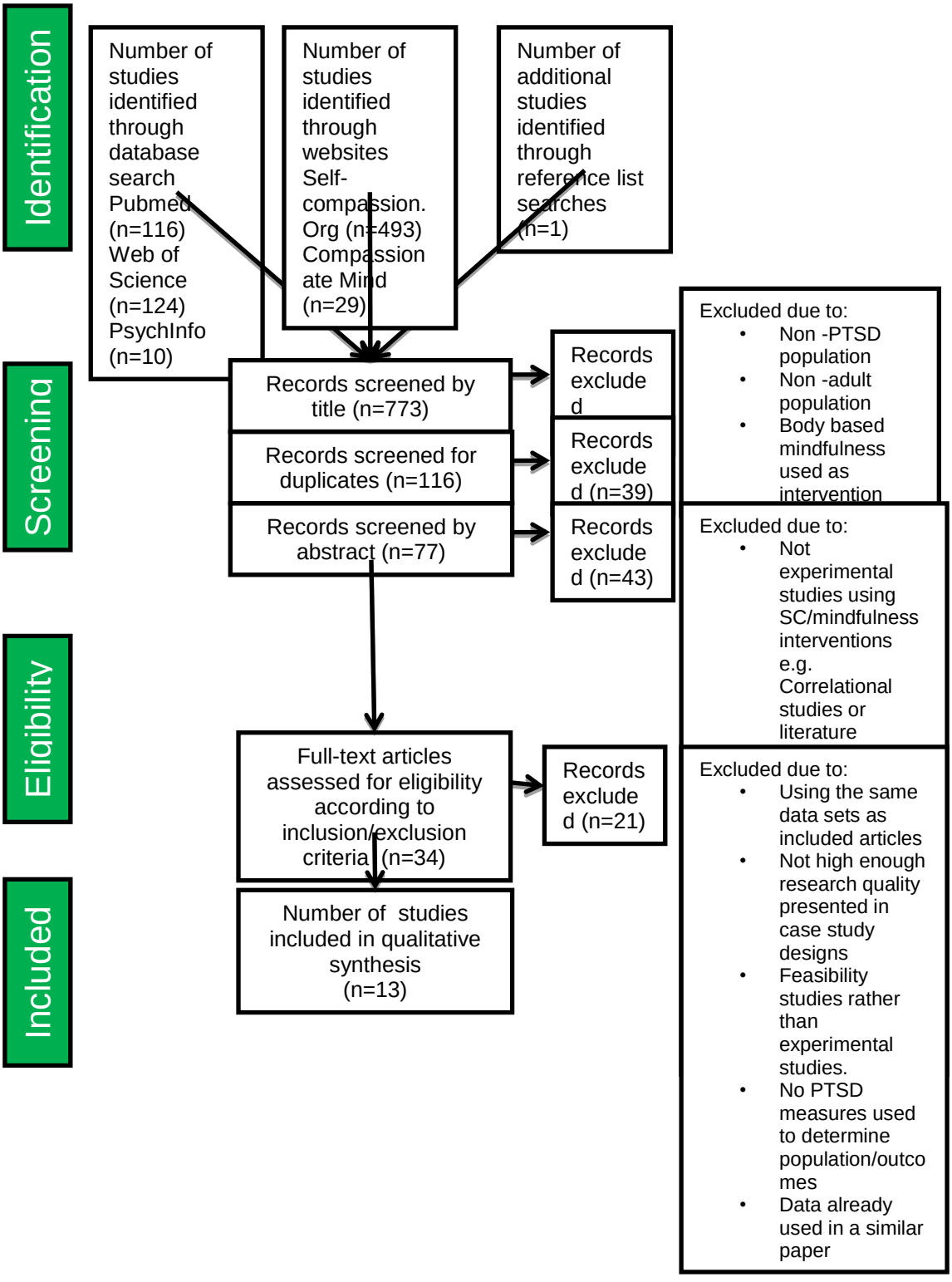

Figure 3. Study Selection Flowchart based on PRISMA procedure (adapted from Moher et al., 2009)

Data Extraction

The summary data from each study was extracted using the PICOS guidelines (Table 2.). The studies were assessed using a standardized and validated research measure, namely the Quality Assessment Tool for Quantitative Studies (QAT-QS) (Armijo-Olivo, Stiles, Hagen, Biondo, & Cummings, 2012) and marked on the tool criteria as “strong”, “moderate” or “weak” (Appendix A). Again, 25% of the final number of studies (*n* = 4) were assigned to a second researcher to inter-rate for research quality using the same tool. Between the researchers there was 100% agreement on the overall QAT quality ratings.

A descriptive approach was employed within the review due to the small sample size, range of designs and outcome measures used in the studies. The aim was to explore themes and commonalities from these studies and their relevance in answering the research question (Centre for Reviews and Dissemination, 2009).

Table 2

Summary of Study Characteristics in Order by Design and Quality

Author(s) and Country	Population	Diagnostic and Outcome Measures	Intervention & Comparator	Study Design, Results, Effect Sizes and Conclusions	Evaluation	QAT-QS
1. Kearney, McDermott, Malte, Martinez, Simpson (2013) United States of America	Veterans given a diagnosis of PTSD from VA hospital (*n*=47 randomised at the start of treatment)	PCL for PTSD. BADS used to measure behavioural avoidance HRQoL measuring health-related quality of life No mechanism measure.	**Intervention:** MBSR. 8 x 2.5hrs weekly sessions plus 7 hour retreat. Groups of 20-30 veterans. (*n*=21) **Comparator:** TAU from veterans hospital care. (*n*=22)	**Design:** Randomised control trial of MBSR and TAU. Measures assessed at baseline, post-treatment and 4 month follow-up. Intention to treat analysis completed. **Key Findings:** Analyses found no reliable effects of MBSR on PTSD or depression. No significant effects for behavioural activation and mindfulness At post-treatment HRQOL showed an increase at a medium effect size (*d* =.77), but by follow up this had reduced to 0. **Conclusions:** MBSR in veterans provided no change in depressive and PTSD symptoms but did provide quality of life change, although this was not maintained at follow-up. No conclusions about mechanisms can be made.	**Strengths**: Randomised trial with a control arm. Follow-up data provided so clinical change over time can be assessed. **Limitations:** RCT design but with passive control arm. Chart diagnosis of PTSD used instead of a clinician's assessment. Treatment fidelity was not assessed. TAU arm included more benzodepine use which may affect results.	A: Strong B: Strong C: Strong D: Strong E: Strong F: Strong G: Strong H: Strong Global: **Strong**
2. Kelly & Garland (2016) United States of America	Community sample of women with history of IPV TI-MBSR (*n*=39)	PCL for PTSD. BDI-II for depressive symptoms Mechanism measure: RSQ for anxious or avoidant attachment.	**Intervention:** Trauma-informed MBSR 8 x 2.5hrs weekly sessions (*n*=20 at follow-up) **Comparator:** Waiting list control group (*n*=19 at follow-up)	**Design:** Randomised control trial of MBSR and TAU. Measures assessed at baseline and post-treatment. Intention to treat analysis completed. **Key Findings:** Compared to the control group, participation in TI-MBSR was associated with statistically and clinically significant decreases in PTSD (*d* =-.94) and depressive symptoms (*d* =-.86) and significant reductions in anxious attachment (*d* =-.85) but not avoidant attachment. **Conclusions:** MBSR shown to be an effective treatment for PTSD for this population. Larger effect may be due to trauma-focused treatment.	**Strengths**: Randomised trial with a control arm. Trauma-focused treatment used as an intervention. **Limitations** No follow-up data provided so clinical change over time cannot be assessed. No mechanistic measures were included in the study to show that SC was a significant factor.	A: Strong B: Strong C: Moderate D: Strong E: Strong F: Strong G: Strong H: Strong Global: **Strong**

Table 2 *Continued*

Author(s) and Country	Population	Diagnostic and Outcome Measures	Intervention & Comparator	Study Design, Results, Effect Sizes and Conclusions	Evaluation	QAT-QS
3. King , Block, Sripada, Rauch, Giardino, Favorite et al. (2016) United States of America	US Veterans who had been deployed in Afghanistan or Iraq (*n*=23)	CAPS used to assess PTSD fMRI, (3T) examined resting-state connectivity (rsFC) in default mode network (DMN) No mechanism measure.	**Intervention:** Mindfulness based exposure therapy (a 16 week non-trauma focused intervention self-compassion training (*n*=14) **Comparator:** Control = present centred group therapy (PCGT) (*n*=9)	**Design:** Randomised control trial of MBET and PCGT. Measures assessed at baseline and post-treatment. **Key Findings:** Patients treated with MBET had reduced PTSD symptoms (d =.92) but this effect was not significantly different from PCGT (d =.46). Changes in connectivity relating to executive control were seen in MBET group. A group × time interaction found MBET showed increased connectivity with DLPFC and dorsal ACC following therapy. **Conclusions:** MBET found to be an effective treatment for PTSD for this population, with larger effects than control group. Larger effect sizes may be due to higher dosage effects.	**Strength:** Provides data on how neuropsychological processes are affected by mindfulness/SC training. RCT design allows intervention effects to be partialled out. **Limitations:** Small sample size in a homogenous veteran population. Study may be under-powered. No mechanism measure.	A: Moderate B: Moderate C: Strong D: Strong E: Strong F: Moderate G: Moderate H: Strong Global: **Strong**
4.O'Connor, Piet & Hougaard (2014) Denmark	Elderly bereaved people with long-term bereavement-related distress (*n*=32)	HTQ used as PTSD measure BDI used for depressive symptoms. ICG-R used for grief measure. No mechanism measure.	**Intervention:** MBCT 8 x 2.5hrs weekly sessions (*n*=12) **Comparators:** Waiting list control (n=18) and intention to treat control (*n*=12)	**Design:** Non-randomised 2x3 repeated measures design with two control groups **Key Findings:** Compared to wait list controls, MBCT reduced depressive symptoms significantly in intervention completers at follow-up but no significant outcome differences were found for PTSD. Effects sizes *g*=.32 post-intervention, *g*= .28 at follow-up) **Conclusions:** MBCT was not an effective intervention for PTSD in this population.	**Strengths:** Design uses a passive control group limiting regression to the mean effects. **Limitations:** Groups divided by location rather than randomised which may account for differences rather than treatment effects. Population does not have primary diagnosis of PTSD. No mechanism measure. HTQ not a standard measure of PTSD and mainly used in non-western populations.	A: Strong B: Moderate C: Strong D: Strong E: Strong F: Strong G: Weak H: Strong Global: **Strong**

Table 2 *Continued*

Author(s) and Country	Population	Diagnostic and Outcome Measures	Intervention & Comparator	Study Design, Results, Effect Sizes and Conclusions	Evaluation	QAT-QS
5. Polusny, Erbes, Thuras, Moran, Lamberty, & Collins (2015)	Veteran with PTSD (*n*=116)	CAPS and PCL used for PTSD symptom severity. PHQ-9 used to measure depressive symptoms. WHOQOL-BREF Quality of Life measure. No mechanism measure.	**Intervention:** MBSR**.** 8 x 2.5hrs weekly sessions (*n*=58) **Comparator:** Control = present centred group therapy (PCGT) (*n*=58)	**Design:** RCT comparing MBSR to PCGT. Outcomes assessed at baseline, post-treatment and 2 month follow-up. **Key Findings:** MBSR group showed greater reduction in PTSD symptoms compared to the PCGT group (PCL, *d* =-.40; CAPS, *d* =-.41). Also significant increases in QoL (*d* =.41). However, they were no more likely at follow-up to have lost the PTSD diagnosis. **Conclusions:** Among veterans with PTSD, MBSR, compared with PCGT resulted in a greater decrease in PTSD symptom severity. However, the magnitude of the improvement is modest.	**Strengths**: Active control group used in order to distinguish intervention effects. Large sample size. **Limitations:** The control group may be equivalent to mindfulness and unequal in dosage and short follow-up period. No mechanism measure.	A: Strong B: Strong C: Strong D: Strong E: Strong F: Strong G: Moderate H: Moderate Global: **Strong**
6.Possemato , Bergen-Cico, Treatman, Allen, Wade & Pigeon (2016)	Veterans with PTSD (*n*=62)	CAPS and PCL used to assess PTSD PHQ-9 used to measure depressive symptoms. No mechanism measure.	**Intervention:** Primary care- brief mindfulness training (PC-BMT) PCBMT is a 4-session program adapted from mindfulness-based stress reduction. Included SC training (*n*=36) **Comparator:** Primary care-treatment as usual (PC-TAU) (*n*=26)	**Design:** RCT comparing PCBMT to TAU. Measures collected at post-treatment and 8 week follow-up. **Key Findings:** PCBMT experienced similar decreases in PTSD severity (CAPS, *d* =-.72; PCL, *d* =-.45) and depression (*d* =-.99) compared with PCTAU participants at post treatment and the 8-week follow-up. However, groups were equivalent at the 8-week follow-up. **Conclusions**: Shorter intervention shows significant decrease in PTSD symptoms in this population. Showed longer lasting effects than previous trials.	**Strengths.** RCT using passive control condition. Clinician and self-report measures used to assess PTSD. Medium sample size. **Limitations**: lower than hoped from rate of participant engagement. Sample size did not allow adequate power for mediation analyses. No mechanism measure.	A: Strong B: Strong C: Strong D: Strong E: Strong F: Strong G: Strong H: Strong Global: **Strong**

Table 2 *Continued*

Author(s) and Country	Population	Diagnostic and Outcome Measures	Intervention & Comparator	Study Design, Results, Effect Sizes and Conclusions	Evaluation	QAT-QS
7.Beaumont, Galpin & Jenkins (2012) United Kingdom	Adults who have experienced trauma referred through NHS services (*n*=32).	IES-R for PTSD (split into avoidance, hyper-arousal, intrusion), HADS for Anxiety and Depression. Mechanism measure: SCS for self-compassion (pre and post).	**Intervention:** Compassionate Mind Training + Cognitive Behaviour Therapy (CM-CBT). 12 individual sessions (1 hour) (*n*=16) **Comparator:** CBT 12 individual sessions (*n*=16)	**Design:** Non-randomised repeated measures design using an active control group. **Key Finding:** Participants in both conditions experienced a highly statistically significant reduction in symptoms of anxiety, depression, avoidant behaviour, intrusive thoughts and hyper-arousal symptoms post-therapy. Effect sizes for PTSD symptoms both large in both groups, CBT (*d*= -.83) & CM-CBT (*d*= -.86). No differences between the groups apart from a significant increase in SC between time and groups.	**Strengths:** Repeated measures design using an active control allowing for useful comparison between SC and CBT interventions. Also measures SC as mechanism. **Limitations:** IES-R not as good as measure of PTSD as others. Self-report used for clinical change rather than clinician measured. No follow-up data published and low statistical power. Not randomised so effect could be due to ordering effects.	A: Strong B: Moderate C: Strong D: Moderate E: Strong F: Strong G: Moderate H: Strong Global: **Strong**
8. Felleman, Stewart, Simpson (2016) United States of America	US veterans currently under treatment at VA hospitals (*n*=116)	Chart diagnosis used for referral. PCL for PTSD. PHQ-9 used to measure depressive symptoms. No mechanism measure.	**Intervention:** MBSR (which included a loving-kindness meditation) 8 x 2.5hrs weekly group sessions. Up to 30 veterans in each group **Comparator:** No comparison group.	**Design:** Retrospective analysis of three clinical trials of MBSR for PTSD. **Key Findings:** Clinically significant reductions in PTSD and depression symptoms post treatment and at 4 months follow-up. Effect sizes were in the medium range post treatment (*d* = .63) and at follow-up (*d*= .69). Depressive symptoms also significantly decreased. However, higher baseline PTSD symptoms predicted greater reductions. **Conclusions:** Shows support for the use of MBSR in facilitating reductions in PTSD symptoms in veterans.	**Strengths:** High sample size. MBSR groups were delivered through usual clinical practice in US. **Limitations:** No control group so unable to say whether clinical change due to the intervention. Retrospective analysis may lead to investigator bias. Over 20% of participants lost to treatment and follow-up data. No measure of SC or mindfulness as a mechanism.	A: Strong B: Moderate C: Weak D: Moderate E: Strong F: Weak G: Strong H: Strong Global: **Moderate**

Table 2 *Continued*

Author(s) and Country	Population	Diagnostic and Outcome Measures	Intervention & Comparator	Study Design, Results, Effect Sizes and Conclusions	Evaluation	QAT-QS
9. Gallegos, Lytle, Moynihan, Talbot (2015) United States of America	Women with history of trauma (*n*=42). IPV before age 18	Modified PTSD Symptom Scale Self-Report (MPSS-SR). Self-reported stress (Perceived stress scale) Inflammatory biomarker IL-6 was measured through blood sampling. Mechanism measure: ERQ for emotional regulation	**Intervention:** MBSR. 8 x 2.5hrs weekly group sessions plus 4 hour retreat. 8x cohorts of 5-10 clients each. **Comparator:** No comparison group	**Design**: Repeated measures design for PTSD symptoms and immunological data. Measures taken at baseline, 4 weeks, 8 weeks and 12 weeks. **Key Findings:** Significant decreases in perceived stress, depression, trait and state anxiety, emotion dysregulation, and posttraumatic stress symptoms as well as increases in mindfulness. Greater attendance in the MBSR program was associated with lower levels of inflammatory cytokine IL-6. No pre means given for effect sizes to be calculated. **Conclusions**: Shows support for the use of MBSR in facilitating reductions in PTSD symptoms in traumatised women, and through the mechanism of increased emotional regulation.	**Strengths:** Follow-up data shows continuing benefits over time and results allow for mechanism of emotional regulation to be assumed. **Limitations:** Lack of control group so unable to say whether clinical change due just to intervention. Also small sample size and very homogenous participant group.	A:Strong B:Moderate C: Weak D: Weak E: Strong F: Strong G: Weak H: Moderate Global: **Moderate**
10. Goldsmith, Gerhart, Chesney, Burns, Kleinman, & Hood (2013) United States of America	General hospital population who met the criteria for PTSD (*n*=10, only 9 for follow-up data)	PCL for PTSD. PHQ-9 used to measure depressive symptoms. TAQ for trauma-related cognitions Mechanism measure: AAQ for emotional avoidance	**Intervention:** MBSR 8 x 2.5hrs weekly group sessions plus 4 hour retreat. **Comparator:** No comparison group	**Design**: Repeated measures design for PTSD symptoms, emotional flexibility and trauma-appraisals. Measures taken as mid-treatment and post-treatment. **Key Findings:** After MBSR participants reported significant moderately sized decreases in PTSD symptoms (*d* =-.7) by post treatment and is depressive symptoms (*d* =.54). Emotional flexibility increased over the treatment (*d* =1.11). Trauma appraisals around shame also significantly decreased (*d* =.7) but subscales that reflected betrayal, self-blame, fear, alienation, and anger did not show statistically significant within-subject differences over time. **Conclusions:** Shows support for the use of MBSR in facilitating reductions in PTSD and depressive symptoms and shame based cognitions. Also shows support for MBSR working through increasing emotional flexibility and decreasing avoidance.	**Strengths:** Follow-up data shows continuing benefits over time and results allow for mechanism of emotional flexibility to be assumed. Sample came from naturalistic settings and therefore probably good ecological validity. **Limitations:** Lack of control group so unable to say whether clinical change due just to intervention. Also very small sample size limiting generalisibility.	A:Strong B:Moderate C: Weak D: Weak E: Strong F: Strong G: Strong H: Moderate Global: **Moderate**

Table 2 *Continued*

Author(s) and Country	Population	Diagnostic and Outcome Measures	Intervention & Comparator	Study Design, Results, Effect Sizes and Conclusions	Evaluation	QAT-QS
11. Kearney, Malte, McManus, Martinez, Felleman & Simpson (2013) United States of America	Veterans from urban VA hospital presenting with PTSD. (*n*=34 completers to follow-up)	Modified PTSD Symptom Scale Self-Report (MPSS-SR) + Life Events Checklist (LEC) PROMIS used to measure depressive symptoms. Mechanism measure: SCS for self-compassion.	**Intervention:** 12 x weekly loving kindness meditation course. Group of unknown numbers. **Comparator:** No comparison group	**Design**: Repeated measures follow-up study. Data collected at baseline, post-treatment, and 3 month follow-up. **Key Findings**: Large effect size was found for reduction in PTSD symptoms 3 months post loving-kindness meditation (*d* =−.89), and a medium effect size was found for reduction in depressive symptoms at 3 months follow-up (*d* =−.49). These changes were mediated by changes in SC scores. **Conclusions:** Good outcomes for the use of loving-kindness meditation in a veteran population and good compliance with the treatment.	**Strengths:** Follow-up data shows continuing benefits over time. Mechanism of increasing SC shown through the data, **Limitations:** Lack of control group so unable to say whether clinical change due just to intervention. Also the population was a predominantly Caucasian and veteran population, over half of whom had previously participated in MBSR.	A: Strong B: Moderate C: Weak D: Weak E: Strong F: Strong G: Weak H: Strong Global: **Moderate**
12. Kearney, McDermott, Malte, Martinez, Simpson (2013) United States of America	Veterans given a diagnosis of PTSD from VA hospital (*n*=66 at 2nd follow-up)	PCL for PTSD. PHQ-9 used to measure depressive symptoms. BADS used to measure behavioural avoidance Mechanism measure: AAQ for emotional avoidance	**Intervention:** MBSR 8 x 2.5hrs weekly sessions plus 7 hour retreat. **Comparator**: No comparison group	**Design**: Repeated measures follow-up study. Data collected at baseline, post-treatment, and 4 month follow-up. **Key Findings:** At 6 months, there were significant improvements in PTSD symptoms (*d*= -.64), depressive symptoms (*d* =-.70) and emotional acceptance (*d* =.67). 47.7% of veterans had clinically significant improvements in PTSD symptoms. **Conclusions:** MSBR effective intervention for veterans with PTSD and depression. Mechanism of decreased emotional avoidance considered as an important factor although SC not measured.	**Strengths:** Follow-up data shows continuing benefits over time. Mechanism of increasing emotional acceptance shown through the data. **Limitations:** Lack of control group so unable to say whether clinical change due just to intervention. PTSD assessed through self-report rather than a clinician rated assessment. Over 20% of participants lost to treatment and follow-up data.	A: Strong B: Weak C: Weak D: Weak E: Strong F: Weak G: Strong H: Strong Global: **Moderate**

Table 2 *Continued*

Author(s) and Country	Population	Diagnostic and Outcome Measures	Intervention & Comparator	Study Design, Results, Effect Sizes and Conclusions	Evaluation	QAT-QS
13. Kimbrough, Magyari, Langenberg, Chesney, Berman (2010) United States of America	Adult survivors of child sexual abuse (*n*=27)	PCL for PTSD. BDI-II for depressive symptoms BSI for anxiety No mechanism measure.	**Intervention**: MBSR. 8 x 2.5hrs weekly sessions (some changes to delivery due to patient characteristics) (*n*=21 at follow-up) **Comparator:** No comparison group	**Design**: Repeated measures follow-up study. Data collected at baseline, mid-treatment, post-treatment, and 3 month follow-up. **Key Findings:** Statistically significant improvements were observed in all outcomes post-MBSR, showing large effect sizes (*d* =1.2) for PTSD subscales in re-experiencing, avoidance and hyper arousal. Improvements were largely sustained until 24 weeks (*d* =.8). Of three PTSD symptom criteria, symptoms of avoidance/ numbing were most greatly reduced. **Conclusions:** MSBR is an effective intervention for adults who are survivors of CSA who also have PTSD and depression.	**Strengths:** Follow-up data shows continuing benefits over time. **Limitations:** Lack of control group so unable to say whether clinical change due just to intervention. PTSD assessed through self-report rather than a clinician rated assessment. Also some clients also under concurrent psychotherapy and sample size were small, meaning that results may be unreliable and statistical power was low. No mechanism measure.	A: Strong B: Weak C: Weak D: Strong E: Strong F: Strong G: Strong H: Moderate Global: **Moderate**

Key: IES-R= impact of event scale-revised, PCL=PTSD checklist, PHQ-9= patients health questionnaire, HADs = hospital anxiety and depressions measure, SCS= self-compassion scale, WHOQOL-BREF = World Health Organization Quality of Life – Short Measure, BDI = Beck Depression Inventory, ICG-R = Inventory of Complicated Grief—Revised, HTQ = Harvard-trauma questionnaire, fMRI = functional resonance magnetic imaging, IPV = interpersonal violence, CSA = child sexual abuse, TAU=treatment as usual, WL = waiting list,

QAT=quality assessment tool: A=selection bias, B=study design, C=confounders, D=blinding, E=data collection method, F=withdrawals and dropouts, G=intervention integrity, H=analyse

Narrative Synthesis of Studies

Overall, the available evidence shows that PTSD symptoms can be reduced using a CFI but it is unclear how strong this effect is. There is insufficient evidence to show which psychological mechanisms are working to alleviate these symptoms.

Study populations. The most common population studied was veterans from hospitals (*n*=7). Different types of trauma were also represented, with populations ranging from single-incident types (e.g. road accidents), women with a history of IPV, survivors of CSA and elderly bereaved people. Population characteristics also differed greatly, with many different ethnic, gender and socio-economic backgrounds being represented. Therefore, these results seem to generalise over trauma type and demographic backgrounds, although limited by geographical location, as all studies were from western countries.

Interventions. Twelve studies were group mindfulness-based studies with seven (5,8,9,10,12 &13) being MBSR. Two studies used a trauma-focused mindfulness intervention (2&3) and two others used mindfulness-based interventions but were not based on the MBSR protocol, being based on MBCT (4) and brief mindfulness + SC training (6) respectively. Only one study used a group treatment entirely based on a CFI (11) and only one other study used individual CFT (7). Although mindfulness-based therapies have been shown to work through increasing compassion, this is just one of the elements of these treatments, which therefore limits the scope of this review and the power of the conclusions drawn.

Treatment fidelity and manipulation checks. Few studies offered any measure of treatment fidelity, which has been deemed essential for good clinical research (Borrelli, 2011). As these studies did not provide data on how faithful their treatment was to the manualised treatments, it is unclear how much of any identified change could be attributed to SC. Many cited that the mindfulness was carried out by qualified practitioners but could not confirm through assessment that the manual had been followed. However, some studies produced evidence to show that mindfulness had been affected by the treatment, therefore confirming the proposed manipulation and provided homework or attendance rates. However, adding measures of treatment fidelity would have greatly enhanced the studies' conclusions regarding efficacy.

Comparators. Only three studies (3, 6 & 7) used active control conditions rather than either no control or passive conditions (such as TAU or waiting lists). Within this subsection, some of these active control conditions (i.e. present focused group therapy) are not evidence-based treatments for PTSD themselves. Only one study (7) compared the CFI to a treatment that is actively used to combat PTSD, thereby allowing for a real comparison between two known treatments.

PTSD measurements and outcomes. The studies generally used proven valid and reliable measures of PTSD in their methodologies. There may have been an overuse of self-report measures in comparison with clinician-

rated assessments, possibly due to time constraints despite the evidence suggesting that using both is optimal in research settings (Cuijpers, Li, Hofmann, & Andersson, 2010). Only two studies made use of the CAPS assessment, seen as the gold standard in PTSD research (Weathers, Keane, & Davidson, 2001), and one (2) used chart diagnosis which has been shown to be a poor match against standardised interviews with poor retest reliability (Jensen & Weisz, 2002). However, self-report measures (e.g. PCL) were used in all of the studies and generally show sufficient validity and reliability to be able to draw conclusions regarding outcomes.

Study Design. Five studies used an RCT design (1-3, 5-6) meaning that their effects could be attributed to the CFI, although only two (3 & 5) used active control conditions rather than WL or TAU methods. Two studies (7 & 4) used non-randomised controlled conditions, meaning that both waiting list and an active condition (CBT) were employed, but subjects were not randomly allocated to them, meaning that effects could be attributed to selection bias. The majority of studies (8-13) used a within-subjects repeated design with no comparison group leaving it unclear as to whether any statistical effects were due to testing, history, maturation or regression to the mean (Field, 2013), which limits the quality of the evidence that the studies can provide.

Quality. Generally the study quality of the publications selected for the review were strong (*n*=7) to moderate (*n*=6). Strong methodologies included all of the RCTs and the controlled un-randomised studies. The studies that failed to achieve a strong rating were usually due to control conditions and the randomisation and blinding criteria not being met. Additionally those designs that did use RCT designs did not all use intention-to-treat analyses, which introduced a withdrawal selection bias, and one study (8) lost too many participants during follow-up for its data to be easily interpreted.

Follow-Up. The majority of the studies did include follow-up measures to their group interventions (*n*=8). Those follow-ups were quite short (the longest being 4 months), limiting how many conclusions could be drawn about the long-term effectiveness of the CFIs. Moreover, two of the studies (2 & 7) lost more than 20% of their participants at this longer follow-up date, which may have led to significant post-treatment bias in their results and is over the recommended allowance for studies (Dettori, 2011). Neither study used an intention-to-treat analysis, which would have helped in eliminating any bias errors (Woolard, et al., 2004)

Discussion

PTSD symptoms. Overall, eleven of the thirteen studies reported significant decreases in PTSD symptoms following a CFI. Four reported large effect sizes (range = 0.85-1.80), with the other seven studies reporting medium effect sizes (range = 0.40-0.77) and these appear to be reasonably stable at follow-up. These results were mixed over research design and quality ratings.

Taken as a whole, these studies provide relatively weak evidence that CFIs reduce PTSD symptoms in clinical populations. Despite the majority of studies demonstrated a reduction in symptoms, in five of the seven controlled studies, this effect cannot be isolated to the CFI. The reduction in PTSD symptoms could be due to testing, history or regression to the mean effects rather than the intervention. Only three of these studies used active control groups and only one of these controls was trauma-focused (7). Of these seven controlled studies only five showed a statistical effect. No study showed any evidence for an increase in PTSD symptoms following treatment with a CFI.

Additionally, the active controls that were used also do not really equate to the recommended interventions that are offered in routine clinical practice (Cloitre et al., 2011). In those studies with active control arms the reported effect sizes were equally as large as those reported in the intervention arm, so it cannot therefore be concluded that CFIs are any more effective than the active controls (i.e. CBT and person-centred group therapies), although this was not

predicted. However, it is promising that those studies that do compare a CFI to an active control show similar effect size.

Interestingly, those studies that reported the largest effect sizes were studies that included the most explicit SC intervention (either CMT or LKM) or were trauma-focused. This aligns with the theoretical evidence showing how SC would reduce PTSD symptoms in comparison to mindfulness, but does not prove that the SC was the most significant mechanism. To be more effective, mindfulness-based interventions may therefore have to be even more compassion-facilitating or adapted for trauma.

Mechanism of change. Only three studies provided measures on possible mechanism of change in the CFIs. Most disappointing for theories regarding SC and PTSD only study 7 and study 11 measured whether SC increased by intervention, although both showed a significant mediation effect. In studies 9, 10 and 12, emotional regulation, emotional flexibility and decreased avoidance were respectively found to be possible mechanisms. However, as all three studies did not have control groups it cannot be established whether these mechanisms caused the reduction in symptoms.

Overall, there is evidence from two studies that increasing SC is the process by which PTSD symptoms are reduced but the mechanism behind this effect is yet to be established. Emotional flexibility, emotional regulation and

emotional avoidance have in the past been implicated in how CFIs work, but there is not enough data in these reviewed studies to suggest any concrete mechanisms. This would be an interesting area for future research.

Limitations

The search yielded only a small number of studies that complied sufficiently with the search criteria. Although this limits the generalisability of the findings, it may also indicate a novel and growing area of research. A more significant limitation is that although mindfulness-based interventions have been shown to work through enhancing SC, the concepts of mindfulness and SC somewhat overlap in terms of theoretical constructs (Neff & Dahm, 2015). Another limitation of this study is that the research reviewed was from varied populations (IPV, CSA and veterans), which may have made it difficult to find an overall strong result as SC interventions in the past have been hypothesised to be most effective with inter-personal trauma (Scooglio et al, 2015), rather than single incident traumas.

Theoretical and Clinical Implications

The data from this review presents some promising findings which suggests that increasing SC is a process that can affect PTSD symptoms. This could have some implications if more evidence is found in the future that could

influence the revision of PTSD (e.g., Figure 1). However, at present how much increasing an SC state compared to a trait affects PTSD symptoms is unknown. Exactly how SC does this is also at present unconfirmed.

Clinically, all of the mindfulness studies were rated as acceptable and feasible for clinical use in the treatment of PTSD and all of those that tested a CFI against an active control were comparable to current treatments. However, the effectiveness of purely CFIs being used to treat PTSD needs to be tested for any secure evidence base to be established.

Future Research

New studies will also need to compare purely CFIs with active control interventions in order to establish a true unique effect size. Studies investigating individual therapy were sadly under-represented in the review and more studies using individual therapy protocols, work with couples or families, as well as groups would be welcomed. It has yet to be established whether CFI groups are effective compared to individual CFI. Studies able to tease out how enhancing compassion works in decreasing PTSD, by measuring potential mechanisms such as mindfulness, negative appraisals, emotional regulation and emotional avoidance, are also needed.

Conclusions

This review has found some evidence that CFIs can result in positive change in PTSD symptoms in clinical populations, but this is limited by the quality of studies, that most research looked at mindfulness interventions combined with a CFI and that SC as not partially out as the mechanism of change. The few studies that demonstrate benefit show large to medium effect sizes, but no more than any other active control condition. However, this is, as yet, based on a very few number of controlled trials and more are needed to establish and only a small number of controlled studies that mainly use mindfulness as the treatment focus, rather than SC.

Potentially, if more research supports these conclusions this may lead to changes in PTSD theory, because if symptoms can be decreased through a mechanism which does not involve memory exposure but instead can be relieved through changing post-trauma cognitions, this could potentially be a fruitful area for treatment.

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Appendix A

QUALITY ASSESSMENT TOOL FOR QUANTITATIVE STUDIES

EPHPP
Effective Public Health Practice Project

COMPONENT RATINGS

A) SELECTION BIAS

(Q1) Are the individuals selected to participate in the study likely to be representative of the target population?

1 Very likely
2 Somewhat likely
3 Not likely
4 Can't tell

(Q2) What percentage of selected individuals agreed to participate?

1 80 - 100% agreement
2 60 – 79% agreement
3 less than 60% agreement
4 Not applicable
5 Can't tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

B) STUDY DESIGN

Indicate the study design

1 Randomized controlled trial
2 Controlled clinical trial
3 Cohort analytic (two group pre + post)
4 Case-control
5 Cohort (one group pre + post (before and after))
6 Interrupted time series
7 Other specify _____
8 Can't tell

Was the study described as randomized? If NO, go to Component C.

No Yes

If Yes, was the method of randomization described? (See dictionary)

No Yes

If Yes, was the method appropriate? (See dictionary)

No Yes

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

C) CONFOUNDERS

(Q1) Were there important differences between groups prior to the intervention?

1 Yes
2 No
3 Can't tell

The following are examples of confounders:

1 Race
2 Sex
3 Marital status/family
4 Age
5 SES (income or class)
6 Education
7 Health status
8 Pre-intervention score on outcome measure

(Q2) If yes, indicate the percentage of relevant confounders that were controlled (either in the design (e.g. stratification, matching) or analysis)?

1 80 – 100% (most)
2 60 – 79% (some)
3 Less than 60% (few or none)
4 Can't Tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

D) BLINDING

(Q1) Was (were) the outcome assessor(s) aware of the intervention or exposure status of participants?

1 Yes
2 No
3 Can't tell

(Q2) Were the study participants aware of the research question?

1 Yes
2 No
3 Can't tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

E) DATA COLLECTION METHODS

(Q1) Were data collection tools shown to be valid?

1 Yes
2 No
3 Can't tell

(Q2) Were data collection tools shown to be reliable?

1 Yes
2 No
3 Can't tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

F) WITHDRAWALS AND DROP-OUTS

(Q1) Were withdrawals and drop-outs reported in terms of numbers and/or reasons per group?

1 Yes
2 No
3 Can't tell
4 Not Applicable (i.e. one time surveys or interviews)

(Q2) Indicate the percentage of participants completing the study. (If the percentage differs by groups, record the lowest).

1 80 -100%
2 60 - 79%
3 less than 60%
4 Can't tell
5 Not Applicable (i.e. Retrospective case-control)

RATE THIS SECTION	STRONG	MODERATE	WEAK	
See dictionary	1	2	3	Not Applicable

G) INTERVENTION INTEGRITY

(Q1) What percentage of participants received the allocated intervention or exposure of interest?

1 80 -100%
2 60 - 79%
3 less than 60%
4 Can't tell

(Q2) Was the consistency of the intervention measured?

1 Yes
2 No
3 Can't tell

(Q3) Is it likely that subjects received an unintended intervention (contamination or co-intervention) that may influence the results?

4 Yes
5 No
6 Can't tell

H) ANALYSES

(Q1) Indicate the unit of allocation (circle one)

community organization/institution practice/office individual

(Q2) Indicate the unit of analysis (circle one)

community organization/institution practice/office individual

(Q3) Are the statistical methods appropriate for the study design?

1 Yes
2 No
3 Can't tell

(Q4) Is the analysis performed by intervention allocation status (i.e. intention to treat) rather than the actual intervention received?

1 Yes
2 No
3 Can't tell

GLOBAL RATING

COMPONENT RATINGS

Please transcribe the information from the gray boxes on pages 1-4 onto this page. See dictionary on how to rate this section.

A	**SELECTION BIAS**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
B	**STUDY DESIGN**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
C	**CONFOUNDERS**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
D	**BLINDING**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
E	**DATA COLLECTION METHOD**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
F	**WITHDRAWALS AND DROPOUTS**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	Not Applicable

GLOBAL RATING FOR THIS PAPER (circle one):

1	STRONG	(no WEAK ratings)
2	MODERATE	(one WEAK rating)
3	WEAK	(two or more WEAK ratings)

With both reviewers discussing the ratings:

Is there a discrepancy between the two reviewers with respect to the component (A-F) ratings?

No Yes

If yes, indicate the reason for the discrepancy

1	Oversight
2	Differences in interpretation of criteria
3	Differences in interpretation of study

Final decision of both reviewers (circle one):

1	**STRONG**
2	**MODERATE**
3	**WEAK**

Appendix B

CLINICAL PSYCHOLOGY REVIEW

AUTHOR INFORMATION PACK

TABLE OF CONTENTS

ISSN: 0272-7358

DESCRIPTION

Clinical Psychology Review publishes substantive reviews of topics germane to **clinical psychology**. Papers cover diverse issues including: psychopathology, psychotherapy, behavior therapy, cognition and cognitive therapies, behavioral medicine, community mental health, assessment, and child development. Papers should be cutting edge and advance the science and/or practice of clinical psychology.

Reviews on other topics, such as psychophysiology, learning therapy, experimental psychopathology, and social psychology often appear if they have a clear relationship to research or practice in **clinical psychology**. Integrative literature reviews and summary reports of innovative ongoing clinical research programs are also sometimes published. Reports on individual research studies and theoretical treatises or clinical guides without an empirical base are not appropriate.

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AUDIENCE

Psychologists and Clinicians in Psychopathy

IMPACT FACTOR

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SCHOOL OF PSYCHOLOGY

DOCTORATE IN CLINICAL PSYCHOLOGY

EXPERIMENTAL PAPER

The Effects of a Compassion-Facilitating Meditation on Recovery from Experimentally Induced Intrusions and Distress in a Healthy Student Sample

Trainee Name:	**Laura Shepstone**
Primary Research Supervisor:	**Dr Anke Karl**
	Senior Lecturer, Mood Disorders Centre
Secondary Research Supervisor:	**Dr Nick Moberly**
	Senior Lecturer, Mood Disorders Centre

Target Journal:	Journal of Traumatic Stress
Word Count:	8000 words (excluding abstract, table of contents, list of figures, references, footnotes, appendices)

Submitted in partial fulfilment of the requirements for the doctorate degree in Clinical Psychology, University of Exeter

Abstract

Objective: Compassion-facilitating interventions are thought to be promising for treating post-traumatic stress disorder (PTSD). It is theorised that inducing self-compassion through a compassion-facilitating meditation task would interrupt the psychological processes that cause emotional distress and trauma-related intrusions that form post-trauma.

Methods: A student sample (*n* = 72) was exposed to a trauma-film and then either listened to a neutral-emotion audio mediation or a compassion-facilitating meditation (CFM). Self-reported distress, self-compassion and self-criticism were measured at baseline, post-film, post-audio meditation and for seven days following the experiment. Measures of sympathetic arousal and parasympathetic activation were measured at baseline and during the trauma-film and audio meditation. Trauma-related intrusions were measured for seven days following the experiment.

Results: Lower self-reported distress and higher self-compassion were reported over the seven day follow-up, but not directly after the meditation. No statistical differences between conditions over time were found for any of the physiological measures but skin conductance was higher in the CFM group, contrary to predictions. There were also no statistical differences found between the two conditions in terms of sum daily intrusions following trauma-exposure.

Conclusions: This research supports the hypothesis that facilitating self-compassion can disrupt some of the observed processes post-trauma, namely felt distress, although only after a delay. These findings are relevant to the theoretical models of PTSD and future clinical interventions.

Keywords: post-traumatic stress disorder, compassion interventions, self-compassion, trauma-film paradigm, psycho-physiological measurement.

Introduction

Experiencing psychological trauma is part of the common human experience, with one in three people suffering a defined traumatic event in their lives. However, only 10-25% of those individuals will go on to develop post-traumatic stress disorder (PTSD) and therefore experiencing a traumatic event is not the only developmental feature in PTSD (Fear, Bridges, Hatch, Hawkins, & Wessely, 2014). Many other factors have been implicated in its development (Brewin, Andrews, & Valentine, 2000), and potential questions have been raised about the psychological mechanisms that may prevent the disorder, including newly developing theory involving self-compassion (Neff, 2003a). The theoretical evidence linking self-compassion to PTSD is still emerging, leading researchers to theorise that this psychological construct may be a missing part of the existing psychological theories of PTSD and therefore a viable new area of interest in developing treatments for this disabling condition.

Self-Compassion

Self-compassion (SC) is a comparatively new psychological concept in the scientific literature. Neff (2003b) identified three core areas of SC: self-kindness, common humanity and mindfulness, and described it as taking a balanced and kindness–orientated perspective on one's situation and has been

described in the literature as both a state and a trait (Chaplin, John, & Goldberg, 1988). It is positively correlated with the healthy traits of happiness, optimism, positive emotion, wisdom, personal initiative, curiosity and exploration, agreeableness, healthy psychological functioning and conscientiousness (Neff, Kirkpatrick &Rude, 2007) and also negatively associated with shame, self-criticism, rumination, avoidance, thought suppression, anxiety, and depression (Gilbert, 2005). There is evidence that a self-compassionate attitude buffers individuals against negative feelings when imaging hurtful events (Leary et al., 2007) and it is known to improve wellbeing and resilience (Wei, Liao, Ku, & Shaffer, 2011).

PTSD and Self-Compassion

There is a growing body of evidence showing that higher trait SC is associated with lower PTSD symptoms. Thompson and Waltz (2008) found that trait SC was associated with lower avoidance in students who have experienced a traumatic event. Harman and Lee (2010) furthermore suggested that lack of SC may be present in shame-based PTSD thinking. They found that high levels of self-critical thinking were associated with high levels of shame within a PTSD clinical sample. Scoglio et al. (2015) found in a sample of women with PTSD that SC was negatively related to PTSD symptom severity and to emotion dysregulation. Maheaux and Price (2015) found that trait self-compassion

negatively correlated with PTSD as defined by the newer DSM-5 criteria, although only avoidance in the older DSM-IV (Diagnostic and Statistical Manual of Mental Disorders, 5th ed.; American Psychiatric Association, 2013), affirming the earlier finding by Thompson and Waltz (2008). Hoffart, Øktedalen, and Langkaas (2015) found that SC significantly influenced subsequent symptoms in a clinical sample receiving PTSD treatments. Interestingly, Barlow, Goldsmith-Turow, & Gerhart (2017) found in a sample of university students reporting childhood abuse and PTSD symptoms that, emotional regulation difficulties, negative trauma appraisals, and trait levels of SC fully explained the link between abuse exposure and PTSD symptoms. This finding may point to SC being a missing part of current models. Although the majority of studies have shown a promising link, Seligowski, Miron and Orcutt (2015) found that SC predicted lower psychological inflexibility in a non-clinical sample but did not predict PTSD symptoms. These limited results have led to psychological theories proposing how SC could be an additional mechanism by which PTSD symptoms could be alleviated.

Models of PTSD and Self-Compassion

Two key models have been published showing how PTSD is developed and maintained. These models are not mutually exclusive and both provide frameworks to show how SC may disrupt the processes seen in PTSD.

Cognitive model. The Ehlers and Clark cognitive-behavioural model of PTSD (2000, Figure 1) focuses on the sufferers' increased physiological arousal, hyper-vigilance to threat, and their negative appraisals of the trauma and themselves, hypothesising that these factors maintain the anxiety. These negative appraisals determine the individual's emotional response to the trauma, and also initiate cognitive and behavioural strategies that further contribute to the maintenance of PTSD (e.g., thought suppression, behavioural avoidance of feared situations, social withdrawal). These appraisals may lead to increased shame, guilt and self-blame and are highly threatening to the psychological integrity of the self, self-esteem and social status (Gilbert & Irons, 2005), and may obstruct recovery from PTSD (Gilbert, 1989).

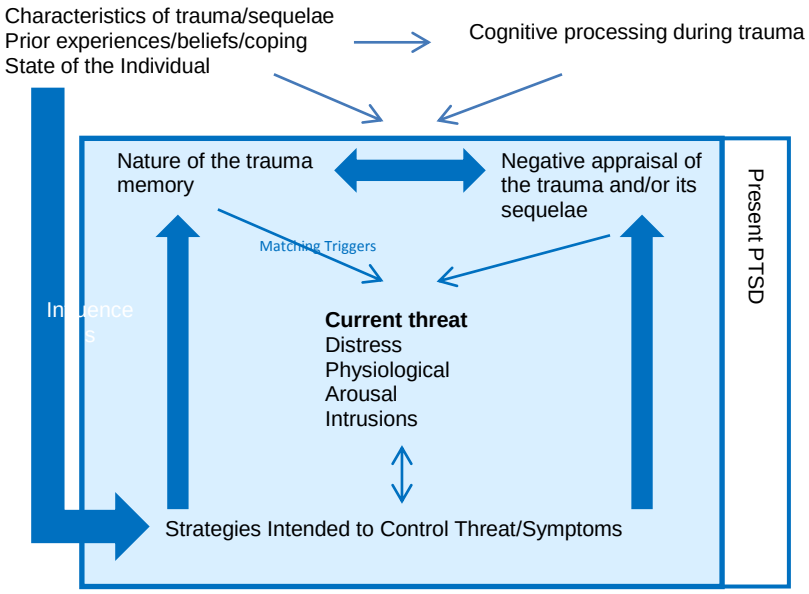

Figure 1. Ehlers and Clark's (2000) model of PTSD

SC appears to be a protective factor to psychological distress (Barnard & Curry, 2011) and a useful trait that can be used to cognitively diminish the negative effects of disturbing life events because it increases an individual's ability to use positive cognitive restructuring (Allen & Leary, 2010). Also inducing SC as a state enabling one to think self-compassionately can be used after a negative event to reduce highly critical thoughts, facilitate self-acceptance and reduce emotional distress (Lee, 2005). This in turn leaves attentional resources free to use more adaptive strategies, such as problem solving.

Therefore, trait SC may disrupt maladaptive cognitive processes in PTSD. Increasing SC helps sufferers develop kinder attitudes towards themselves when dealing with threatening stimuli, thereby reducing thought suppression (Neff, Hseih, & Dejitthirat, 2005) and encourage varied, and exploratory thoughts and actions (Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008). A reduction in these highly self-critical negative appraisals through SC may enhance an individual's stress tolerance, allowing them to face their traumatic memories (Gilmour, 2014) and reduce their overall symptoms. These negative appraisals may be synonymous with cognitive intrusions, in that they could be defined as intrusive negative thoughts that are trauma related and may be directly affected by a self-compassionate intervention.

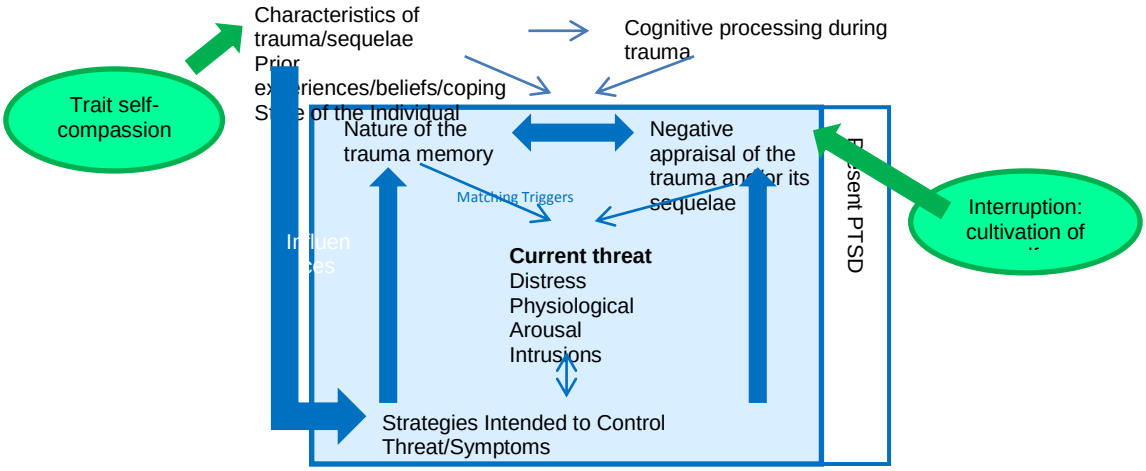

Figure 2. Representation of Ehlers and Clark's model, adapted by the author. This shows how SC affects the trait characteristics of an individual before trauma and the negative appraisals following trauma.

Emotional regulation model. Complementary to this model is the trans-diagnostic three systems model by Gilbert (2005) which proposes that PTSD is in part maintained by an over-activated threat system and under-developed or inhibited relief system. Emotional dysregulation therefore occurs, which has been shown already to be an important process within PTSD (Scoglio et al., 2015), as it influences symptoms (Lanius et al., 2010) and correlates with activity in the limbic systems (Etkin & Wager, 2007). Shepherd and Wild (2014) found that trauma-exposed individuals with PTSD symptoms had greater difficulty regulating negative emotions and as a result had to use emotional

suppression in order to cope. This resulted in more intrusions and greater physiological arousal meaning increased activation of the threat system.

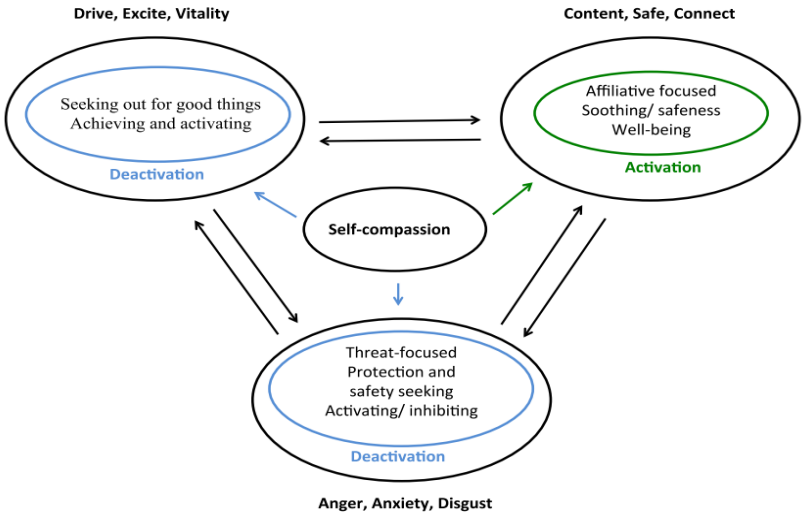

Figure 3. Kirschner's (2016) adaptation of Gilbert's emotional regulation model (2009) shows how self-compassion could enhance the relief system, thereby reducing the threat system.

In Gilbert's model SC could activate feelings of contentment, safeness and connectedness which may balance feelings of threat and anxiety (Figure 3). SC as a psychological trait may also work to improve emotion regulation allowing negative feelings and experiences to be held in awareness with kindness and therefore ameliorated. SC has been shown to negatively predict emotional regulation difficulties and stress in non-clinical samples (Finlay-Jones, Rees, & Kane, 2015). SC is known to reduce emotional and experiential avoidance (Neff & Dahm, 2015), allowing for emotions to be more fully explored

and processed. Physiological arousal is thereby reduced and individuals are less likely to use response modulation (i.e., suppression) to avoid traumatic intrusions. This then allows new learning to occur and the trauma to be processed.

Therefore, PTSD symptoms are predicted to be reduced through increasing state SC through cognitive pathways and affective/neuropsychological mechanisms. As a result of these theoretical hypotheses about how SC and PTSD are associated many have tried to use compassion-facilitating interventions (CFIs) to ameliorate PTSD symptoms, with some success.

Compassion-Facilitation

Researchers have developed psychotherapeutic interventions (loosely grouped as CFIs) to help individual increase state SC in hopes of facilitating trait SC in the long term. Neff and Germer (2013) developed their Mindful Self-compassion Programme and Gilbert (2010) created his Compassion-focused Therapy (CFT). These interventions increase SC by asking individuals to practise being kinder to themselves and using compassionate imagery to self-soothe. This may be completed in self-care exercises or by practising forms of meditation (Hofmann, Grossman, & Hinton, 2011). SC training over a number of sessions has been found to reduce self-critical appraisal, self-blaming, negative

thoughts and avoidance strategies, enabling a kinder perspective towards oneself (Neff & Germer, 2013) and has been shown to aid emotional regulation (Terry & Leary, 2011).

CFIs have a growing evidence base for their use in disorders where there is high self-criticism (Gilbert, 2009), including psychosis (Braehler, Harper, & Gilbert 2013), trauma (Beaumont, Galpin, & Jenkins 2012) and other mixed presentations (Leavis & Uttley, 2015). The preliminary trend shows that CFIs are most effective in conditions where high self-criticism is present (i.e., PTSD; Cox, MacPherson, Enns, & McWilliams, 2004) although the evidence for trauma-related conditions such as PTSD or complex grief is still relatively new and has not been established over traditional trauma focused treatment (i.e. CBT), see the above review).

Research has shown that CFIs can cause changes in the affective system which can be measured using physiological tools (Porges, 2007). Feeling threatened is associated with higher psychological arousal measured by higher skin conductance level (SCL) and higher heart rate (HR) (Bradley & Lang, 2000). Both are controlled by the sympathetic nervous system in order to prepare the body for threat reaction. The mirroring system of parasympathetic activation is linked to the relief system and is associated with increased to the beat-to-beat variability in heart rate known as heart rate variability (HRV).

As predicted by the emotional regulation model CFIs have been shown to positively affect these variables. Kirschner, Karl, and Kuyken (2013) found that even a brief state SC meditation exercise in healthy individuals lowered negative emotions, negative thoughts about the self and sympathetic arousal and increased positive affiliative affect and parasympathetic activation. Recent research (Storr, 2015) found that a SC meditation exercise reduced the self-reported distress and physiological correlates of PTSD in a healthy trauma-exposed sample (although not in a group with PTSD).

Trauma Film Paradigm

As it is unethical to expose laboratory participants to real traumatic events and working with clinical patients who have experienced PTSD involves many confounding variables, the trauma film paradigm has been developed as an experimental analogue of viewing real trauma and the subsequent intrusions and emotional distress suffered in PTSD (Holmes & Bourne, 2008; Holmes, Brewin, & Hennessy, 2004). Previous studies have shown that analogue traumatic content can be manipulated experimentally by completing cognitive tasks *before* trauma film viewing or *during* the film (Holmes, James, Kilberk, & Deeprose, 2012; Stuart, Holmes, & Brewin, 2006). Most studies have used distraction (e.g., finger –tapping) or visual-spatial tasks (i.e., playing Tetris) to disrupt the post-traumatic sequelae. However, a task which facilitates SC could

have similar effects but via a different mechanism (i.e. cognitive and/or affective).

Facilitating state SC may change and even disrupt the psychological processes that occur following trauma by reducing negative appraisals, aiding better emotional regulation or by helping people self-soothe and feel less distressed. This in turn would aid their recovery and allow them to experience fewer symptoms.

Aims and Hypotheses

The aim of this project was to investigate a current gap in the research regarding compassion and PTSD. As yet few studies have looked at how a direct CFI influences the after-effects of trauma-induction. Earlier studies have looked at CFIs that treat individuals months or years after the trauma took place. This study investigated whether a compassion-facilitating meditation (CFM), compared to a neutral emotional meditation (NEM), given to an analogue population immediately following exposure to a trauma film resulted in a reduction in post-traumatic symptoms (in the form of self-reported distress, physiological arousal and post-traumatic intrusions) compared to a control

group. To this end, the study specifically examined three primary hypotheses and secondary hypotheses within them.

1. **Self-report distress, self-criticism and self-compassion.**

a. It is hypothesised that participants who listened to the CFM post film, relative to those who listened to the NEM, will show greater decreases in mean distress, mean self-criticism and an increase in mean self-compassion, post meditation compared to pre-meditation.

b. It is hypothesised that participants who listened to the CFM post film relative to those who listened to a NEM will show greater decreases in mean distress, mean self-criticism and an increase in mean self-compassion seven days after the meditation, compared to directly after the meditation.

2. **Sympathetic and parasympathetic arousal**

   a. It is hypothesised that participants who listened to the CFM post film relative to those who listened to a NEM will show a greater decrease in mean change in sympathetic arousal, i.e., heart rate (HR) and skin conductance (SCL), from the film time period to the audio meditation time period.

   b. It is hypothesised that participants who listened to the CFM post film relative to those who listened to a NEM will show a greater increase in

mean change in parasympathetic activation, i.e., heart rate variability (HRV), from the film time period to the audio meditation time period.

3. **Post-trauma intrusions**

It is hypothesised that participants who received the CFM post film relative to those who listened to a NEM will report fewer total daily intrusions over the seven days following the meditation.

Methods and Materials

Design

This study employed a mixed design with a between-subjects factor of condition and a repeated-measures factor of time. The independent variable in the experiment had two levels, which participants were randomly allocated into: either a self-compassion induction in the form of a compassion-facilitating meditation (CFM), or a neutral emotion meditation (NEM) condition as a control. As a proxy for PTSD-like symptoms, the main dependent variables were self-reported distress, self-criticism and self-compassion, physiological reactivity (HR, HRV, SCL) and the number of self-reported intrusions in the seven days following the experiment.

Participants

Participants were recruited through printed and online advertisements at the University of Exeter. Students were assessed for eligibility through an online questionnaire that they completed before they were invited to the experimental session. The final sample of 72 consisted of 59 females and 13 males (Mean = 20.44 years, SD = 4.35 years, range = 18-35 years). The University of Exeter ethics board approved the study (Appendix A) and all participants gave written informed consent (Appendix B).

Inclusion/exclusion criteria. Inclusion criteria for the study included no current PTSD symptoms, depression or suicidality. A positive affirmation for any of the questions on the Primary Care PTSD Screen indicated exclusion. Any participant who disclosed a clinical level of depressive symptoms, was excluded from the study, (indicated by a score higher than 10 on the Patient Health Questionnaire or any score on the risk question). Participants were excluded on these ethical grounds because as although the trauma-film has been used extensively using healthy participants it is unknown how the manipulation may interact with depressive or trauma psychopathology. Excluded participants were signposted to on and off campus mental health services. Participants who disclosed that they were currently taking cardiovascular medication or had experienced cardiovascular problems (e.g., heart disease, pacemakers, shunts or stents) were also excluded from the study because of the complications that

may arise with the vascular measuring devices. All participants were reimbursed for their time either through the university's psychology credit system or they were entered into a prize draw for ten prizes of £20 Amazon vouchers, awarded after the study was completed.

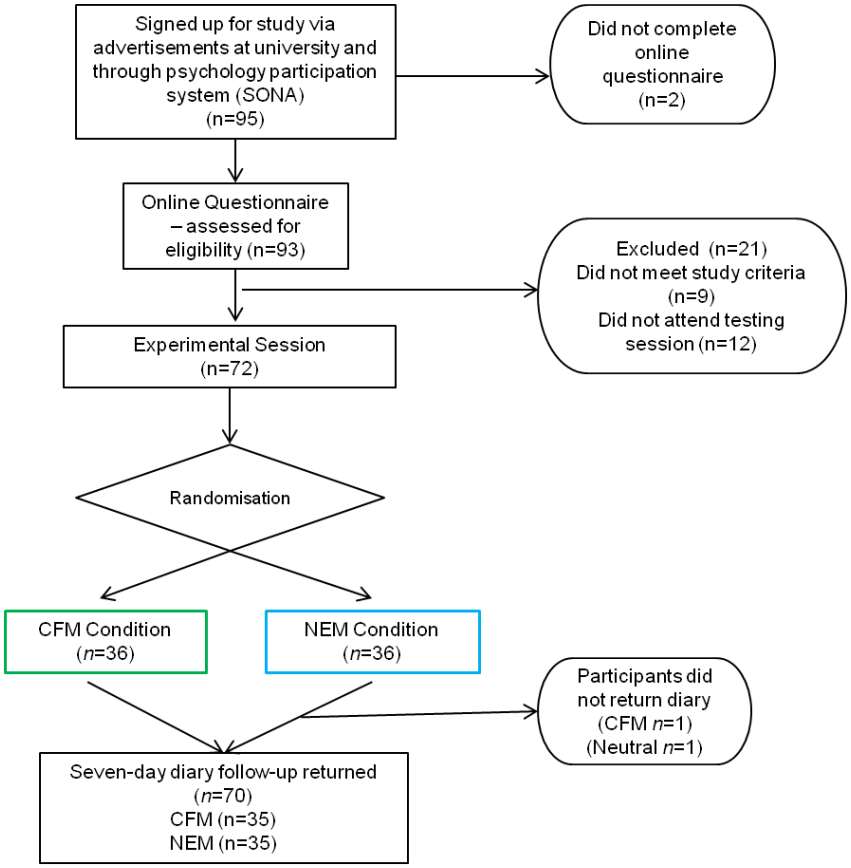

Figure 4. Participant pathway through the experimental procedure.

Power Analysis

The target sample size was 74 and based on a priori power calculation (see Appendix D.) This was estimated after considering effect sizes obtained in

previous studies using the GPower software (Faul, Erdfelder, Buchner, & Lang, 2009).

Screening Measures

Primary-care PTSD screen (PC-PTSD; Prins et al., 2003) Current PTSD symptomatology was screened using the PC-PTSD. This is a four-item screen designed for use in primary care and other medical settings. It is a useful diagnostic tool for PTSD and shows good sensitivity (.78) and predictive value (*r* = .65) against the clinician administered PTSD scale.

Patient health questionnaire-9 (PHQ-9; Kroenke, Spitzer & Williams, 2001). Depressive symptoms experienced in the last two weeks were measured using the PHQ-9, a nine item measure based on the diagnostic criteria for major depressive disorder. PHQ-9 scores > 10 had a sensitivity of 88% and a specificity of 88% for major depressive disorder. The PHQ-9 has high internal consistency with Cronbach alphas of .86 and .89 (Kroenke et al, 2001). In this sample the Cronbach alpha was .61(which is low and possibly due to the little psychopathology in the sample).

Trait Baseline Measures

Participants completed three self-report questionnaires as baseline measures and to check and control for group differences pre-randomisation.

Self-compassion scale (SCS; Neff, 2003b). The scale is a 26-item measure of self-compassion which can be used as a single factor (Neff, Whittaker, & Karl, 2017) or sub-divided into a six-factor model consisting of self-kindness, self-judgment, common humanity, isolation, mindfulness and over-identification (Neff, 2016a). In this study the full scale was used. Psychometric evaluation of the SCS has yielded good internal consistency (Cronbach's alpha ≥ .86) and has been reported to be highly reliable with the long form (Raes, Pommier, Neff, Gucht, Van, & Wiley, 2011), validated by Neff (2003b). In this sample the Cronbach alpha was .93.

Emotional regulation questionnaire (ERQ; Gross & John, 2003). This is a ten-item scale designed to measure respondents' trait propensity to regulate their emotions in two ways: cognitive reappraisal and expressive suppression. The measure is reliable with Gross and John (2003) reporting mean Cronbach alphas of .79 for cognitive reappraisal and .73 for expressive suppression. In this sample the Cronbach alpha was .60 (again low possibly due to this measure being designed for a sample with higher psychopathology).

Acceptance and action questionnaire (AAQ-II; Bond et al, 2011**).** This is a seven-item unifactorial self-report measure of psychological flexibility and experiential avoidance. Higher scores are related to greater experiential avoidance and psychological inflexibility. The mean Cronbach alpha coefficient for the AAQ-II (Bond et al., 2011) is .84 (.78 - .88), and the three-month and

one-year test-retest reliability is .81 and .79, respectively. In this sample the Cronbach alpha was .67, (again low possibly due to this measure being designed for a sample with higher psychopathology).

State Behavioural Measures

In order to determine how participants were responding to the baseline, film and audio meditation in the moment, they were asked to rate their state levels of distress, self-criticism and self-compassion at baseline and after each part of the experimental task (Figure 6). Participants answered the three statements in the form of a visual analogue scale (VAS) from 0-100, similar to scales used by Davies and Clark (1998) and have good evidence for validity and reliability (Bond & Lader, 1974). These items were used in line with the specified hypotheses.

Manipulation ratings. Additionally, VASs were also administered on scales of 0-100, at the post-film and post-audio time points, regarding film and audio task attention and ability to follow the given instructions, similar to the film ratings used in Holmes et al. (2012). These were used to ascertain that participants had been attending to the stimuli and to check that these did not differ between conditions.

Trauma Film

The original trauma film paradigm has been widely and successfully used in research settings and provides a prospective experimental tool for investigating the analogue cognitive mechanisms underlying intrusion development (Holmes & Bourne, 2008; James, Lau-Zhu, Clark, Visser, Hagenaars, & Holmes, 2016). Due to ethical considerations, the trauma-film used in this study differed from the video used by Holmes et al. (2012). Instead of a narrative and complete film of an accident, each participant was shown a video montage film of still pictures with accompanying emotive music designed to induce the symptoms in line with post-traumatic stress. The film showed car and train accidents, scenes of war, medical emergencies, inter-personal attacks and images of injured people.

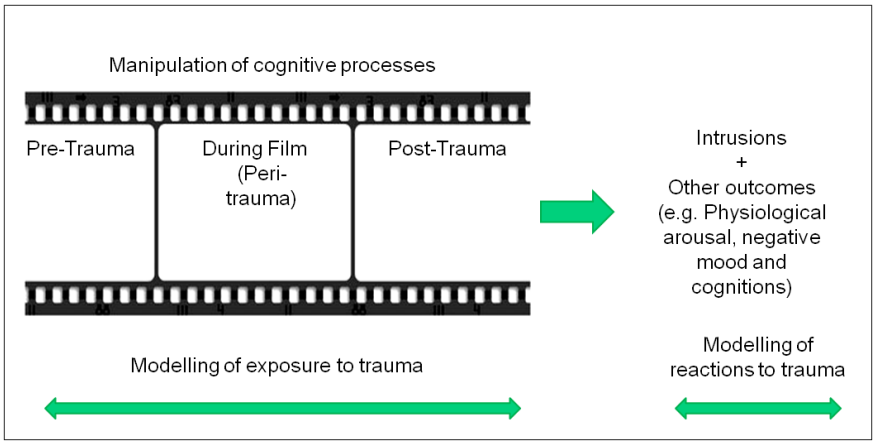

Figure 5. The trauma film paradigm as an experimental psychopathology model for both exposure and reactions to trauma, modelling pre-, peri and post-traumatic stages. Adapted from James et al, (2016).

Audio Meditation Tasks

Compassion-facilitating induction. The CFM was used to guide participants to direct loving/friendly feelings towards a close person (minutes 1-6) and were then asked to direct the same feelings towards themselves (minutes 7-11). The meditation script was developed by Kirschner (2016) in collaboration with an experienced female British mindfulness teacher (who also narrated the script) and delivered via headphones. It is 11.31 minutes long (Appendix E.1).

Neutral-emotion induction. The NEM was designed to keep participants' attention but not develop any particular emotional state and to control for the effects of the audio meditation alone. An audio script was used that described walking around a supermarket and uses the same number of words, the same narrator and is of the similar length (11.37 minutes) as the compassion script and was also developed by Kirschner (2016), narrated by the same mindfulness teacher (Appendix E.2.).

Psycho-physiological Measurement

Electrocardiogram (ECG) and skin conductance level (SCL) were continuously measured during the experiment. Heart rate (HR), as determined

from ECG, and SCL was used as measures of sympathetic arousal and heart rate variability (HRV), as determined from ECG, as a measure of parasympathetic arousal.

HR & HRV. The ECG was recorded continuously from using two sensors; one placed below the participant's right collar bone and one to the participant's left side, underneath the ribcage using a BIOPAC ECG100C amplifier at a sampling rate of 1 kHz with a low pass filter of 35 Hz and a high pass filter of 0.5 Hz. A two-minute baseline measurement was taken for comparison. Mean HR and HRV was calculated using the procedure described in Berntson et al. (1997) for each minute of the experiment and then averaged for the overall time periods: baseline, film and audio meditation.

SCL. Skin conductance level was measured using a BIOPAC GSR100C amplifier and a skin resistant transducer (TSD203) from the middle phalanx of the first and ring finger of the participant's non dominant hand at a sampling rate of 500 Hz with a low pass filter of 1.0 Hz. Mean SCL per minute was calculated for each minute tested then averaged for the overall time periods: baseline, film and audio meditation.

Intrusion Diary

A self-report diary was given to participants to record their post-traumatic intrusions (adapted from Holmes, 2012) via either email or a hard copy

(according to their preference). Participants recorded all the intrusions that they had had over the seven days post-experiment and categorised the intrusions by type (cognitive, visual, audio or combination) at the end of the day (Appendix C). Added to this were daily VASs of distress, self-criticism and self-compassion.

Procedure

Individuals were screened for eligibility through an online questionnaire (PC-PTSD, PHQ-9 and cardiac health measures). They were invited to an experimental session and received the information sheet and consent form. They then answered another online questionnaire consisting of the demographic information (age, gender) and the trait baseline measures (ERQ, AAQ-II and SCS).

On the testing day, participants gave written informed consent and were then invited into the lab area which was temperature controlled (set at 21ºC for the SCL measurement) and sound controlled. Participants were fitted with the recording equipment and given verbal instructions of the experimental tasks that they would be participating in whilst the ECG and SCL measures were being recorded (Figure 6.).

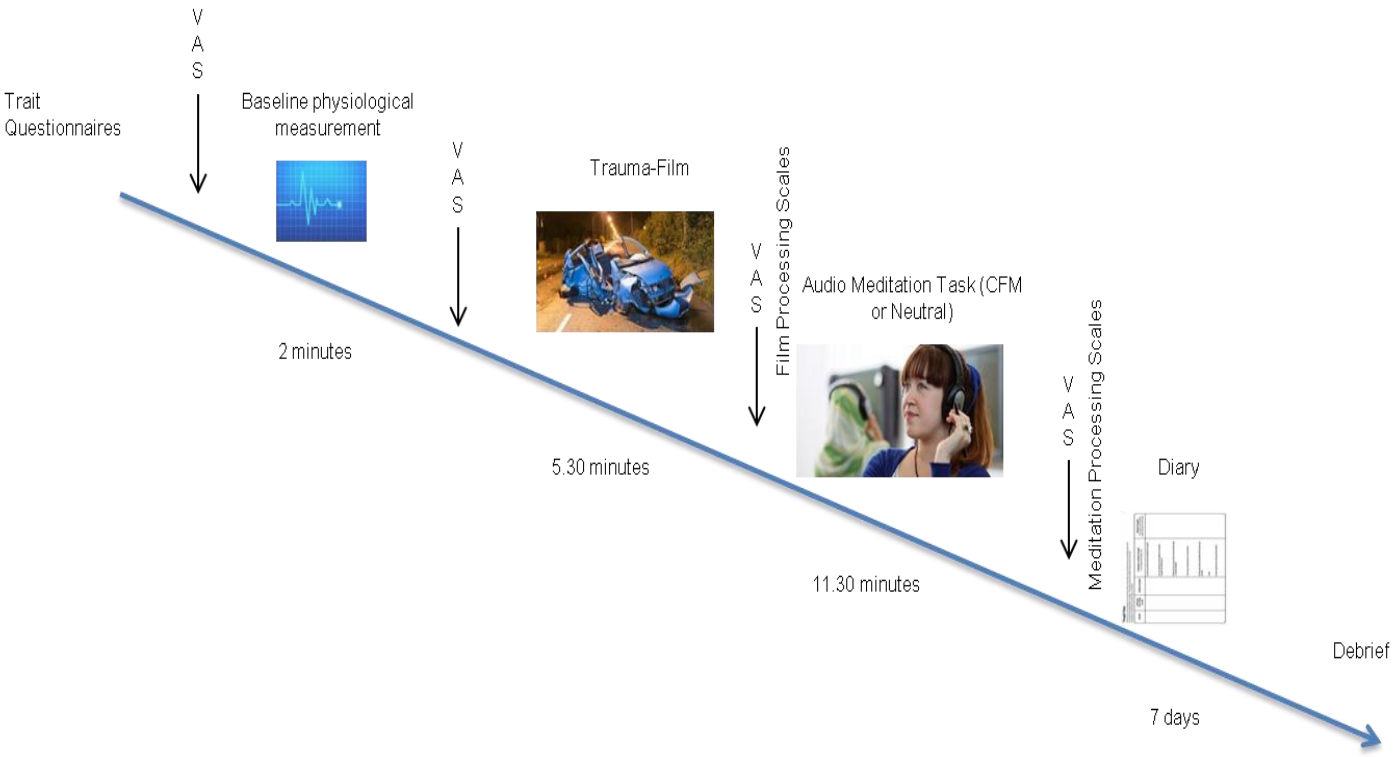

Figure 6. Experimental timeline and procedure.

The lab session was conducted using E-Prime software (Psychology Software Tools; www.psnet.com/eprime) that was presented on a Dell (E1715S) monitor. Participants were given headphones that were attached to the computer enabling them to listen to the film and audio tasks. Participants completed the mood state measures of distress, self-criticism, and self-compassion on the separate VASs, presented on the computer screen. Each scale appeared until the participants had indicated their mood on the scale by using the mouse and pressing the button to indicate a percentage score. After

this, participants remained seated and still for two minutes whilst the baseline psycho-physiological measures were taken. Following this they were again asked to rate their mood state measures. Participants were then shown the trauma film and again asked to rate their mood states. Participants then listened to either the CFM or NEM before providing post audio mood state measure ratings.

After the experimental session participants were asked to complete the diary over the next seven days and were given a short debrief. Participants were offered to watch a three-minute positive mood induction audio film (Sawicka, 2016) but only five participants took up this offer. No participants reported any immediate negative unexpected effects of the trauma film or reported that they were too distressed to continue with the experiment. Post seven days the diaries were then given back to the researcher either by hand or by email. Participants then received a full written debrief of the whole study.

Data Analysis

Pre-processing of Psycho-physiological Data

Heart rate (HR; sympathetic arousal). In order to determine the beats per minute a semi-automatic R wave detection algorithm was applied using the software AcqKnowledge (Version 4.1., BIOPAC Systems Inc.). The unfiltered

ECG data were cleaned by applying a FIR bandpass filter between 0.5 and 35 Hz and 8000 coefficients. Artefacts were detected (such as missing, noisy or ectopic beats) and removed using a template correlation and interpolation from the adjacent R-peaks (Berntson, Quigley, Jang, & Boysen, 1990; Berntson & Stowell, 1998; Solem at al., 2006). Using a macro script, the mean HR for each minute of data in the baseline (2 minutes), film (6 minutes) and audio (12 minutes) time periods in beats per minute were extracted from the R-waves. To determine the HR responses to the trauma film, the mean baseline value was subtracted from each minute of value for the trauma film, producing the change in HR for each minute. To determine the HR recovery through audio meditation tasks post trauma film, the last film HR was subtracted from the audio meditation for each minute.

Heart rate variability (HRV; parasympathetic activation). Using the same method to clean the ECG data, the HRV was determined by calculating a time series of the R-peaks and submitting it to a fast Fourier transformation that calculates the power spectrum of the R-R interval variation for a time period (Berntson et al., 1997; Malik et al., 1996). The frequency range between 0.15 Hz and 0.4 Hz (high frequency, HF) was calculated. This high frequency band of HRV is generally considered a marker of parasympathetic input. Mean HF-HRV responses were then extracted for each data section using the same process as used with the HR.

Skin conductance level (SCL; sympathetic arousal). Maximum, minimum and mean SCL values were extracted for the same time windows as the HR and HRV analyses and a range correction was applied to each data section for each participant to give a mean SCL corrected for individual differences (Lykken, Rose, Luther, & Marley, 1996). The formula applied to calculate this was: Corrected SCL = (SCL mean - SCL min) / (SCL max - SCL min). Determination of SCL responses to both trauma film and recovery through audio tasks post trauma film followed the same procedure as for HR and HRV.

Data Cleaning

All questionnaire and behavioural measures were checked for outliers using the SPSS (v23) explore function, and inspection of box plots, which comprised less than 5% of the data. In order to retain study participants, outliers were not removed but winsorised, meaning that the outlying data was transformed and the extreme values limited by replacing them with the trimmed minimum and maximum data points at the 95th percentiles (i.e. Tukey's hinges: Tukey, 1977) (Tabachnick & Fidell, 2001). Although analysis of variance (ANOVA) has been found to be robust to moderate deviations from normality, normality and homogeneity were established before running parametric analysis (Glass, Peckham, & Sanders, 1972; Lix, Keselman, & Keselman, 1996).

Normality was violated (as assessed by the Shapiro-Wilks test) in some VAS and intrusions measures in particular, due to the high prevalence of positively skewed variables. Transformation of the data was attempted in order to meet the normality assumptions but in all cases this did not improve the fit of the distributions. Therefore, non-parametric tests were used instead.

Results

Baseline Differences Between Groups

A series of independent *t*-tests showed that the condition groups did not differ from each other in terms of baseline measurement of the ERQ, AAQ, SCS, age and gender (Appendix F).

Manipulation rating responses. A second series of independent *t*-tests showed that the condition groups did not significantly differ from each other in terms of how much attention participants had paid to the trauma film, their trait enjoyment of action/horror films, how much attention they gave to the audio meditation and their ability to follow the instructions (Table 1) Overall, attention and instruction rating were also high (all over 50 on 0-100 scale).

Table 1
Manipulation responses (VAS scores)

		Min-Max	M	SD	df	t	p
Attention to Film	CFM	67–100	89.66	9.06	70	-.52	.59
	NEM	67-100	90.83	9.63			
Attention to audio	CFM	51-100	82.19	2.14	70	.59	.10
	NEM	50-100	77.19	2.17			
Ability to follow audio's instructions	CFM	50-100	79.52	2.21	70	.51	.62
	NEM	50-100	77.97	2.27			

Trauma Film Manipulation. A mixed 2 x 2 ANOVA with a between-subject factor of condition and a repeated measure of time (pre-trauma film, post-trauma film) showed that distress rose significantly from pre-to post trauma film, $F(1, 70) = 750.77$, $p < .001$, $\eta_p^2 = .91$ (main effect of time), indicating that participants felt significantly more distress after the film, but there was no significant differences by meditation group, $F(1, 70) = 1.25$, $p = .26$, $\eta_p^2 = .01$, and no significant time by group interaction, $F(1,70) = 3.46$, $p = .059$ $\eta_p^2 = .05$. Conversely, a similar mixed 2 x 2 ANOVA on state self-compassion showed that levels of self-compassion post the trauma film were significantly reduced as compared to pre-film, $F(1,70) = 68.15$, $p<.001$, $\eta_p^2 = .49$,and there was no significant effects for meditation group, $F(1,70) = 2.99$, $p = .08$, $\eta_p^2 = .04$, and no significant interaction between group and time, $F(1,70) = .01$, $p = .89$, $\eta_p^2 = .01$, (see Table 3).

Another 2x2 ANOVA on state self-criticism indicated that there was no significant change in participants' levels of self-criticism from pre-to-post film, $F(1,70) = 2.47$, $p = .12$, $\eta_p^2 = .03$ and there was no significant difference for

meditation group, $F(1,70) = .01$, $p = .91$, $\eta_p^2 < .00$, and no significant interaction between group and time, $F(1,70) = .028$, $p = .86$, $\eta_p^2 < .001$. This indicates that the trauma film was effective in its intended manipulation in producing increased distress in the participants but did not do so in one meditation group more than another. The trauma film also expectedly reduced state self-compassion (Table. 2).

Table 2
Pre to post film self-report measures.

		Pre-Film		Post-Film	
	VAS Score	*M*	*SD*	*M*	*SD*
Distress	CFM	22.86	19.41	63.41	21.14
	NEM	20.41	19.76	73.22	17.23
Self-Criticism	CFM	38.22	23.67	33.83	21.75
	NEM	38.30	24.62	32.86	20.67
Self-Compassion	CFM	72.22	18.13	40.66	23.19
	NEM	66.52	20.55	35.94	19.44

Hypothesis testing

Hypothesis 1a. Distress, self criticism and self compassion post meditation. A Wilcoxon Signed-ranks test found a significant decrease in distress between post-film and post-audio (Z=-7.14, p<.001, r=.84), across the whole sample. A Mann-Whitney-U test revealed no significant differences between meditation conditions at post audio meditation (U=517.00, $p = .13$, r=.17). The same pattern emerged for self-criticism where a Wilcoxon Signed-ranks test found a significant decrease between post-film and post-audio criticism ($Z = 3.82$, $p < .001$, $r = .45$) but a Mann-Whitney-U test also revealed no

significant differences between meditation conditions at post audio meditation (*U*=635.00*, p* = .88, *r*=.01) (Table 3).

Table 3.
Post meditation VAS scores for self reported measures

		Post-Film		**Post-Audio**	
		Mdn	*IQR*	*Mdn*	*IQR*
Distress*	CFM	68.00	21.00	14.50	24.75
	NEM	76.50	23.50	20.50	28.25
Self-Criticism*	CFM	32.50	34.25	31.00	21.25
	NEM	29.00	37.00	34.50	30.00
		M	*SD*	*M*	*SD*
Self-Compassion	CFM	40.67	23.19	25.52	20.41
	NEM	35.94	19.44	25.55	18.63

*Median (Mdn) and inter-quartile range (IRQ) used instead of mean and standard deviation for non-parametric analysis

A mixed 2 x 2 ANOVA with condition as a between-subject factor did not show a main effect for time between post-film and post-audio self-compassion self report scores, $F(1,70) = 3.44$, $p = .06$, $\eta_p^2 = .04$. There was also not a significant interaction between meditation group conditions, $F(1,70) = 2.75$, $p = .10$, $\eta_p^2 = .03$. Therefore, these results show that participants did not differ in terms of self-rated distress, self-criticism and self compassion between meditation groups directly after the meditation task and the null hypothesis was not rejected.

Hypothesis 1b. Mean Distress, self-criticism and self-compassion at seven days.

An independent sample *t*-test indicated that self-reported mean distress in the seven days post trauma film exposure was significantly lower in participants who had experienced the CFM (*M* = 16.45, *SD* = 11.27) rather than the NEM meditation (*M* = 27.28, *SD* = 18.71), *t(*55.79) = 2.93, *p* =.005, *d* =.70. However, another independent sample *t*-test indicated that self-reported self-criticism over this period was not significantly lower for participants who had experienced CFM (*M* = 26.81, *SD* = 17.61) than for participants in the NEM group (*M* = 31.35, *SD* = 18.35), *t(*68) = 1.05, *p* = .30, *d* = .25. A Mann-Whitney U test indicated that self-reported self-compassion was significantly higher in participants who had experienced CFM (*Mdn* = 71.10, *IQR* = 28.10) rather than the NEM (*Mdn* = 53.90, *IQR* = 26.00), *U* = 439.00, *p* =.042, *r* =.24 (Figures 7a, 7b and 7c.).

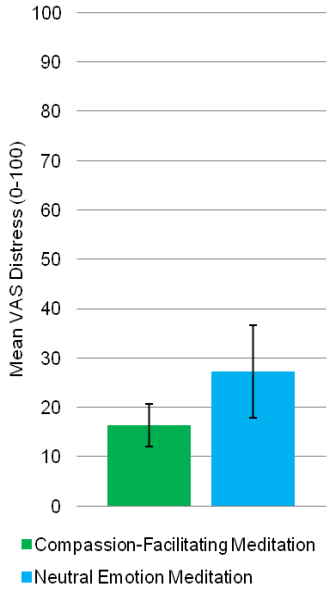

Figure 7a. Differences in mean self reported distress

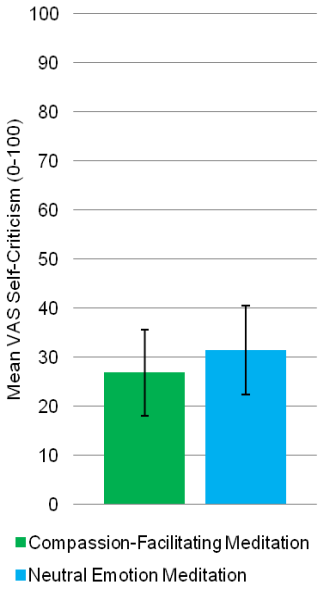

Figure 7b. Differences in mean self reported self-criticism

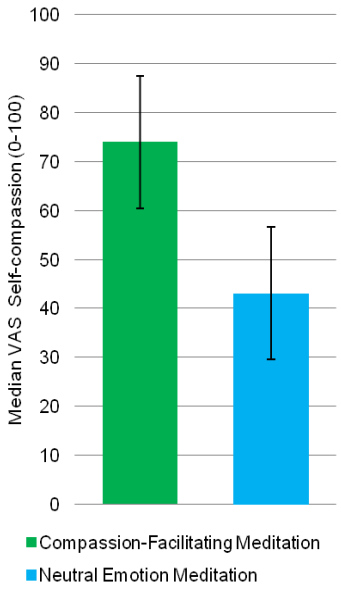

Figure 7c. Differences in median self reported self-compassion

*Graph showing the self-report differences between groups at the calculated as the average score over seven days. Error bars = SD (Distress and self-criticism), IQR (Self-compassion).

Hypothesis 2. Physiological changes

The extracted data from the initial analysis was transformed into a useable structure. The HRV data were first transformed from s^2 to ms^2 and then log-transformed (Berntson, 1997). Means were then calculated for each minute time point for the three time periods; baseline (two minutes), trauma film (six minutes) and audio meditation (twelve minutes). Figures 8, 9 and 10 show how HR, SCL and HRV changed over time during the experimental session. In order

to test whether there were statistically significant changes between time-periods, mean change in the three variables was calculated. For the change in measure over the film period, for each minute of data the baseline mean was subtracted from each minute of film data. For the audio time period the last film data point was subtracted from each minute of raw audio of data to calculate change in HR, SCL or HRV.

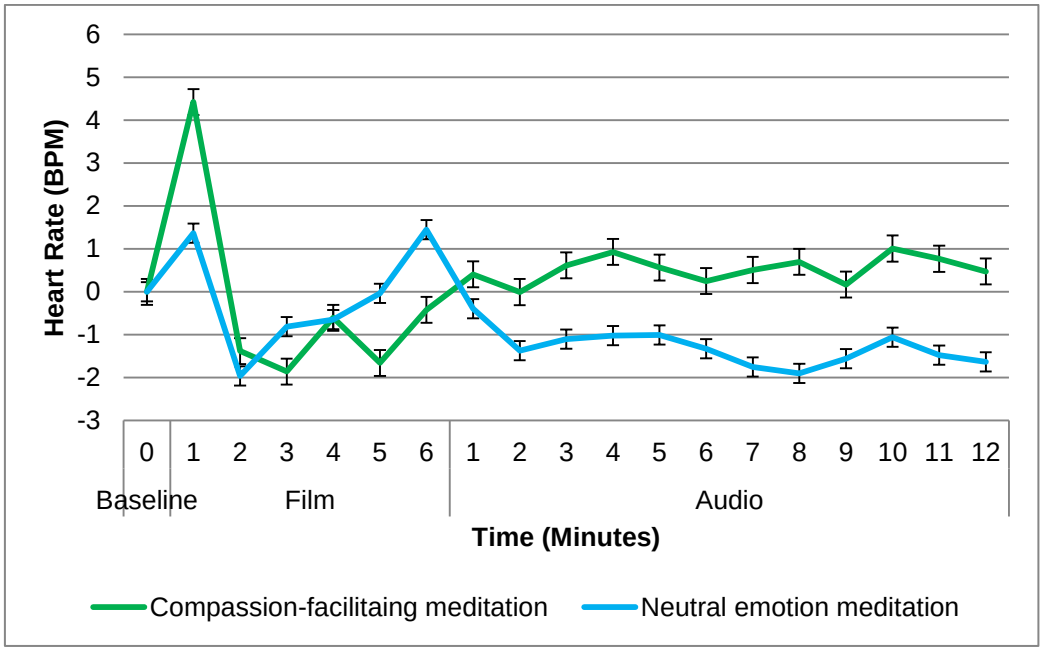

Figure 8. Change in HR (measured via beats per minut; BPM) over the experimental session. Error bars = standard deviation

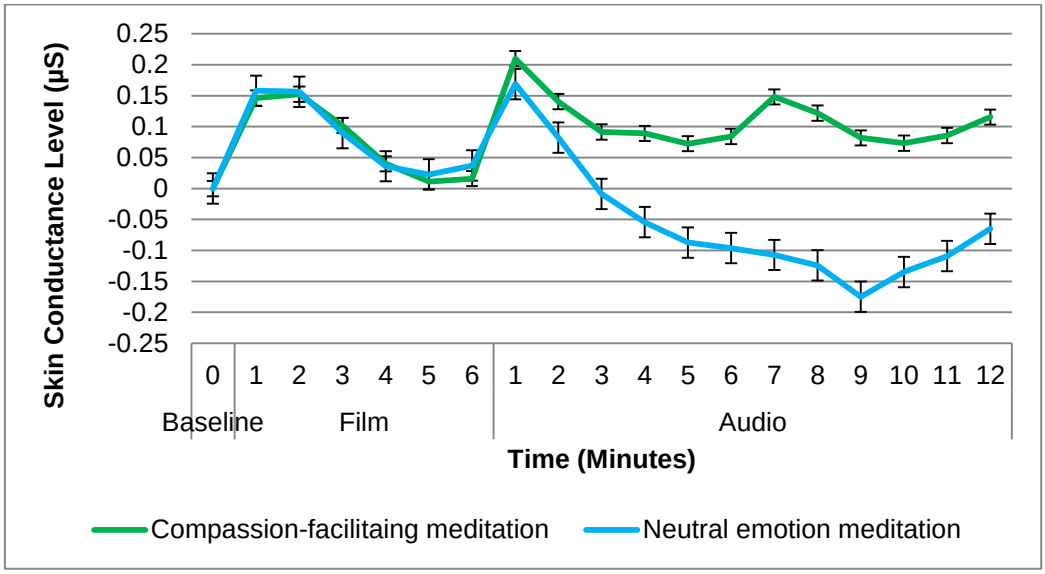

Figure 9. Overall changes in SCL (measured in microsiemens µS) over the experimental session. Error bars = standard deviation

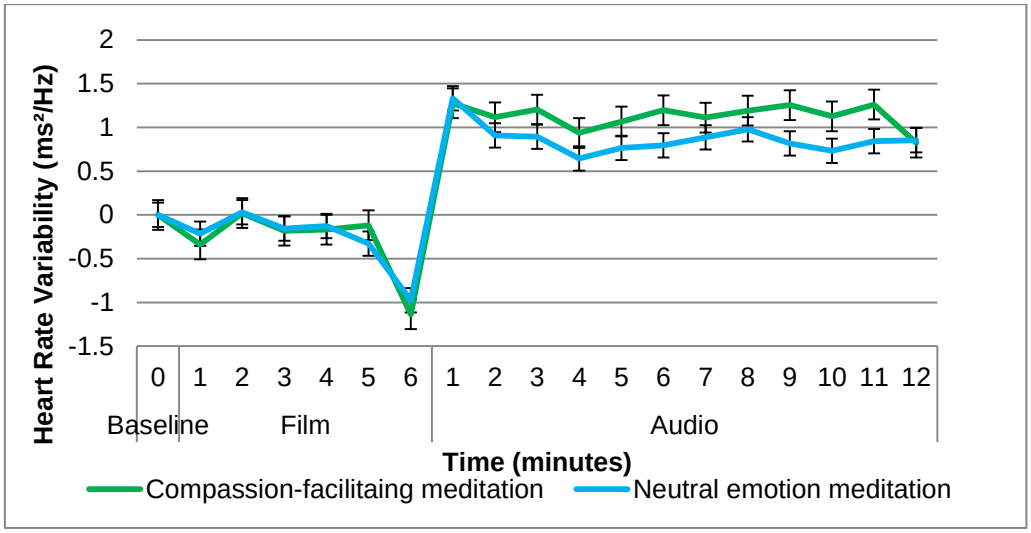

Figure 10. Overall changes in HRV (measured in milliseconds²/Hz) over the experimental session. Error bars = standard deviation

Change in mean HR. A mixed ANOVA with a between-subject factor of condition and a repeated-measures factor of time (during film, during audio) indicated that there was a significant effect for time, $F(1,70) = 182.21$, $p < .001$, $\eta_p^2 = .72$ as heart rate decreased over time. However there was not a significant meditation group effect, $F(1,70) = 2.59$, $p = .11$, $\eta_p^2 = .03$, and no significant interaction between time and meditation group, $F(1,70) = 1.23$, $p = .27$, $\eta_p^2 = .72$, indicating that the in HR was not lower in the CFM group than the NEM group and the null hypothesis was not rejected.

Change in mean SCL. Another mixed ANOVA did not reveal significant main effect for time for SCL, $F(1,70) = 1.44$, $p = .23$, $\eta p^2 = .02$, but did reveal a significant main effect for group, $F(1,70) = 6.09$, $p = .01$, $\eta_p^2 = .08$), but not a group by time interaction, $F(1,70) = 3.499$, $p = .066$, $\eta p^2 = .048$. This indicates that changes in participants' SCL were significantly different between group conditions but did not in themselves differ significantly over time. SCL was higher in the CFM group than the NEM group, contrary to expectations (Table 4.).

Change in mean HRV. Another mixed ANOVA did reveal a significant main effect for time, $F(1, 70) = 72.65$, $p < .001$ $\eta_p^2 = .50$, but not a significant effect of group, $F(1, 70) = .67$, $p = .41$ $\eta_p^2 = .01$, nor a significant group by time interaction, $F(1,70) = .50$, $p = .47$, $\eta p^2 = .007$. This indicated that HRV changed over time period but did not differ by group.

These results show that parasympathetic activation (HRV) increased over time as expected but did not differ by meditation group (Table 4). The results for sympathetic arousal were mixed as SCL did not significantly differ over time period but did differ significantly between conditions, although this rose in the CFM instead of fell, as expected. However, the opposite pattern occurred in the HR data.

Table 4
Changes in physiological measurement between baseline, film and audio time periods

		Baseline to Film		Film to Audio	
		M	*SD*	*M*	*SD*
Mean Change in HR	CFM	10.9	3.28	.67	6.11
	NEM	11.00	2.39	-1.07	3.80
Mean Change in SCL	CFM	.07	.25	.11	.29
	NEM	.08	.22	-.06	.23
Mean Change in HRV	CFM	-.32	.68	1.05	.93
	NEM	-.29	.48	.87	.84

Hypothesis 3. Total number of intrusions. A Mann-Whitney U test showed that there was not a significant difference in sum total of intrusions between the CFM (*Mdn* = 3.0) and NEM meditation (*Mdn* = 2.0) groups, $U = 647.00$, $p = .99$, $r < .01$.

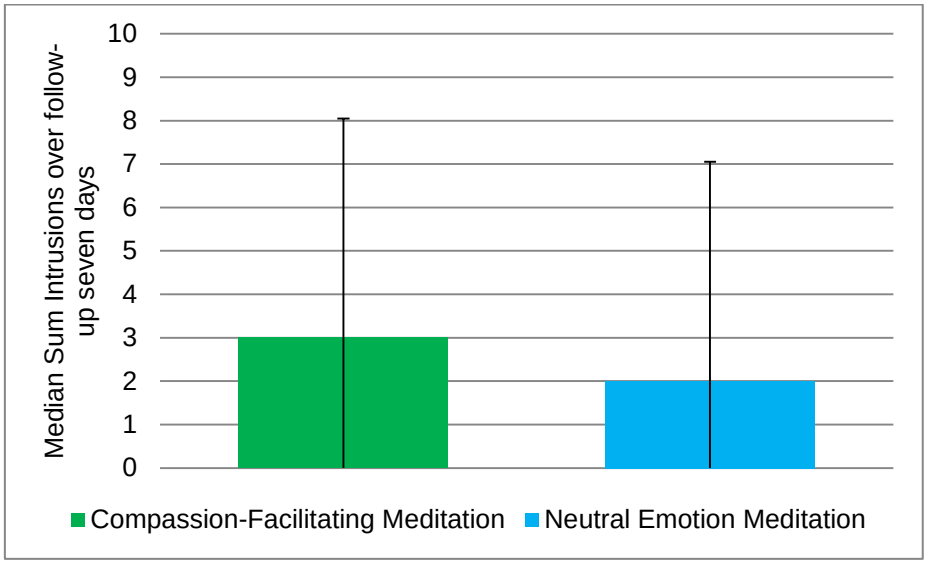

Figure 11. Graph showing the median of the sum of the weekly intrusion in both groups. Error bars = IQR.

Discussion

The aim of this study was to investigate whether a brief SC meditation can decrease distress, self-criticism, sympathetic arousal and intrusions and increase parasympathetic activation and SC, following the trauma film paradigm in an analogue sample, both immediately after the experiment and over seven days follow-up. Although the majority of the hypotheses for immediate recovery and one-week intrusions were not supported, this study found that individuals who received CFM following the trauma film reported lower levels of distress in the following week than those who received a neutral recovery induction.

Self-report measures. The results did not confirm the hypothesis that participants would show decreased levels of distress and self-criticism and increased SC immediately after the CFM compared to the NEM condition. This is surprising given that Kirschner (2016) found these effects in a depressed population and Storr (2015) found self-report changes in both a PTSD group and a trauma-exposed healthy group. There are several possible explanations for this. First, in these studies the SC induction was not preceded by a stressful task such as the trauma film.

Second, owing to very strict exclusion criteria required by the ethics board the sample for this study was a very healthy and resilient sample with potentially good emotional recovery, even though their mean SC scale scores (CFM = 83.00, NEM = 83.05) were within the moderate range (as compared to Neff's, 2003b, validated scoring). Earlier research (Kirschener, 2016; Storr, 2015) had found effects but within populations with higher psychopathology. Overall distress shown in this sample was quite moderate even after the film (see Table 4) in comparison with a PTSD sample (Schell, Marshall, & Jaycox, 2004), which may have been due to the film in this study being altered from Holmes et al.'s (2012) film, meaning that it might have been less distressing. In line with this both groups did not show a defensive physiological response, as their SCL lowered gradually rather than stayed high, over the course of the film, indicating a pattern of interest rather than overt aversion. Their healthy recovery

abilities and low propensity for threat bias post trauma film may therefore not have additionally benefitted from a self-compassion-based recovery condition.

Third, it is possible that the timing for delivering the SC induction was not optimal as immediate recovery may need to follow a natural course and not be interrupted by an effecter (i.e. a CFI) prematurely. In nearly all trauma-film studies the psychological manipulations have been delivered *before* or *during* the trauma film (Holmes & Bourne, 2008). Therefore in this study, where the CFM was delivered directly *after* the film, the negative effects of the film may have muted the CFM's effectiveness. Immediate intervention following traumatic events such as psychological debriefing, have been shown to be ineffective in preventing PTSD (McNally, Bryant & Ehlers, 2003) and may actually hinder the normal recovery process and lead to an *increased* rate of PTSD in debriefed survivors (Rose, Bisson, Churchill, & Wessely, 2001). PTSD is a condition of failed extinction and re-learning and therefore post-trauma individuals may need time to process before they can be affected by a positive intervention.

Interestingly, self-criticism was not significantly different between both groups over seven days. It may be that the CFM was not focused enough to affect this measure of self-criticism as it centred exclusively just on promoting compassion, rather than reducing criticism, whereas many longer CFIs do both (Gilbert & Irons, 2004). Self-criticism was reduced however in previous studies

(Kirschner, 2016; Storr, 2015). Indeed, Storr (2015) found that in a PTSD group self-criticism did decrease but self-compassion did not increase. This study's finding may again have occurred as the low psychopathology in this group meant self-criticism was relatively very low and possibly the CFM could not lower the levels any further. This result also minimally supports the idea that self-compassion and self-criticism are not two ends of a single continuum with individuals oscillating between the two, but are fundamentally distinct concepts (Falconer et al., 2014). However, this is a contentious issue with unresolved debate in the literature (Neff, 2016b).

Physiological measures. These results indicate that there were no differences between conditions in terms of physiological arousal and activation between meditation conditions, apart from a significant group difference in mean SCL with individuals in the neutral condition showing higher recovery. This means that CFM group's sympathetic arousal remained higher that the NEM group indicating that this group were more distressed.

It was expected that the delayed beneficial effect of the CFM would be accompanied by the respective parasympathetic activation pattern that Kirschner (2016), Storr (2015) and Rockcliff et al. (2011) found. In this study the physiological measures were only taken during the experiment (as in the earlier studies) but here there was no time to test for the delayed effect of the CFM that

was shown in the self-report data. A replication of this study where arousal is measured at follow-up would need to be completed for this to be determined.

Second, this result may be due to participants feeling slightly threatened by the CFM. There was a significant group difference whereby participants showed a higher SCL than controls during the meditation tasks, the opposite direction as expected, which may indicate some arousal or fear when confronted with a compassionate meditation task. In this study participants were invited to direct compassion to themselves which may be even more challenging than receiving it or directing it to someone else (as shown by the spike in SCL midway through the audio task where this occurred, shown in Figure 9). A fear of compassion has been found in clinical (Gilbert, 2010) and non-clinical populations (Gilbert, McEwan, Matos, & Rivis, 2011), and could have been present here. This has been recognised as an effect that can inhibit compassion-facilitation (Gilbert & Proctor, 2006). In this instance this effect of fear of compassion may caused a defensive arousal response (as shown by the increase in SCL). Similar effects have been shown to occur in studies measuring parasympathetic activation (Rockliff, Gilbert, McEwan, Lightman, & Glover, 2008). However, in this study a conscious 'fear of compassion' was not directly measured (i.e., by using the Fear of Compassion Scale, Gilbert et al., 2011) and therefore it would be critical for any replication of this experiment to measure this as an additional variable.

Intrusions. These results do not support the hypothesis that a CFM can be used to disrupt the psychological processes that cause post-trauma intrusions. Unlike physiological measurement, intrusions were measured at a seven-day follow-up and therefore if SC were going to be effective (as it was in the self-report data) it should also have been effective by this time point. Compared to Holmes et al. (2012; *M*= 5 flashbacks per week) in this study the number of intrusions measured was low (*M*=2) and possibly too minimal to observe condition differences. Due to ethical considerations this study used an adapted trauma film which may have reduced its power to stimulate intrusions and therefore it may have been unrealistic to expect similar results to those found by Holmes et al., (2012).

The process by which the CFM reduced distress may not be the same as the process that affects the trauma-intrusions. The trauma film is a useful paradigm has mostly been used to measure visual intrusions (Holmes & Bourne, 2008). Holmes et al., (2012) found that visual pathways could be disrupted by use of a visual Tetris game, but not by a verbal condition. Different types of trauma-paradigm (i.e., audio) have been shown to be effective in creating visual intrusions (Krans, Näring, Holmes, & Becker, 2010) which suggests an overall underlying way in which all types of intrusions are processed, namely a more visual pathway in line with Brewin, Dalgleish, & Joseph's (1996) dual processing theory. Therefore, as the CFM did not provide

any overt visual stimulation it may have not been able to counteract the post-trauma intrusions. It may be that participants could have imagined a visual compassionate image but this would need to be measured in any follow-up work. Possibly, a self-compassionate imagery task, where participants are asked to picture a compassionate figure (e.g. Gilbert & Irons, 2004) may have produced a significant reduction, being able to use both the imagery disruption effect shown in Holmes et al, (2012), to relieve distress through self-compassion. Therefore, it may be also that the control condition was unintentionally a more effective than previously thought as it did ask participants to ‘imagine ‘moving through a visual space (i.e. a supermarket) and may have been enough to diminish the intrusions.

Limitations and Strengths

This research used a student population and any participants that presented with any psychopathological difficulties were screened out. They therefore were unrepresentative of PTSD sufferers and unrepresentative of the general population (Henrich, Heine, & Norenzayan, 2010). Current research also suggests that CFIs are most effective when working with disorders in which high self-criticism is a strong factor. However, although the trauma-film paradigm was nominally effective in increasing distress and lowering self-compassion it did not change participants’ reported levels of self-criticism. This

could have resulted in the CFM missing its target area for intervention and explain why it was not effective in changing more symptoms. Self-criticism may not have been changed because participants were passive agents watching the events rather than having any active agency. A manipulation involving more agency or in conjunction with a self-criticism induction making them feel more shame or self-criticism (which is more similar to how PTSD actually works; Leskela, Dieperink, & Thuras, 2002) may have allowed the CFM to be more effective. It would be interesting to repeat this experiment with a clinical population or with a manipulation that promotes these emotions and appraisals.

The strengths of this study were the controlled conditions in provided and the randomisation of the sample meaning that effects linked to potential bias were controlled. This study was also a multi-method approach and sought to measure a variety of PTSD-like symptoms (self-report distress, physiological measures and intrusions) and not just one type, meaning that it tried to encapsulate the complexity of symptoms in PTSD.

Theoretical Implications

This study has provided evidence that inducing state SC can lessen self-reported distress but has not shown any evidence that the other symptoms PTSD were affected. This research does point to some issues with adapting the trauma-film paradigm in that minimizing its original premise may lead to it

becoming ineffective in simulating PTSD in a healthy population. This would be worthy to note for future research in this area.

Additionally, most of the research linking SC with PTSD has focused on trait SC rather than state SC. Inducing state SC will not produce the same effects that have been reported in the trait literature. The results seen in both this study and in Storr's (2014) PTSD sample might suggest that increasing state SC is not effective in changing PTSD symptoms. It may be that methods to induce state SC need to be refined.

Future Research

There is still limited evidence for the clinical use CFIs to treat PTSD but even fewer experimental studies investigating how inducing state SC may cause potential change. A replication of this study with the original trauma film used and measuring avoidance, negative appraisals in addition to self-report emotions and psychophysiology would be welcomed. Qualitative work aiming to reveal the complexities in the understanding of SC within trauma-populations would also be a useful addition to the evidence base. The proposed mechanisms here are either cognitive or affective but future research may look at discriminating these two possible models. Future research could describe exactly the processes by which SC works in PTSD, which may involve more measurement of avoidance, cognitive reappraisal or emotional regulation. If a

pathway is found in the non-clinical samples it would be useful to see if this is replicated in clinical PTSD populations. This research may also point to SC being a concept that overlaps too much with mindfulness and therefore may need to be refined into a more distinct construct.

Conclusions

This work shows that a one-off self-compassion induction immediately after the experience of the trauma film paradigm was not better at reducing physiological arousal and did not lead to lower intrusions during the week after testing than a NEM condition. This suggests that, in a healthy sample with small-to medium stress, the self-compassion induction does not have an additional beneficial effect. Although subjective distress levels seven days after testing were significantly lower in those who received the CFM after the stressor, findings of this study provide little support for the notion that self-compassion is beneficial for prevention of PTSD-like symptoms. Future research is needed to confirm if this negative effect is generalisable, or if it may be due to the methodological limitations discussed above. Alternatively, research could test whether the timing of the intervention is important, which might be suggested by the delayed stress-reducing effect that the self-compassion induction had in the week after the testing sessions. It may be that SC is not as useful as an early intervention for PTSD in the same way that

generally early interventions have not been successful (Kearns, Ressler, Zatzick, & Rothbaum, 2012).

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Appendix A - Ethics Documentation

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Psychology on line Ethics approval system - Laura Shepstone

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2017/1315	Laura Shepstone, Anke Kark, Nick Moberly	The role of self-compassion in reducing posttraumatic symptoms	conditional acceptance	8/08/2016	Track B

Appendix B - Participant Information & Consent Form

Emotional Processing in Films

What is the purpose of the study?
The purpose of this study is to investigate the relationship between individuals' responses to stress reminders, emotional processing, and body responses. We are interested to understand how different individuals cope with stress and what we can learn from this for facilitating wellbeing. The study will form the basis of a Doctorate of Clinical Psychology thesis being undertaken by the Principal Researcher, Laura Shepstone, Trainee Clinical Psychologist.

Am I required to take part?
It is entirely up to you if you wish to take part. If you do decide to take part, you are free to change your mind at any time and can withdraw during the study by letting the principle researcher know. If you decide not to take part after you have started the study, any data collected will no longer be included in the results of the study and will instead be destroyed.

What does participation involve?
In order to take part in this study you will be asked to complete a screening questionnaire that will be sent to you by email. ***If you are currently experiencing excessive levels of distress in your daily life or if you have a history of psychological trauma or posttraumatic stress disorder, we advise you not to participate in this research***.

Individuals who fulfil the inclusion criteria will then be invited to participate in a laboratory session which lasts approximately one hour during which we will measure your heart rate and skin conductance response. For this, we will clean your skin with alcohol and a peeling gel and place leads on your head, chest and fingers which we fill with a salty gel that can be easily wiped off.

After we have set this up, we will ask you to view a film clip with a series of short photographs accompanied with emotional music. The clip involves images of different types of stressful or potentially life threatening events. These images and the accompanying sounds and music have been designed to create an emotional response and to study how individuals respond to potentially stressful situations. You are likely to perceive them as temporarily unpleasant or upsetting. The clip will be similar to what you could see on TV news, safe

driving advertising clips that use emotional content or short scenes from a guidance-rated film (12, 15) BUT they DO NOT contain images of horror movies or gory violence.

After the film, we will invite you to listen to an audio exercise and to follow this exercise as well as you can. In our experience, this exercise can be perceived very differently as pleasant or neutral or boring.

We will also ask you to answer questions about your mood and your reactions towards the film and the audiofile.

At the end we will invite you to watch a brief movie that often makes people smile or feel relaxed and calm.

If at any time you wish to stop your study participation you can ask to leave and your data will not be used.

At the end of this part, we will give you a diary and ask you to note your thoughts and feelings related to the film that come to your mind for 1-week. These can be completed on-line. Then we will ask you to complete a brief interview and some questionnaires ***(***

Overall the study will take up to 1.5 hours of your time.

Participants' Rights

- You may decide to stop being a part of the research study at any time without explanation.
- You have the right to ask that any data you have supplied to that point be withdrawn/destroyed.
- You have the right to omit or refuse to answer or respond to any question that is asked of you.
- You have the right to have your questions about the procedures answered

If you have any questions as a result of reading this information sheet, you should ask the researcher before the study begins.

Benefits and risks

There are no direct benefits for your study participation. Your study participation will benefit to help us understand important processes behind watching film clips reminding of extremely stressful life events anybody can experience and individual differences in emotion processing associated during and after film presentation.

Watching the film clip may be temporarily unpleasant or upsetting, similar to watching some guidance rated (PG 12-15) cinema movies. This is a generally safe, widely used and well-researched task in the scientific field.

However, some people may become temporarily distressed during the presentations but this usually passes quickly. In the hours and days after the experiment you may or may not occasionally be reminded of the film, similarly to an upsetting cinema movie. This movie has been used routinely in research and there are no known risks for healthy adult participants watching it.

In the unlikely event that you experience high levels of distress or feel very uncomfortable during the experiment, you can stop any anytime and the investigator will be there to support you and answer possible questions. In the unlikely event that the distress persists or returns after the experiment, we advise you to talk to your GP, the student wellbeing centre or to contact any of the 24-hours phone numbers (on page 4)

You can also contact the researchers through their contact details (see below)

Cost, reimbursement and compensation

Your participation in this study is voluntary. However, to reimburse you for your time you will have the chance to win 10 prizes of £20. 10 participants will be randomly selected from the pool of participants. Students will also receive 2 hours of course credit for taking part.

Confidentiality/anonymity

All information which is collected from you during the research would be kept strictly confidential within the limits of the law. You will be allocated your own unique study code number, ensuring that all information that you give will contain your number rather than your actual name. Identifiable information will be stored in a locked cabinet and only the researchers of this project will have access to it. In accordance with British Psychological Society research guidelines, all data for the study will be securely stored for 20 years and will be destroyed after this time.

What will happen with the results?

It is planned that the results will be written up in order to inform clinicians and researchers who are interested in mood disorders. Any write-up of the findings for this study will not mention you personally. If you would like to obtain a copy of the findings, we will be more than happy to send them to you when they become available. If you wish, we can provide you with information about the main results of the research projects

Dissemination

The results are hoped to be published in a academic journal. Again, your personal details will not be revealed in any publication or report.

Who has reviewed this study?
This study has been reviewed and approved by the School of Psychology Ethics Committee, University of Exeter (Chair Dr Lisa Leaver, l.a.leaver@ex.ac.uk). If you wish to complain, or have any concerns about any aspect of the way you have been approached or treated during the course of this study, you can contact the primary study supervisor, Dr Anke Karl (contact details below) or the chair of the ethics board.

Researcher:

Laura Shepstone
Clinical Psychology Doctoral Program
Washington Singer Laboratories
Perry Road
Exeter
EX4 4QG
lls204@exeter.ac.uk

Supervisors:

Dr Anke Karl & Dr Nick Moberly
Mood Disorders Centre
Washington Singer Laboratories
Perry Road
Exeter
EX4 4QG
A.Karl@exeter.ac.uk &
N.Moberly@exeter.ac.uk

Helpline Details

Reed Mews - Wellbeing Centre
University of Exeter
Streatham Drive
Exeter
EX4 4QP

Reed Hall - Hailey Wing
University of Exeter

Streatham Drive
Exeter
EX4 4QR
We also offer limited appointments at St Lukes Campus
Phone: 01392 724381
Email: wellbeing@exeter.ac.uk

Samaritans
Samaritans provides confidential emotional support, 24 hours a day, for people who are experiencing feelings of distress or despair. Samaritans are there if you're worried about something, feel upset or confused, or just want to talk to someone.

Telephone (24 hours): 08457 90 90 90
E-mail: jo@samaritans.org
Website: http://www.samaritans.org
Address: Chris, P.O. Box 9090, Stirling, FK8 2SA

Depression Alliance
Depression Alliance is a charity which aims to assist people who are affected by depression. Depression Alliance offer information, a range of publications, self-help and support groups for people with depression.

Telephone (to request an information pack): 0845 123 23 20
E-mail: information@depressionalliance.org
Website: http://www.depressionalliance.org
Address: Depression Alliance, 20 Great Dover Street, London, SE1 4LX

SANEline
SANEline is a national out-of-hours telephone helpline, offering emotional support and information for people affected by mental health problems. They also offer e-mail support through SANEmail, their e-mail service.

Telephone (6pm – 11pm, daily): 0845 767 8000
E-mail: visit http://www.sane.org.uk/SANEmail
Website: http://www.sane.org.uk/SANEline
Address: 1st Floor Cityside House, 40 Adler Street, London E1 1EE

CONSENT FORM

1) I confirm that I have read and understood the Information Sheet for the above study. I have had the opportunity to consider the information and ask questions, and have had these answered satisfactorily. ☐

2) I am aware that my participation is voluntary and that I can withdraw my consent at any point during the study without giving any reason, and without my legal rights or medical care being affected. ☐

3) I understand that I have the right to obtain information about the findings of the study after it is completed. ☐

4) I understand that sections of the data collected during the study may be looked at by relevant individuals of the University of Exeter (i.e. the research Supervisors) and from regulatory authorities, where it is relevant to my taking part in this research. I give permission for these individuals to have access to my data. ☐

5) I agree to take part in the above study. ☐

6) I would like my name and contact details to be kept on a secure and confidential database so that I can be contacted about taking part in other research studies within the Mood Disorders Centre. ☐

_____ **Name of participant (print)**

_____ **Signature**

_____ **Name of Researcher (print)**

_____ **Signature**

One copy for participant, one copy for researcher

Appendix C. Induction Transcripts

E. 1. Script for Loving Kindness Meditation clip (in the style of Loving-Kindness for Beginners (Neff)

Sit in a comfortable position, reasonably upright and relaxed. (Pause) Close your eyes fully or partly. (Pause) You will now be guided through a few minutes exercise.

Bring to mind a person with whom you have a positive relationship, someone who you feel naturally warmly towards. This could be a child, a grandparent, a former teacher or mentor your cat or dog - whoever naturally brings happiness to your heart. Allowing yourself to feel what it's like to be in that being's presence (pause for 2 sec).

(Pause)

Holding this person in mind now extending best wishes towards them. Repeat softly with this person in mind:

May you be safe.

May you be peaceful.

May you be healthy.

May you live with ease.

(Pause)

May you be safe.

May you be peaceful.

May you be healthy.

May you live with ease.

(Pause)

When you notice that your mind has wandered, return to the words and the image of the loved one you have in mind. Savour any warm feelings that may arise. Go slow.

(Pause)

Now add yourself to your circle of good will. Put your hand over your heart and feel the warmth and gentle pressure of your hand (for just a moment or for the rest of the exercise), saying:

May I be safe.

May I be peaceful.

May I be healthy.

May I live with ease.

(Pause)

May I be safe.

May I be peaceful.

May I be healthy.

May I live with ease.

(Pause)

Holding your body in awareness, notice any stress or uneasiness that may be lingering within you, and offer kindness to yourself.

May I be safe.

May I be peaceful.

May I be healthy.

May I live with ease.

Repeat the phrases inwardly with enough space between them so that they are pleasing you. As best you can, gather all your attention behind one phrase at a time. (Pause)

If you find your attention wandering, don’t worry, that’s what minds do. You can simply let go of distractions and begin from here you are.

May I be safe.

May I be peaceful.

May I be healthy.

May I live with ease. (Pause)

Feelings, thoughts, or memories may come and go; allow them to arise and pass away. Let the anchor be the repetition of these phrases:

May I be safe.

May I be peaceful.

May I be healthy.

May I live with ease. (Pause)

Just rest and sit quietly in your own body, savouring the good will and compassion that flows naturally from your own heart. Know that you can return to the phrases anytime you wish.

(Pause for 15 sec)

(Pause, then end) Now, in your own time, slowly open eyes. The exercise is over.

Neutral Emotion Meditation

E. 2. Script for Control condition clip supermarket scenario

Sit in a comfortable position, reasonably upright and relaxed. (Pause) Close your eyes fully or partly. (Pause) You will now be guided through a few minutes exercise.

We would like you to think about a normal or routine supermarket scenario. Try to think of a particular time that you visit a supermarket to do a large or weekly shopping. (Pause)

Think about arriving at the supermarket (Pause for 2 sec). What time in the day is it (Pause). Is it in the late morning or early afternoon? How does the supermarket look like? (Pause for 2 sec) Think about why you are at the supermarket. (Pause)

How does it feels like being at the supermarket (Pause)

Try to feel the weather of that day. Is it could or warm? (Pause) Feel the temperature (Pause)

Do you have plenty of time to do the shopping or are you in a rush (Pause)?

You may select a trolley to store your items or a shopping basket? (Pause for 3 sec) See if it's possible to think about what the trolley or shopping basket looks like. (Pause for 3 sec)

Feel the texture of the trolley or the shopping basket (Pause)

Now think about entering the shop (Pause for 3 sec). Try to remember if you noticed anything special? (Pause for 3 sec) Is the shop quiet and empty or is it crowded? (Pause) Do you hear or see anything special (Pause for 3 sec) maybe a special offer (Pause for 3 sec).

What sounds do you hear? (Pause)

And now try to imagine which goods you come across first (Pause for 3 sec) Think about walking down the first aisle (Pause for 3 sec). Are there particular items you are looking for (Pause for 3 sec).

Play back what you were thinking in the situation. (Pause)

Now think about putting the items you need to buy into your trolley or shopping basket. (Pause for 3 sec) Think about going through the shop aisle by aisle … (Pause for 8 sec) see if it is possible to imagine the shopping as much detailed as possible (Pause for 5sec).

You might come across the fruit and vegetable section (Pause).

Is there any particular smell that you notice (Pause) try to focus on them (Pause)

Do you have problems to reach an item? (Pause for 3 sec) Do you have to reach up to a top shelf? (Pause for 3 sec) Do you have to weight an item (Pause for 3 sec)

Try to feel the items (Pause)

Do you notice something special (Pause for 3 sec) Or do you hear something special (Pause for 3 sec)

And now, think about going to the check-out/till to pay (Pause for 3 sec).

Think about putting your items out of the trolley or shopping basket (Pause for 3 sec).

Think about paying your purchases (Pause for 3 sec). Are you paying by card or cash? (Pause for 3 sec) Do you get some cash back (Pause for 3 sec).

Now think about putting your purchases back in the trolley or did you use a bag to carry them home? (Pause for 3 sec) Think about taking your purchases home (Pause for 3 sec)

(Pause, then end) Now, in your own time, slowly open eyes. The exercise is over.

Appendix D – Intrusion Diary

Participation Number……..

Date Started……. Date Completed…….

Instructions

Scales

- Please mark on the scale how you are feeling on that day

Diary

- If over the next week you experience any spontaneous occurring intrusions/memories about the film you have just watched in the laboratory sessions, we would be grateful if you could note then down in the diary.
- Note that this is only for intrusions/memories that pop into your mind spontaneous, not times when you deliberately think about it.
- What goes through our minds can either take the form of words or phrases (verbal thoughts), or it can be like mental pictures (images). Although mental images often take the form of pictures that can actually include any of the five senses so you can imagine sounds too.
- For each intrusion, mark I, T or S. Or a combination of the three e.g. (IS or ITS). Please also write down the corresponding time, or write down that you had had zero in the time frame and the fill in the details.
- If you are on occasion unable to record details, please make sure you record that any intrusion has occurred and the date.

Day 1. Scales		
I don't feel distressed at all	0 ----------100	I feel very distressed
I am feeling like not criticising myself at	0 ----------100	I am feeling like criticising myself very much
I am feeling like not being kind and understanding towards myself at all	0 ----------100	I am feeling like being very kind and understanding towards myself

Day 1. Diary			
Was it a thought (T), an image (I), a sound (S)	What was the content of the intrusion ? i.e. what popped into your mind ?	Did anything trigger the intrusion	How distressed did you feel on a scale of 0 (not distressed at all) to 100 (extremely distressed)
Image	*Image of the car accident*	*Walking to university*	*50*

If you run out of space please continue on another sheet

Appendix E

Power Calculation. For hypothesis one estimations were performed for a series of independent t-tests for self-reported distress, self-criticism and self-compassion (*d*= .8), assuming a large statistical power (*d* = .1, α = .05) and assuming high correlations (*r* = .8) based on the research by Kirschner (2016) between measurement time points. From these calculations it was found that required final sample size was 44. For hypothesis two, previous research found effect sizes (average, *d*=.8) for the effect of compassion-facilitating meditation type (i.e. LKM) vs neutral on self-reported state self-compassion and physiological change responses (Kirschner, 2016, study 1) in a 2x2 analysis of variance revealing a required sample size of 66 . For hypothesis three however, the effect of compassion meditation on stress recovery and intrusions are not yet well understood. Holmes, James, Kilford, & Deeprose (2012) found a medium effect group difference (*d*=.70) for comparing intrusions across seven days after two different post-trauma film cognitive interventions. Assuming a similar effect size, power calculation for an independent t-test (*d*=.8, α= .05) revealed that 68 + 10% diary attrition rate (*n*=74) participants are required for hypothesis three. As the sample size for hypothesis one was the largest it was found sufficient to answer both hypothesis two and three.

Table 5.
Power estimations for each hypothesis

Hypothesis	Measure/DV	Required sample size	Analysis
Hypothesis 1	Self –report distress, self-compassion and self-criticism (VAS) immediately post-experiment and post seven days	44	2x1 ANOVA
Hypothesis 2	Mean HR,SC and HRV at pre-film post-film (T1) and post LKM/neutral (T2) per group	66	2x2 ANOVA
Hypothesis 3	Between group mean difference in intrusions over seven days post experiment.	74*	T-Test

*post film = pre LKM/neutral; including 10% attrition by dropout/non-completion

Appendix F Trait measures by group

Table 6.
Trait measures by group

Trait Measure	Group Condition	Mean	Standard Deviation	T Statistic	Significance (2 tailed)
Age	NEM	20.28	4.28	-3.23	.75
	CFM	20.28	4.48		
Emotional Regulation (ERQ)					
Cognitive Reappraisal	NEM	30.66	4.30	0.72	.48
	CFM	29.94	4.22		
Expressional Suppression	NEM	12.19	4.49	-3.76	.71
	CFM	12.61	4.89		
Total	NEM	42.86	5.28	0.21	.83
	CFM	42.55	6.84		
Experiential Avoidance (AAQ-II)					
	NEM	21.27	6.14	1.31	.19
	CFM	19.22	7.11		
Self-compassion (SCS)					
Self-kindness	NEM	16.38	4.10	0.24	.81
	CFM	16.16	3.64		
Self-judgment	NEM	14.77	3.73	0.75	.46
	CFM	14.13	3.48		
Common humanity	NEM	13.00	3.68	-0.20	.84
	CFM	13.16	3.45		
Isolation	NEM	12.88	3.43	0.04	.97
	CFM	12.86	3.22		
Mindfulness	NEM	13.75	3.42	-0.26	.79
	CFM	13.94	2.83		
Over-identification	NEM	12.19	3.04	-0.75	.46
	CFM	12.77	3.56		
Total SCS	NEM	83.00	12.19	0.25	.98
	CFM	83.05	10.93		

Appendix G: Dissemination statement

The results of this study will be disseminated to interested parties through feedback, journal publication and presentation. Participants will be informed of the results of the study. Participants will be provided with details of who to contact, should they require further information. Both the literature review and empirical paper will be written up for publication and submitted to the appropriate journals (Clinical Psychology Review and the Journal of Traumatic Stress, respectively).

http://onlinelibrary.wiley.com/store/10.1002/(ISSN)1573-6598/asset/homepages/JTS_Author_Guidelines_1.pdf?v=1&s=6f26411953c196e8cbf4a7eabbeb2645a58d5b42&isAguDoi=false

In June 2017, the research findings were presented to an academic audience, for peer review, as part of the Doctorate in Clinical Psychology at the University of Exeter.