



LITERATURE REVIEW: How are Self-Compassion, Self-Criticism and Self-Blame, Related to Executive Function Skills: A Systematic Review
EMPIRICAL PAPER: Skills for Self-Compassion After Trauma: The Role of Executive Function

Submitted by Tamsin Miles, to the University of Exeter
as a thesis for the degree of Doctor of Clinical Psychology, May 2020

This thesis is available for Library use on the understanding that it is copyright material and that no quotation from the thesis may be published without proper acknowledgement.

I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

Signature:

Author's Declaration

Tamsin Miles completed the literature review independently. For the empirical paper, all of the data collection was completed by Tamsin Miles. One of the neuropsychological test measures used (the BRIEF) was partially scored by Lara O'Connor, an undergraduate student at Exeter University, from anonymised data. The analyses and the write-up of the empirical paper were completed independently by Tamsin Miles

List of Tables	6
Literature Review	6
Empirical Paper	6
List of Figures	6
Literature Review	6
LITERATURE REVIEW	7
Abstract	8
Introduction	10
Self-Compassion	10
Self-Compassion, Self-Criticism and Self-Blame	11
Executive Function	14
Evidence of Links Between Self-compassion and Executive Function	17
Objectives	18
Research Question:	19
Methods	19
Protocol	19
Eligibility Criteria	19
Information sources	22
Search Strategy	22
Data collection process	23
Data Items and Measures	24
Risk of Bias within studies	24
Results	25
Screening	26
Included	26
Eligibility	26
Identification	26
Characteristics of Included Studies	27
Synthesis of results	34
Association between levels of Self-Compassion and Executive Function	34
Association between measures of self-criticism and Executive Function.	35
Association Between Measures of Self-Blame and Executive Function.	38
Discussion	39
Summary of Evidence	39
Implications	45
Limitations and Strengths	46
Conclusions	47
References	49
Appendix A	71
Quality Assessment Tool for Quantitative Studies	71
Appendix B	75
Quality Assessment Tool for Quantitative Studies Dictionary	75
Appendix C	80

Preparation Guidelines for The Journal of Positive Psychology .	80
EMPIRICAL PAPER.....	82
Introduction	85
Self-Compassion as a Protective Factor for PTSD.....	86
The Role of Executive Function in PTSD.....	88
PTSD Treatment approaches.....	90
Compassion Focused Interventions	93
The Association Between PTSD Severity, Self-Compassion and	
Executive Function.....	95
Aims and Hypotheses	96
Research Questions (RQ).....	97
Method	97
Design.....	98
Participants.....	98
Power calculation.....	100
Ethical Approval.....	100
Measures and Materials	100
Screening measures.....	100
Trait Self Compassion.....	101
Measures of Executive Function.....	101
Measure of posttraumatic stress symptoms.....	103
Measures of state levels of self-compassion.....	103
Compassion Induction	104
Procedure	104
Data Analysis	105
Results	106
Preliminary Analyses.....	106
Manipulation Checks.....	106
Hypotheses Testing.....	107
Additional Preliminary Analysis.....	110
Discussion.....	111
Self-Compassion and PTSD.....	111
Executive Function and PTSD.....	113
Self-Compassion, Executive Function and PTSD Symptoms	116
Limitations and Strengths.....	118
Implications	120
References.....	125
Appendix A	154
Ethics Approval.....	154
Appendix B	155
Information and consent forms	155
Appendix C	158
Additional Protocol and Consent Forms for Remote Data	
Collection	158
Appendix D	161
Participant Debrief Sheet	161

Appendix E	162
LEC-5 Sample.....	162
Appendix F	163
PCL-5 Sample.....	163
Appendix G.....	165
Additional Correlation Analysis	165
Appendix H.....	166
Preparation Guidelines for the Journal of Traumatic Stress.....	166

List of Tables

Literature Review

Table 1. Inclusion and Exclusion Criteria for Eligibility in Systematic Literature Review

Table 2. Search Terms Used

Table 3. Summary of Papers Included

Table 4. Summary of Findings

Empirical Paper

Table 1. Participant Descriptive Statistics

Table 2. Zero Order Correlations (Spearman's ρ Coefficients)

List of Figures

Literature Review

Figure 1. Results of literature search strategy and screening based on PRISMA protocol (adapted from Moher et al., 2009).

SCHOOL OF PSYCHOLOGY
DOCTORATE IN CLINICAL PSYCHOLOGY

LITERATURE REVIEW

**How are Self-Compassion, Self-Criticism and Self-Blame, Related to
Executive Function Skills: A Systematic Review**

Trainee Name: **Tamsin Miles**

Primary Research Supervisor: **Dr Anke Karl**
Associate Professor & Group Lead, Clinical
Psychology Research Group, Mood
Disorders Centre, University of Exeter

Secondary Research Supervisor: **Dr Alicia Smith**
Research Tutor, Clinical Psychology
Doctorate Programme, University of Exeter

Target Journal: Journal of Positive Psychology

Word Count: 5995 words (excluding abstract, table of
contents, list of figures, tables, references,
footnotes, appendices)

**Submitted in partial fulfilment of requirements for the Doctorate Degree
in Clinical Psychology, University of Exeter**

Abstract

Objective: Self-compassion is associated with greater well-being and happiness and reduced symptoms of psychological distress. Negative self-compassion such as self-criticism, has the opposite effect. Having higher self-compassion involves the use of a range of emotion regulation strategies, including aspects of cognitive and attentional control. Executive function (EF) describe skills involved in these 'higher order' or supervisory cognitive processes such as the ability to shift attention, inhibit automatic responses and use working memory (WM). Research to date has shown that interventions either self-compassion or EF skills can result in improvements to the other. To explore the association between these two variables, this systematic review collated studies that measured the relationship between EF and self-compassion, self-criticism and self-blame.

Method: Studies that measured self-compassion, self-criticism or self-blame, and assessed EF skills in adults, were selected from a number of databases, both multidisciplinary and subject-specific, prior to 1st April 2020. The search strategy provided 183 results, 128 after duplicates were removed. Full text screening of 39 studies led to the inclusion of seven papers for this review.

Results: Results provided partial support for the association of WM with self-criticism, but no confirmed support for the association of self-compassion, self-criticism or self-blame with other aspects of EF. Results were not conclusive due to the lack of quality research.

Conclusions: There is scant support at present for the association of levels of self-compassion, self-criticism or self-blame, with EF skills, however there is also little quality support for the lack of a relationship between them. Further research would be needed to address what appears to be a gap in the evidence base.

Keywords: *self-compassion, self-criticism, self-blame, executive function, systematic review*

Introduction

This review explores the association between self-compassion, including its counterparts self-criticism and self-blame, and levels of executive function (EF) in adults. There is emerging evidence that high levels of self-criticism and impaired EF could help psychological disorders such as Posttraumatic Stress Disorder (PTSD) and affect how individuals benefit from psychological interventions to address these disorders. Despite this, little has been written about any connections between the two sets of skills. Existing research suggests that interventions targeting self-compassion can increase EF skills, and vice versa. Models of self-compassion and self-regulation refer to the use of skills that would be considered part of EF. To date, however, there has not been a systematic review to test the available evidence of this association. This systematic review will therefore address this gap by examining the available evidence regarding the association of EF skills to levels of self-compassion, self-criticism and self-blame.

Self-Compassion

Self-compassion, although based on ancient Buddhist traditions, has only been a recognised term in the West in relatively recent times. According to Neff (2003), it incorporates a balanced awareness of painful thoughts and feelings, alongside a desire to ease suffering. Self-compassion is not separated from a wider view of compassion, but incorporates the same

concerns for the self as for others, in that all are equally worthy of the same compassion (Neff, 2003). Vettese, Dyer, Li and Wekerle (2011) describe self-compassion as a strategy to help regulate the impact of negative emotions concerning the self.

It is perhaps not surprising, that self-compassion has been associated with increased well-being (Bluth & Blanton, 2014; Jeon, Lee & Kwon, 2016; Neff & McGehee, 2010). A meta-analysis of 79 studies comparing the two concepts concluded there was a medium to large and significant correlation (Zessin, Dickhauser & Garbade, 2015). Associations have been found between measures of self-compassion and happiness, optimism and positive affect (Neff, Rude & Kirkpatrick, 2007) and negatively with negative affect (Reis et al., 2015) while also mediating the effect of negative emotions on psychopathology (Trompetter, de Kleine & Bohmeijer, 2017).

Self-Compassion, Self-Criticism and Self-Blame

When reviewing the concept of self-compassion, there are a number of antonyms that are worth including. Neff (2003) defined self-compassion as treating oneself kindly, without self-criticism or self-judgment. Research has since provided support for a number of terms being useful to represent such an absence of self-compassion. High self-blame was negatively correlated with self-compassion ($r = -0.48$) and within the model used, was predictive of self-compassion levels (Erb, 2016), these results were supported by similar studies (Hamrick & Owens, 2018; Petrocchi, Ottaviani & Couyoumdjian, 2014; Terry & Leary, 2011). Self-criticism was also found to have a significant negative correlation with self-compassion (Ehret, Joormann & Berking, 2015; Joeng & Turner, 2015; Neff, 2016), particularly when related to internalised

self-criticism ($r = -0.575$; Joeng & Turner, 2015). These constructs have also demonstrated similar levels of association (in the other direction) with mental health difficulties as self-compassion (Gilbert & Irons, 2009).

There is evidence to suggest that higher levels of self-compassion have been associated with reduced depression and symptoms associated with trauma (Hamrick & Owens, 2018; Kuyken et al, 2010). Early childhood experiences can contribute to a person's sense of self-compassion (Farnsworth, Mannon, Sewell, Connolly, & Murrell, 2016; Raque-Bogdan, Ericson, Jackson, Martin, & Bryan, 2011) with abuse and neglect reducing future levels (Tanaka, Wekerle, Schmuck, Paglia-Boak, & the MAP Research team, 2011) which can itself lead to increased psychological distress (Macbeth & Gumley, 2012).

Further evidence suggests that higher levels of self-compassion can protect against the negative longer-term effect of trauma (Seligowski, Miron, & Orcutt, 2015; Thompson & Waltz, 2008) and adverse childhood experiences (Van Dam, Sheppard, Forsyth, & Earlywine, 2010; Vettese et al., 2011). When trauma related difficulties are experienced, research has suggested that higher levels of self-compassion are both associated with lower experience of symptoms (Barlow, Goldsmith, Turow, & Gerhart, 2017; Maheux & Price, 2015; Palgi, Klein, & Shamay Tsoory, 2016), and a reduced reliance on unhelpful maintaining behaviours such as avoidance (Thompson & Waltz, 2008). Levels of self-compassion also predicted emotional and cognitive responses to negatively perceived events (Leary, Tate, Adams, Allen, & Hancock, 2007). In addition, higher levels of self-compassion may buffer the effect of symptoms of

PTSD on overall quality of life (Meyer et al., 2018; Seligowski et al., 2015). Higher levels of self-compassion have also led to improved outcomes during treatment for mental health difficulties at both an individual session and overall treatment level (Galili-Weinstock et al., 2018).

In summary, there is evidence to support the value of self-compassion in maintaining well-being, protecting against the effects of traumatic experiences, and in supporting recovery from difficulties.

There are signs that those with higher self-compassion are better able to regulate their emotions and behaviours (Inwood & Ferrari, 2018; Posner & Rothbart, 2009). One proposed mechanism is that self-compassion contributes to overall well-being through supporting the management of emotions and enabling constructive decision-making (Terry & Leary, 2011). Higher self-compassion may enable people to deploy effective strategies to support themselves in times of difficulty.

Gilbert's (2010) theory of affect regulation systems could provide a model to help explain this. Gilbert (2010) proposes that there are three systems regulating affect and behaviour within the body. The drive system enables goal directed behaviour and rewards achievement, the soothing system promotes calm, compassion and connectedness with others while the third, threat response system, provides more automatic protective responses to perceived threats. This last system can also be highly associated with self-criticism, shame and increased vulnerability to anxiety and depression (Gilbert & Irons, 2009). While the threat system is overactive, the body aims to protect first and think later – "Better safe than sorry", (Gilbert, 1998, p.450). When an

individual is affected by high levels of self-criticism or internally generated fear or anxiety, increasing compassion towards the self requires conscious effort. Cognitive control is needed to disengage from the sense of threat being generated internally in order to promote a more caring and encouraging voice (Gilbert, 2010).

Karatzias et al. (2017) concluded that difficulties shifting towards a compassionate voice may be associated with a disturbance in self-organisation, something associated with more complex presentations of post-traumatic stress disorder (PTSD). A disturbance in self-organisation describes difficulties with emotion regulation, negative self-concept, and with relationships. Low levels of self-compassion were also related to emotion regulation difficulties in non-clinical populations (Finlay-Jones, Rees & Kane, 2015). The ability to self-regulate emotions and behaviour is associated with both the effortful control of attention and the ability to follow plans for goal directed behaviour (Posner & Rothbart, 2009).

Executive Function

Executive function (EF) has been defined as higher order or supervisory cognitive processes that enable us to regulate both our behaviour and thought processes (Alvarez & Emory, 2006; Roebbers, 2017). EF plays an important role in enabling strategies for emotional regulation (Khanna et al., 2017; Scult, Knodt, Swartz, Brigid, & Hariri, 2017).

Specific elements of EF purported to be involved in emotion regulation include working memory (WM), response inhibition, and attention switching or shifting

(Schmeichel & Tang, 2015; van der Horn, Liemburg, Aleman, Spikman, & van der Naalt, 2016). McRae and Gross (2020) suggest that these may have different roles in modulating emotional responses to (inhibition), and redirecting attention from (attention shift), negative emotional experiences, followed by cognitive strategies to reappraise the experience (WM).

Specific brain regions associated with EF skills include sub regions of the prefrontal cortex and the anterior cingulate cortex (Aupperle, Melrose, Stein & Paulus, 2012; Fenster et al., 2018).

There is evidence that the ability to focus and control where we guide our attention improves wellbeing (Miklosi, Martos, Szabo, Kocsis-Bogar, & Forinto, 2014; Miley & Spinella, 2006; Moffitt et al., 2011; Short, Mazmanian, Oinonen, & Mushquash, 2016; Zylowksa, Smalley, & Schwartz, 2009). EF performance test measures that have associated lower EF skills with reduced wellbeing include: the Stroop test of response inhibition (Lippa & Davis, 2010; Tan & Rossell, 2014); the Trail making test (Mitchell & Miller, 2008; Swanson, 2005; Wagner, Helmreich, Dahmen, Lieb, & Tadić, 2011); and the digit span test for working memory (Bridgett et al., 2013). Self-report measures have also demonstrated associations between EF difficulties and lower wellbeing, asking questions related to behavioural aspects of EF e.g. self-organisation, impulsivity and goal related behaviour (Miley & Spinella, 2006; Toplak, Bucciarelli, Jain, & Tannock, 2013).

Performance measures (Bernstein, Heeren, & McNally, 2017; Tang, Yang, Leve, & Harold, 2012; Tchanturia et al., 2012; Treasure & Schmidt, 2013) and self-report measures (Miklosi et al., 2014; Miley & Spinella, 2006; Ogilvie, Stewart, Chan, & Shum, 2011) of EF have been associated with a range of

problems including: anxiety, depression, anti-social behaviour and increased drug misuse (Moffitt et al., 2011; Tang et al., 2012).

Studies investigating the relationship between EF skills and psychological outcomes of therapy for trauma and addiction, have found that improved outcomes were associated with higher levels of EF at the outset of the programme (Alvarez-Moya et al., 2011; Lee & DePrince, 2017; Noel et al., 2002; Morgenstern & Bates, 1999). Additional studies found that EF skills also improved following a psychological intervention for trauma (Alvarez-Moya et al., 2011) and were associated with symptom improvement (Crocker et al., 2018; Mozzambani et al., 2017).

A decreased ability to allocate attention and inhibit responses affecting the regulation of emotion, was also found to impact drop-out rates for trauma therapy, as well as psychological outcomes (Crocker et al., 2018; Fonzo et al., 2017; Haaland, Sadek, Keller, & Castillo, 2016).

Researchers have investigated whether interventions aimed at increasing EF might also be able to improve wellbeing measures. Attention training programmes have demonstrated improvements in symptoms of anxiety (Amir, Beard, Burns, & Bomyea, 2009) and intrusive thoughts associated with trauma (Callinan, Johnson, & Wells, 2015). In addition, exercises to increase control of attention are incorporated into some of the third wave of Cognitive Behavioural Therapy (CBT) approaches (Hayes, Villatte, Levin, & Hildebrandt, 2011; Neff & Tirch, 2013). It has also been noticed that interventions targeting improvement in levels of self-compassion have noticed improvements in measures of EF alongside wellbeing measures (de Bruin, van der Zwan, & Bogels, 2016; Hunsinger, Livingston, & Isbell, 2013; Kozasa et al., 2015).

Evidence suggests that changes in self-compassion might be associated with changes in EF, however the relationship between self-compassion and EF is unclear.

Evidence of Links Between Self-compassion and Executive Function

It would seem that both self-compassion and EF support effective emotional regulation and there is some evidence that self-compassion facilitating interventions can improve levels of EF and vice versa (Haukaas, Gjerde, Varting, Hallan & Solem, 2018).

Masicampo and Baumeister (2007) suggest that self-control, in any form, is a muscle to be trained. They argue that once trained in one area: such as mindfulness practice or a specific physical exercise regime; the skill can be used elsewhere for example in enhanced self-regulation associated with emotions or inter-personal relationships. Many different training approaches involve careful attention to a specific task and the regulation of both thoughts and behaviour (Masicampo & Baumeister, 2007). The implication of this is that it would be helpful to find the most accessible and acceptable “training” approach for an individual to use. As such, regular practice would work to improve self-regulation and provoke broad improvements (Baumeister, Gailliot, deWall, & Oaten, 2006).

There are a number of studies that looked at brain activation levels during or following a programme of self-compassion related meditation. Many have indicated an increased utilisation of brain areas associated with EF (Fox et al., 2016; Wang et al, 2019). Are the same muscles being worked in both processes?

If this is the case, understanding how interventions targeting either EF or self-compassion may have benefit for both areas, could increase patient choice and enable a wider range of people to be supported. However, it would appear that relatively little is understood about this relationship, particularly in terms of accessible measures of specific EF skills, such as performance related tests or self-report measures.

To date, no literature review has been published to evaluate the relationship between EF and self-compassion. Understanding what is already known and the quality of the existing evidence base, would provide direction for future research. Such future research could have practical benefits for the provision of interventions to improve well-being across a range of mental health difficulties.

Objectives

There is evidence that certain interventions have simultaneously led to improvements in both self-compassion and EF. In addition, similar brain regions have been found to be activated in practices addressing both areas. What is not clear, is the degree to which levels of these two are associated in practice, for example how demonstrated skill levels in EF are associated with experienced levels of self-compassion. The aim of this review is to investigate how levels of self-compassion, self-criticism and self-blame are related to EF difficulties.

Research Question: How are levels of self-compassion, self-criticism and self-blame related to EF difficulties?

Methods

Protocol

The aim of a systematic review of literature is to use a consistent, repeatable and rigorous approach to examining the available evidence on a specific research question. It requires a systematic and clearly defined methodology to identify, assess and synthesise available literature according to a defined set of criteria (National Institute for Health and Clinical Excellence, 2013).

Accordingly, this review followed the Preferred Reporting Items for Systematic Review and Meta-analysis Protocol (PRISMA-P) in order to search, screen, review and summarise the studies available (Moher, Liberati, Tetzlaff, & Altman, 2009).

Eligibility Criteria

The search and inclusion criteria followed population, exposure, comparator, outcome and study design (PECOS) criteria as outlined in Table 1. The review focuses on adult samples considering that EF is a skill that continues developing beyond adulthood (Blakemore & Choudhury, 2006).

Table 1*Inclusion and Exclusion Criteria for Eligibility for Systematic Literature Review*

	PECOS Criteria	
	Included	Excluded
Population	Adults aged 18 and above, with or without evidence of mental health difficulties	Children aged less than 18
Exposure	Measures evaluating levels of self-compassion or self-criticism. Can include interventions regarding self-compassion	Measures of compassion / criticism not directly related to the self. Intervention studies where levels of self-compassion etc. not explicitly measured
Comparator	Levels of EF as measured by performance based assessment / tasks or self reported ability related to EF (attention control, inhibition, working memory)	Assessments that only measure brain activity and not demonstrated or reported ability
Outcomes	Associations in levels of self compassion and/or EF measures as they relate to one another, whether single point correlations or intervention related changes.	Outcomes of self-compassion or EF not compared with one another
Study	Published papers of quantitative studies. Including mixed methods, experimental, naturalistic, correlational, & small scale studies	Qualitative, discussion / opinion, conference abstracts, review articles, editorials, papers with no English translation available

The concept of self-compassion was operationalized to include exposure to measures of its antonyms, such as self-criticism (Falconer et al., 2014; Neff,

2016) and self-blame (Erb, 2016; Hamrick, & Owens, 2018). As a self-compassion related meditation (Kirschner et al., 2019), the phrase “Loving Kindness Meditation”, and associated terms, were also included. Some studies included interventions specifically intended to increase self-compassion levels, however they were only included if levels of self-compassion etc. were measured explicitly.

Executive Function was operationalized to include assessment measures of both performance-based tests of EF skills and self-report measures.

Performance tests included measures of working memory; attention control; and inhibition control. Self-report measures included any measure reported to investigate behavioural aspects of EF and included measures such as the Behavioural Rating of Executive Function (Roth, Isquith, & Gioia, 2005).

Studies that only measured activation in regions of the brain commonly associated with EF were excluded. This was due in part to there not being a single specific region or network of regions solely associated with each function (Alvarez & Emory, 2006; Baddeley, 1998; Baddeley & Wilson, 1988; Chan, Shum, Touloupoulou, & Chen, 2008) and also due to there not necessarily being a correlation between activation levels and actual or perceived performance (Lippelt, Hommel & Colzato, 2014).

In order to understand the relationships observed between self-compassion and EF constructs, outcomes were operationalized as direct associations of the two measures; correlations between levels of EF and self-compassion, or correlations between changes in either or both.

Eligible studies were therefore required to be quantitative in design (at least in part) and could be experimental, cross-sectional and/or longitudinal in design. Published peer review papers and unpublished studies could be included.

Information sources

The primary source of studies was an electronic search using Ovid, including multidisciplinary databases in addition to subject specific databases.

Databases included in the core search were: PsycArticles, EMBASE, Ovid Medline, PsycINFO and Social Policy and Practice. Additional searches were conducted using Web of Science, Open Thesis and Electronic Thesis Online System (EThOS), Grey Literature Report, and the UK Clinical Research Network Portfolio Database. This search was last completed on 1st April 2020 and all publication dates were included up until that date.

Search Strategy

An initial scoping review was completed in order to identify key search terms to include. Due to the relatively low number of studies in this field, a full-text search was conducted in order to help identify additional terms, as well as using key words from relevant target publications and critical reviews.

Truncations * were used to ensure different spellings of words or phrases were captured, although in some cases multiple terms were used to catch all.

Boolean operators combined the search terms; using 'OR' within category and

'AND' to combine categories. The complete list of search terms used is documents in Table 2.

Table 2

Search Terms Used

	Category 1 Self-compassion and its antonyms combined with "OR"	Category 2 Executive Function terms combined with "OR"
Individual search terms (in title or abstract)	"*compassion*" "kindness*based" "loving kindness" "LKM" "self*criticism" "self*blame" "self*judgement"	"executive function*" "executive control" "cognitive control" "dysexecutive" "inhibitory control" "cognitive flexibility" "attention*flexibility" "central executive network" "attention*control" "central executive network" "Working Memory"
Search: Category 1 and Category 2 combined with "AND"		

Note: LKM = Loving Kindness Meditation

Data collection process

Initial screening of articles was based on title and abstract. In many cases this highlighted where self-compassion and EF measures were included (Exposure and Comparator factors) whereas their relationship (Outcome) might not be reported within the Abstract.

Following screening, full texts were reviewed against the inclusion and exclusion criteria. An independent reviewer assessed a random selection of 6

papers using the PECOS criteria. There was total consistency in the papers judged to meet the PECOS criteria, giving a Kappa value of $\kappa = 1$.

All included papers had their reference lists scrutinised for additional papers.

Data Items and Measures

The variables to be included for analysis included scores on measures of EF and self-compassion, self-criticism or self-blame. The EF measures include scores from EF tests including working memory, inhibition and switching/shift as well as self-report EF questionnaires. Self-compassion, self-criticism and self-blame are to be assessed by varying self-report measures explicitly asking about at least one of these items such as Neff's 2003 Self-Compassion Scale (SCS).

Specific statistics to be included were correlation coefficients of the relationship between levels of EF and self-compassion and /or multiple regression coefficients showing the predictive power of EF over self-compassion, or of self-compassion over EF.

Risk of Bias within studies

According to Cochrane guidelines, bias within systematic reviews can result from both bias from the original study, and also in the inclusion, appraisal and synthesis of such studies by the reviewer (Chandler, Cumpston, Li, Page, & Welch, 2019). It is therefore critical that an appropriate methodology or tool is adopted to consistently assess each study included.

The Quality Assessment Tool for Quantitative Studies (QAT) from the Effective Public Health Project (Armijo-Olivo, Stiles, Hagen, Biondo, &

Cummings, 2012; Appendix A-B) was selected to appraise the papers included in this review for the breadth of its areas for assessment, as well and the clear guidelines provided.

An independent reviewer rated a random selection of three included studies using the QAT tool. Global ratings using QAT had 100% compliance, giving a Kappa value of $\kappa = 1$.

Results

Combining search results from online databases and reference list searches, a total of 183 papers were identified (Figure 1). After removing duplicates and review papers, 133 papers were screened at abstract level using PECOS criteria. Following this, 39 studies were subjected to a full-text review. Seven papers met the inclusion criteria and were assessed using the QAT quality assessment protocol.

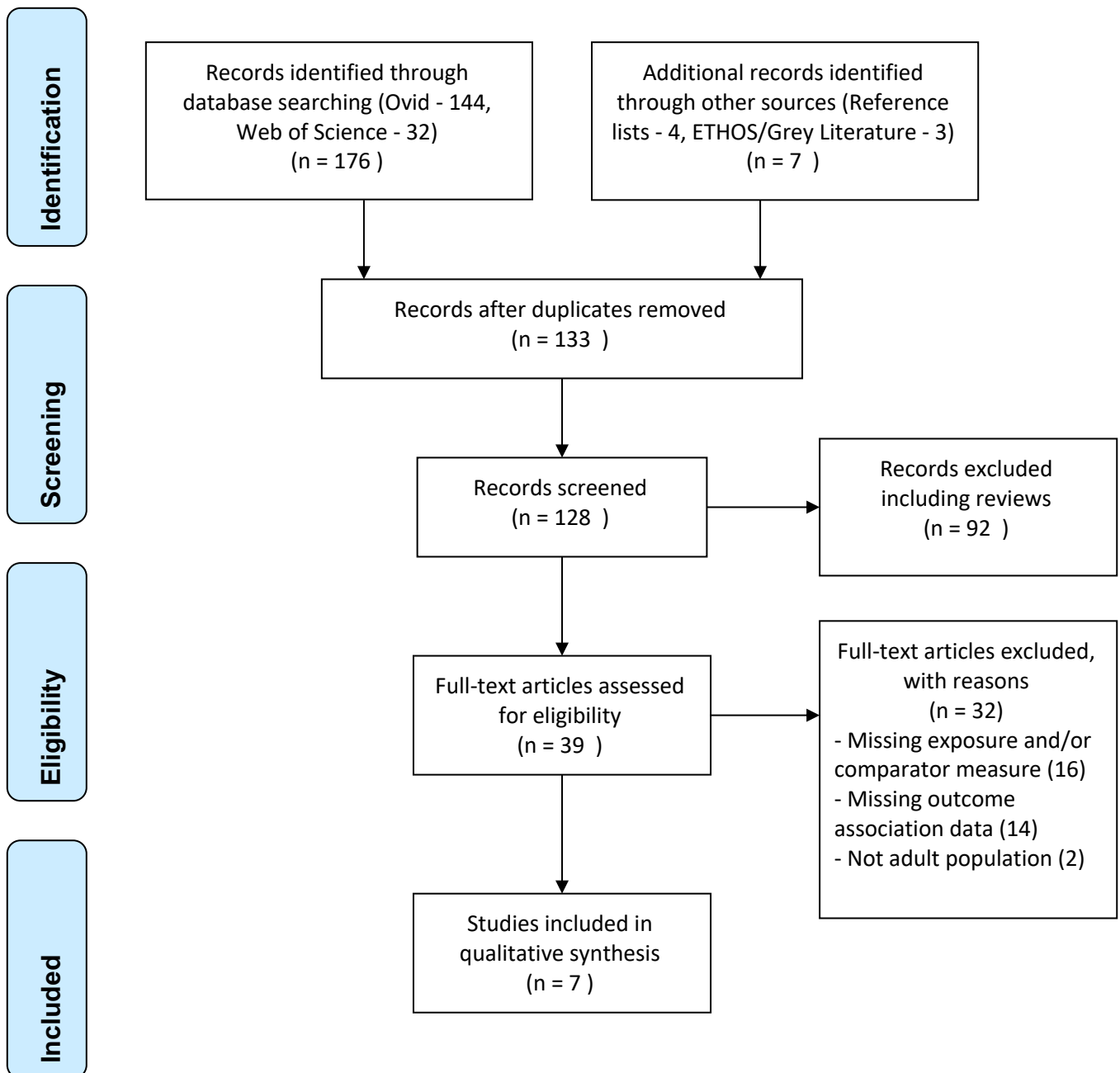


Figure 1

Results of literature search strategy and eligibility screening. Flowchart is based on PRISMA protocol (adapted from Moher et al., 2009)

Characteristics of Included Studies

Study designs (S). The papers found in the search included 4 cross-sectional designs (Studies 1, 5, 6 & 7, Table 3). One study (4) used a case control design. The remainder (Studies 2 & 3) used a controlled clinical trial design.

Participants (P). Three studies recruited healthy adult participants through academic institutions (studies 2, 3 & 5). Study 7 recruited healthy adult participants through a state managed research registry of twins. One study (study 4) used a matched control approach, and indicated this was a community recruitment approach but there was no additional recruitment information provided. The remaining two studies (1 & 6) provided very little information about the sample recruitment approach uses.

Exposure (E). Only one study (study 4) measured self-compassion using the SCS. Two studies used a validated scale for self-criticism (2 & 3), others used a broader scale that included a sub-scale for self-criticism (studies 5 & 7) or self-blame (study 6). Study 1 used a single question related to self-criticism levels.

Comparator (C). EF constructs measured included WM, attention control and inhibition as well as broad self-report measures. Study 5 included measures of all these, while the others included a subset. There was very limited consistency in the measures used across the studies and there can be difficulties with reliability and validity with many measures used (Crawford, Sutherland, & Garthwaite, 2008; Parsons Carlew, Magtoto, & Stonecipher, 2017; Strauss, Sherman, & Spreen, 2006)

Outcome (O). Analysis focussed on correlations and multiple regression to identify the degree to which different factors predicted others.

Quality of included studies. Concerns have been raised regarding the appropriate quality assessment of cross-sectional studies in Systematic Reviews (Mallen, Peat, & Croft, 2006). Analysis of the studies using the QAT method indicated a weak quality in 6/7 of the studies (Studies 1, 2, 3, 5, 6 & 7). Common issues within these studies included being a cross-sectional design (Studies 1, 5, 6 & 7) and poor reporting of participant recruitment approaches and sample characteristics (studies 1 & 6). All studies except number 7 appeared to recruit through a self-referral approach with studies 2 and 3 requiring participants to volunteer for a fee or course credit, in this way, selection bias could not be eradicated.

Table 3.*Summary of Papers Included*

Study (Population)	Exposure	Comparator	Outcome	Key Findings	Results and Effect Sizes	Evaluation	QAT Ratings
1. Bernstein, Heeren, McNally, 2017, USA (91 adults Aged 18-39, f-52, m-39)	Self-criticism question (single)	n-back test of working memory, IST, emotional flanker	Self-criticism associated with n-back & IST	Key Findings: only working memory was significantly associated with increased self-criticism although self-criticism predicted negativity which in turn predicted shift test performance. Conclusion: Support for link between WM and self-criticism and also potentially shift. No support for association of inhibition.	Correlations: small-to-medium correlations for n-back and self-criticism level $r = -0.21, p < 0.05$ IST and self-criticism $r = 0.19, p < 0.1$	Strengths: range of EF measures used & reported, reasonable sample size. Good reporting of correlations and networked view. Limitations: single self-report question for self-criticism.	Weak
2. Lueke & Rubinow, 2019, USA (80 college age adults – all male)	LOSC	WM measures - A-OSPAN	Correlations and interactions between WM/ Self-crit / and feedback condition	Key Findings: Following negative feedback, WM performance was associated with levels of self-criticism. Higher levels of self-criticism predicted decreases in WM performance following negative feedback. Conclusion: an association between WM and self-criticism was supported, when mediated by feedback.	Correlations: medium to large correlations for WM score & self-criticism in failure condition $r = -0.44, p < 0.004$ Predictive value of Self-Crit on WM $F(4,75) = 16.16, p = 0.004, R^2 = 0.46$	Strengths: Clear protocol & analysis. Measures strong. Reasonable sample size. Limitations: Participant bias, Randomising protocol not specified. Statistics inconsistent between studies	Weak

Study (Population)	Exposure	Comparator	Outcome	Key Findings	Results Reported and Effect Sizes	Evaluation	Total QAT Ratings
<p>3. Lueke & Skeel, 2017, USA (218 college age adults – all female)</p>	<p>LOSC</p>	<p>WM measures - A-OSPAN</p>	<p>Correlations and interactions between WM/ Self-crit / and feedback condition</p>	<p>Key Findings: Significant 3-way interaction between Self-crit, FB and WM. Significant main effect of self-criticism. For people with moderate or high levels of self-criticism, feedback significantly influenced WM performance. Higher levels of self-criticism accompanied by failure feedback, led to increased WM performance. Conclusion: Association between self-criticism and WM is supported, particularly when mediated by feedback.</p>	<p>Correlations: Small sized main effect of WM score and self-crit level $F(2,212) = 3.68, p < 0.03$, Partial eta sq = 0.03 Medium sized 3-way interaction between WM, feedback condition & self-criticism $F(2,212) = 9.5, p < 0.001$, Partial eta sq = 0.08</p>	<p>Strengths: Clear protocol & analysis. Measures strong. Large sample size. Limitations: Participant bias. Randomising protocol not specified. Reported stats inconsistent between the paired studies</p>	<p>Weak</p>

Study (Population)	Exposure	Comparator	Outcome	Key Findings	Results Reported and Effect Sizes	Evaluation	Total QAT Rating
<p>4. Moadab, 2013, USA (46 adults Mean age 46.71, SD 17.50 f-23, m-23)</p>	SCS-SF	<p>ATQ-SF subscales & modified flanker test - plus imaging measures</p>	<p>Correlations between SCS & ATQ. Elements mediating impact of self-kindness on imaging measures</p>	<p>Key Findings: No direct associations between measures of EF and Self-compassion. Activation levels within target brain regions differed during EF tasks, however performance did not. Conclusion: No support for an association between measures of EF performance and self-compassion.</p>	<p>Correlations: Small correlations between SCS subscales & effortful control of ATQ r values range from -0.126 to 0.191 All were non-significant</p>	<p>Strengths: Use of validated SCS tools. Limitations: Hypotheses only related to EEG findings and so not focussed on actual EF skills observed. No peer review (yet)</p>	Moderate
<p>5. Ren, Wang, Jarrold, 2016, China (367 adults aged 17-27, f-215, m-152)</p>	<p>STS incl: self-crit subscale</p>	<p>SCT, n-back test, antisaccade test, BIS</p>	<p>Correlations checked between self-crit and BIS + & other EF measures.</p>	<p>Key Findings: The self-criticism sub-scale was not significantly associated with cognitive EF scores, only with motor control. Only self-management of inner speech correlated with measurements of EF (0.23**) Conclusion: No support for the association between EF and self-criticism, only with self-management of inner speech</p>	<p>Correlations: Non-significant correlations between: SCT and Self-Crit r = 0.01, Antisacc and Self-Crit r = 0.05, n-back and Self-Crit r = 0.06 Small-to-medium sized correlation between MI subscale of BIS and self-criticism r = 0.23, p < 0.01</p>	<p>Strengths: Large sample. Measures used. Broad range of correlations tested Limitations: Only reported associations of self-control and EF - overlapping constructs? Limited descriptive stats</p>	Moderate

Study (Population)	Exposure	Comparator	Outcome	Key Findings	Results Reported and Effect Sizes	Evaluation	Total QAT Rating
<p>6. Rochat, Billieux, van der Linden, 2012, Switzerland (74 adults aged 18-32, f-34, m-40)</p>	<p>CERQ - incl self-blame subscale</p>	<p>Alphabet Task (switching), Letter number switching (WAIS - WM)</p>	<p>Correlations of all measures with each other</p>	<p>Key Findings: CERQ scores not significantly associated with switching, but was significantly associated with the interaction of specific switch “costs” & depressive symptoms. N.B. self-blame was not separated from e.g. rumination in this Conclusion: Association between attention switching & self-blame not supported but switching did moderate the effect of dysphoria on CERQ.</p>	<p>Correlations: Non-significant correlation between Alphabet Task and MSRT $r = -0.02$, Significant interaction of switch-cost, depression and MSRT $\text{Beta} = 0.35, t(66) = 3.38, p < 0.01$ Medium sized correlation between SI-SO cost and WM $r = 0.27, p < 0.001$, Non-significant correlation between SO-SI cost and WM $r = 0.04$</p>	<p>Strengths: Good measure of attention switching. Clear and detailed reporting of statistical processes. Limitations: Results not specifically related to self-blame construct, Some EF tests not well validated.</p>	<p>Weak</p>

Study (Population)	Exposure	Comparator	Outcome	Key Findings	Results Reported and Effect Sizes	Evaluation	Total QAT Rating
7. Wieland, 2015, USA (120 adults – aged 25-64, all female)	GSAB o/w one subscale was self-criticism	BIS & TEXAS plus combined EF score	No correlation between self-crit measure and EF	This study investigated the relationship between EF, Body Mass Index (BMI) and measures of self-regulation (which included a self-criticism subscale), within a twin population. Key Findings: EF measures correlated with self-efficacy and negative affect but not self-criticism. Conclusion: An association between self-criticism and EF was not supported	Correlations: BIS and self-crit r = 0.122 TEXAS and self-crit r = 0.092 Compound EF Score r = 0.129 All non-sig	Strengths: BIS as a validated EF measure Limitations: TEXAS not validated, Combined EF score not detailed. GSAB self-crit subscale not validated. No peer review (yet)	Weak

Note: A-OSPAN = Automated Operation Memory Span text, ATQ = Adult Temperament Questionnaire, BIS = Barratt Impulsiveness Scale, CERQ = Cognitive Emotion Regulation Questionnaire, FB = Feedback type, GSAB = Goal Systems Assessment Battery, IST = Internal Shift Test, LOSC = Levels of Self-Criticism Scale, MI = Motor Impulsiveness, MSRT = Maladaptive Self-Referential Thinking, SCS-SF = Self-Compassion Scale (short-form), SCT = Star Counting Test, SI-SO Cost = Stimulus Independent to Stimulus Oriented Cost, STS = Self-Talk Scale, TEXAS = Telephone Executive Assessment, WM = Working Memory

Synthesis of results

Table 4 documents a summary of the findings from the included studies.

Association between levels of Self-Compassion and Executive Function

Only one study (study 4) explicitly measured the relationship between self-compassion and EF and reported no evidence of an association between the total SCS score and the Attention Temperament Questionnaire (ATQ: Evans and Rothbart, 2007), a self-report measure of EF. Small and non-significant correlations were reported for all the subscales of the SCS with the ATQ. This was a study of moderate quality, the ATQ, like the SCS has good documented validity and consistency with other measures such as the BRIEF scale (Bridgett et al., 2012). The primary focus of this study was to investigate associations with a series of neuro-imaging tests. There may have been further opportunity to analyse additional data captured, such as performance measures of a performance-based test of EF, but this was not completed nor reported.

This therefore provides no significant evidence for or against the association of experienced EF to self-compassion and further investigation is certainly warranted.

Table 4*Summary of Findings by Study Number*

	Self-Compassion	Self-Criticism	Self-Blame
Executive Function areas			
Working Memory		1 - sig small negative correlation n-back & single self-crit Q 5 - no correlation (n-back & self-crit subscale of STS) 3 - sig positive medium interaction OSPAN & LOSC 2 - sig negative medium to large associations of OSPAN & LOSC	
Attention Switch / Shift		5 - no correlation (SCT & self-criticism subscale of STS) 1 - no correlation (IST & single self-crit Q)	6 - medium sized positive correlation (Alphabet task & maladaptive self-referential thinking scale)
Inhibition		1 - no correlation (Flanker & single self-crit Q) 5 - no correlation (antisaccade test & self-crit subscale of STS)	
Broad EF measure	4 - no correlation (ATQ & SCS)	5 - limited (only small positive correlation between motor control subscale of BIS & self-crit subscale of STS) 7 - no correlation (BIS, TEXAS and self-crit subscale of GSAB)	

Association between measures of self-criticism and Executive Function.

Five studies (1, 2, 3, 5 & 7) reported results of correlation analysis between measures of self-criticism and EF skills. Studies 1, 2 and 3 found significant

correlations between self-criticism and WM, with effect sizes ranging from small to large. Study 5 found no significant relationship between WM and self-criticism.

Studies 1 and 5 found no significant relationship between self-criticism and either attention or inhibition control. Studies 5 and 7 also used broad self-report measures of EF, both using the Barratt Impulsiveness Scales (BIS: Patton, Stanford, & Barratt, 1995) with study 7 also using a brief Telephone Executive Assessment (TEXAS: Bauer, McBride, Shea, Gavin, & Fogel, 1994). In neither study was there support for an association between those measures and self-criticism. While the TEXAS tool has limited evidence supporting its validity (Bauer et al., 1994), the BIS has shown good reliability and validity (Steinberg, Sharp, Stanford, & Tharp, 2013; Vasconcelos, Malloy-Diniz, & Correa, 2012).

In using the QAT protocol to assess quality, all were judged to be weak in quality. Issues raised in studies 2 and 3 relate specifically to selection bias and insufficient reporting of some elements of the protocol, which was unfortunate as many other aspects of the study appeared thorough. The fact that study 2 repeated the protocol of study 3 provides some consistency and the measures used were thorough and well validated for both self-criticism (Castilho, Pinto-Gouveia, & Duarte, 2013; Thompson & Zuroff, 2004) and the WM task (Unsworth & Engle, 2005; Unsworth, Heitz, Shrock, & Engle, 2005). Studies 2 and 3 reported similar levels of association between the constructs. Participants completed the levels of self-criticism (LOSC: Thompson & Zuroff, 2004) trait measure and two rounds of WM tests based on an automated operation span test (OSPAN: Turner & Engle, 1989). Prior to the second

round, they were provided with positive or negative feedback on their performance (based on random group allocation). Both studies followed the same protocol although the populations differed. Study 3 examined effects among a female population while 4 studied a male population.

In both studies, there were significant interactions between feedback condition, self-criticism levels and changes in WM performance, Effect sizes were small in study 3 but large in study 2. Within the female population there was also a significant main effect of self-criticism level on WM performance change (small effect size). Across the genders, there were significant effects across the groups reporting moderate and high levels of self-criticism.

Women with high reported self-criticism demonstrated an increase in working memory performance following negative feedback and a decrease in performance following positive feedback, while those with moderate levels of self-criticism showed increases following success feedback, all of which were statistically significant. Within the male study, the results were reversed with and higher levels of self-criticism were significantly associated with decreased WM performance following failure feedback, within the failure condition, this was a medium sized effect.

Study 1 only used a single self-criticism question to measure what can be a broad construct (Castilho et al., 2013) and the measure used to assess self-criticism in study 6 has been found to have little in common with other measures associated with self-criticism (Karoly & Ruchman, 1995). Despite the intention to measure the same constructs, different measures were used in all of these studies, as shown in Table 4. It would therefore be important to clarify the constructs and measures, in order to build sufficient evidence.

Despite the rating in some of the quality assessment categories for studies 2 and 3 might there was a good sample size used between them and overall, there is moderate evidence to support an association between WM ability and levels of self-criticism. The effect sizes ranged from small to large and were significant. While there is no evidence to support other EF skills being correlated to self-criticism, the issues with the measures used indicate that there is no good evidence to support that they are not associated.

Association Between Measures of Self-Blame and Executive Function.

The only study to compare levels of EF to a measure of self-blame was study 6. Self-blame was one of the subscales of their maladaptive self-referential thinking measure from the Cognitive Emotion Regulation Questionnaire (CERQ; Jermann, Van der Linden, d'Acromont, & Zermatten, 2006). Multiple correlations were tested between this and tests of EF (WM and attention switching). There was only one significant correlation found between this and the attentional control task used and this related to a particular “switch-cost” of moving from stimulus independent to stimulus-oriented targets, this was approaching a medium effect size. The “switch-cost” referred to the extra time taken to complete a trial when changing to a specific target and aims to represent the additional challenge of switching attention from the self to the external environment. Unfortunately, this related to the overall maladaptive self-referential thinking scale (which included rumination and catastrophising along with self-blame) and there were no reported analyses of the relationship

between the specific self-blame subscale and the attentional control measures.

It is unclear whether this study did not report specific tests of association with the self-blame subscale due to lack of significance, or whether this was not tested at all. The paper refers to self-blame as a construct but does not investigate it further. It is therefore difficult to conclude anything from this study in relation to this specific research question. There is some evidence that specific aspects of attentional control are associated with maladaptive self-referential thinking, of which self-blame is a part. The effect size was medium for this study, making it worthy of additional investigation.

Discussion

Summary of Evidence

The aim of this review was to understand the relationship between aspects of executive function (EF), and self-compassion, self-criticism and self-blame. Only one study (Moadab, 2017) was found to directly test the association between self-compassion and EF, but results did not support a direct relationship. The review revealed however some evidence supporting the link between working memory and self-criticism, and also between aspects of attentional control and self-blame, however, none of this is conclusive due to the paucity of quality evidence using consistent measures. All but one study (Moadab, 2017) was judged to be weak in quality. In addition, few studies investigated the associations directly and some of the reported correlations included here were outside the original study aims and research questions

investigated. Only three of the studies tested hypotheses regarding the direct relationship between self-compassion or self-criticism and EF (Bernstein et al., 2017; Lueke & Rubinow, 2019; Lueke & Skeel, 2017). In line with the hypothesis, higher levels of self-criticism or self-blame were associated with lower levels of EF measures in some studies but not others.

The review can conclude that there is little evidence to support an association between elements of EF and self-compassion or self-criticism. At present, the strongest evidence would support the association of working memory with self-criticism with two studies showing medium to large effect sizes (Lueke & Rubinow, 2019; Lueke & Skeel, 2017) and one with a small effect size (Bernstein et al., 2017). One study found no such association (Ren et al, 2016). The quality across the Lueke and Ren studies were similar, issues with the potential for participant bias leading to quality assessments of weak, however other aspects of the studies, such as protocol, measures used and analysis reported, were good. On balance there is more evidence supporting the association than denying it.

Evidence for associations between the other EF skills included here, and self-compassion or self-criticism is more equivocal. Attention shift or switch was investigated using different measures within three studies of which only one found a medium sized association between one particular attention switch score, and a broad measure including self-blame (Rochat et al, 2012).

Similarly, no associations were found for inhibition and self-criticism in the two studies that analysed measures associated with this. None of the studies used a specific or well-validated measure for their self-criticism / self-blame

variable. It would therefore not be appropriate to conclude anything significant from these findings.

Existing theories providing potential links between self-compassion and EF include the tripartite models of affect (Gilbert, 1998; Gilbert, 2014). The threat system centres on the amygdala, which, when activated, takes priority in order to protect the self from either physical or psychological harm (Kim et al., 2020). An over-active threat system can reduce the ability of the pre-frontal cortex to regulate automatic fear responses (Mahan & Ressler, 2008). Self-compassion practice has been seen to reduce levels of activation in the amygdala (Kirschner et al., 2019), helping to mediate the impact of threat and allow cognitive control networks to support more deliberate actions. This implies that increasing self-compassion may work to allow EFs to operate more effectively.

The role of self-compassion is not, however, solely to soothe in the face of threat: having self-compassion also means supporting goal driven action which involves elements of emotion regulation to support (Gilbert, 2009). Strategies to regulate emotion through cognitive approaches can mediate the effect of a perceived stressor on resulting levels of anxiety (Miklosi et al., 2014; Sharp, Miller & Heller, 2014).

The process model of emotion regulation as first proposed by Gross (1998; McRae & Gross, 2020) involves three types of strategies (once faced by threat). Attention deployment (either to distract from or focus on the threat), cognitive change (cognitive reappraisal or acceptance) and response modulation (either through suppression of emotional expression or the use of physiological strategies) (McRae & Gross, 2020).

These different strategies are proposed to map onto elements of EF with attention deployment being associated with attention shift / switch skills, cognitive change with both attention control and working memory, and response modulation to inhibition (Gross, 1998; McRae & Gross, 2020; Webb, Miller & Sheeran, 2012). A study investigating the regions of neurological activation during use of these strategies support the view that they are supported by regions associated with the relevant EF skills (Braunstein, Gross & Ochsner, 2017).

The evidence from this review would provide some cautious support to the association of the working memory skills used in cognitive reappraisal, and higher self-compassion (or lower self-criticism). There is however, little evidence supporting the association of self-criticism / self-blame with the other EF skills referenced in this model. The conclusion would be that this has not yet been appropriately tested. Further research is needed to determine how specific EF skills of inhibition and attentional control are associated with self-compassion / self-criticism.

If an association between these areas is confirmed, there is support for the theory that such EF skills are 'muscles' to be improved through training (Masicampo & Baumeister, 2007). Interventions aimed at improving attentional control (Callinan et al., 2015; Haukaas et al., 2018), working memory (Melby-Lervåg & Hulme, 2013; Melby-Lervåg, Redick & Hulme, 2016) and inhibition (Allom, Mullan & Hagger, 2015; Beauchamp, Kahn & Berkman, 2016; Spierer, Chavan & Maniel, 2013) have seen improvements within that specific skill area. However, there is limited evidence of these

improvements being transferrable across cognitive domains (Allom & Mullan, 2015; Clausen et al., 2019; Melby-Lervåg & Hulme, 2013) or even outside of the lab specific training task used (Allom & Mullan, 2015). Spierer et al. (2013) concluded that the more conscious and deliberate efforts were to increase control, the more generalizable this skill would be.

Merlo (2015) suggests that programmes focussing on individual task training rather than skills development may be less successful at 'training the muscle' and improving performance outside of the specific task trained. They suggest that interventions targeting broader cognitive skills would result in more generalisable skill development (Melby-Lervag & Hume, 2013; Melby-Lervag, Redick & Hume, 2016). To understand how these broader cognitive 'muscles' may be trained, it could therefore be more appropriate to review evidence from interventions targeting broader ranges of cognitive skills.

Cognitive Remediation Therapy (CRT) is an approach to improving cognitive abilities and thinking skills, and encompasses a range of training programmes (Wykes & van der Gaag, 2001). While these did originally focus on specific memory and attention skills, interventions have broadened considerably to target more general cognitive flexibility and 'meta-cognitive' skills (van Passel et al., 2020). They are specifically cognitive skills based programmes and do not feature details related to the individual's own situation or difficulties experienced (Wykes & van der Gaag, 2001).

Evidence from such CRT programmes suggests that they enable improvements in directly measured cognitive skills such as set-shifting (Dahlgren & Ro, 2014; Leppanen, Adamson & Tchanturia, 2018), WM and cognitive flexibility (Wykes & van der Gaag, 2001) as well as other EF skills

(Van Noort, Kraus, Pfeiffer, Lehmkuhl & Kappel, 2016). In addition, these programmes have also demonstrated that such improvements in cognitive skills are then also associated with symptom improvements in psychiatric disorders, specifically schizophrenia (Kim et al., 2018) and anorexia nervosa (Juarascio, Manasse, Espel, Kerrigan & Forman, 2015; Tchanturia, Giombini, Leppanen & Kinnaird, 2017; Wood, Al-Khairulla & Lask, 2011). This implies that once trained in a cognitive skills environment, more effective attention control, flexibility and other EF skills can contribute to improvements in managing aspects of emotional distress. The cognitive 'muscles' involved in emotional regulation being trainable outside of a personal emotional context.

Theories of self-compassion reference these cognitive skills also, in that practice to improve self-compassion levels requires attention control, cognitive appraisal of the situation and the ability to inhibit some reactions in order to be more goal directed (Gilbert, 2014).

Interventions aimed at improving self-compassion have also increased levels of EF skills in measures of attentional control and inhibition (de Bruin et al, 2016; Hunsinger et al., 2013; May, Burgard, Mena, Abbasi & Bernhardt, 2011; Schanche et al., 2019). It is possible that continued practise in activities such as self-compassion meditations also train the participants to redirect their attention continually and thereby increase control of their attentional resources (Merlo, 2015). One study tested the effect of both a self-compassion intervention and attentional control training simultaneously, and found both had similar effects in increasing both levels of self-compassion and self-reported attentional control (Haukaas et al., 2018). Unfortunately, there

were no investigations of the direct relationship between EF and self-compassion reported in any of these studies and accordingly, they were not included in this review.

It would appear that there are situations where simultaneous changes in both self-compassion and EF skills can be observed. There has been, to date, few attempts to investigate this directly using measures of self-compassion and EF. It is possible that difficulties associated with defining the concepts (particularly that of EF) clearly, have inhibited more concrete investigations. Unfortunately to date, there is no evidence that observed levels of these specific cognitive skills and strategies have been directly associated with improved self-compassion and gaps remain in our knowledge about the underlying mechanism of self-compassion (Kirschner et al., 2019). Further evidence is needed.

What has been demonstrated is that there is little current evidence either to confirm, or deny an association between self-compassion and EF. In addition to this, there are so many different test measures for EF, with little consistency between them, that any existing results have been difficult to compare. The area lacks investigation and clarity.

Implications

Future research could be coordinated around a proposed model in order to gain some consistency of approach and increase the evidence base. Using a framework such as the self-regulation process (Gross, 1998; McRae & Gross, 2020) would allow specific tests and measures to explore associations

between self-compassion and EF in a methodical way. While exploratory research could increase understanding of associations, this could then lead the way for more high-quality research projects. Trials could then measure the effect of targeted interventions of both self-compassion and EF, and understand the relationship between them and their ability to change over time.

Limitations and Strengths

The review has a number of limitations. First, while the reference lists of the included studies were scrutinised for additional sources, few studies were identified that compared EF to self-compassion or self-criticism etc. as a primary objective. While effort was made to widen the search stream as much as possible (including full text searches as well as abstract searches) it is possible (although unlikely, particularly in more recent studies) that other studies have measured and contrasted EF and self-compassion without directly reporting it in their abstracts or keywords.

An explanation for the dearth of studies is that self-compassion itself is a term that only recently became part of psychological research and as such, has limited research to date.

In terms of EF measurement, there are issues associated with test validity and reliability and in many cases face validity has been relied upon (Strauss et al., 2006). This review was focussed on neuropsychological test measures for EF because these measures are more indicative of actual performance than brain activation levels. The exclusion of studies which did not measure EF skill but did measure activation in brain regions associated with EF, was

supported by Baddeley (1998) and Baddeley & Wilson (1998) who state that EF function should be separated from anatomical location as the processes are not unitary and brain regions support many different skills and difficulties. The review also has strengths in highlighting a gap in evidence which could support potentially inter-related models. Should this be confirmed in further research it could enhance our understanding of the cognitive factors involved in maintaining well-being. There would also be the potential to test novel ways to support people in improving well-being.

Conclusions

The review found partial evidence for negative self-compassion (self-criticism) being associated with reduced EF (working memory), with effect sizes ranging from small to large. This evidence is however inconclusive because it is based on inconsistencies in measurement approaches for both the construct of self-criticism and the specific EF skills proposed to be involved in self-regulation. The assessment is also based on studies that have been assessed as weak in quality due to both methodological and reporting issues. While there are models that could provide some structure around which research could focus, there was limited number of studies available. There was no evidence found for an association between self-compassion and either inhibition or attentional control. A relationship between EF and self-compassion cannot therefore not be concluded from this review. Future research could helpfully provide more clarity to the specific involvement of key EF skills, in particular: attention control, working memory and inhibition control to self-compassion. Should further evidence of associations be found, there is potential for both EF and

self-compassion to be enhanced through training interventions addressing both aspects.

References

- Allom, V., & Mullan, B. (2015). Two inhibitory control training interventions designed to improve eating behaviour and determine mechanisms of change. *Appetite, 89*, 282-290.
- Allom, V., Mullan, B., & Hagger, M. (2016). Does inhibitory control training improve health behaviour? A meta-analysis. *Health Psychology Review, 10*(2), 168-186.
- Alvarez, J. A., & Emory, E. (2006). Executive function and the frontal lobes: a meta-analytic review. *Neuropsychology Review, 16*(1), 17-42.
- Álvarez-Moya, E. M., Ochoa, C., Jiménez-Murcia, S., Aymamí, M. N., Gómez-Peña, M., Fernández-Aranda, F., ... & Menchón, J. M. (2011). Effect of executive functioning, decision-making and self-reported impulsivity on the treatment outcome of pathologic gambling. *Journal of Psychiatry & Neuroscience: JPN, 36*(3), 165.
- Amir, N., Beard, C., Burns, M., & Bomyea, J. (2009). Attention modification program in individuals with generalized anxiety disorder. *Journal of Abnormal Psychology, 118*(1), 28.
- Armijo-Olivo, S., Stiles, C. R., Hagen, N. A., Biondo, P. D., & Cummings, G. G. (2012). Assessment of study quality for systematic reviews: a comparison of the Cochrane Collaboration Risk of Bias Tool and the Effective Public Health Practice Project Quality Assessment Tool: methodological research. *Journal of Evaluation in Clinical Practice, 18*(1), 12-18.

- Aupperle, R. L., Melrose, A. J., Stein, M. B., & Paulus, M. P. (2012). Executive function and PTSD: disengaging from trauma. *Neuropharmacology*, *62*(2), 686-694.
- Baddeley, A. (1998). The central executive: A concept and some misconceptions. *Journal of the International Neuropsychological Society*, *4*(5), 523-526.
- Baddeley, A., & Wilson, B. (1988). Frontal amnesia and the dysexecutive syndrome. *Brain and Cognition*, *7*(2), 212-230
- Barlow, M. R., Turow, R. E. G., & Gerhart, J. (2017). Trauma appraisals, emotion regulation difficulties, and self-compassion predict posttraumatic stress symptoms following childhood abuse. *Child Abuse & Neglect*, *65*, 37-47.
- Bauer, M., McBride, L., Shea, N., Gavin, C., & Fogel, B. (1994). Screening for executive cognitive dysfunction in bipolar disorder. *Biological Psychiatry*, *35*(9), 636.
- Baumeister, R. F., Gailliot, M., DeWall, C. N., & Oaten, M. (2006). Self-regulation and personality: How interventions increase regulatory success, and how depletion moderates the effects of traits on behavior. *Journal of Personality*, *74*(6), 1773-1802.
- Beauchamp, K. G., Kahn, L. E., & Berkman, E. T. (2016). Does inhibitory control training transfer?: Behavioral and neural effects on an untrained emotion regulation task. *Social Cognitive and Affective Neuroscience*, *11*(9), 1374-1382.

- Bernstein, E. E., Heeren, A., & McNally, R. J. (2017). Unpacking rumination and executive control: A network perspective. *Clinical Psychological Science, 5*(5), 816-826.
- Blakemore, S. J., & Choudhury, S. (2006). Development of the adolescent brain: implications for executive function and social cognition. *Journal of Child Psychology and Psychiatry, 47*(3-4), 296-312.
- Bluth, K., & Blanton, P. W. (2014). Mindfulness and self-compassion: Exploring pathways to adolescent emotional well-being. *Journal of Child and Family Studies, 23*(7), 1298-1309.
- Braunstein, L. M., Gross, J. J., & Ochsner, K. N. (2017). Explicit and implicit emotion regulation: a multi-level framework. *Social Cognitive and Affective Neuroscience, 12*(10), 1545-1557.
- Bridgett, D. J., Oddi, K. B., Laake, L. M., Murdock, K. W., & Bachmann, M. N. (2013). Integrating and differentiating aspects of self-regulation: Effortful control, executive functioning, and links to negative affectivity. *Emotion, 13*(1), 47.
- Callinan, S., Johnson, D., & Wells, A. (2015). A randomised controlled study of the effects of the attention training technique on traumatic stress symptoms, emotional attention set shifting and flexibility. *Cognitive Therapy and Research, 39*(1), 4-13.
- Castilho, P., Pinto-Gouveia, J., & Duarte, J. (2015). Exploring self-criticism: Confirmatory factor analysis of the FSCRS in clinical and nonclinical samples. *Clinical Psychology & Psychotherapy, 22*(2), 153-164.

- Chan, R. C., Shum, D., Toulopoulou, T., & Chen, E. Y. (2008). Assessment of executive functions: Review of instruments and identification of critical issues. *Archives of Clinical Neuropsychology*, *23*(2), 201-216.
- Chandler, J., Cumpston, M., Li, T., Page, M. J., & Welch, V. A. (2019). *Cochrane Handbook for Systematic Reviews of Interventions*. John Wiley & Sons.
- Clausen, A. N., Francisco, A. J., Thelen, J., Bruce, J., Martin, L. E., McDowd, J., ... & Aupperle, R. L. (2017). PTSD and cognitive symptoms relate to inhibition-related prefrontal activation and functional connectivity. *Depression and Anxiety*, *34*(5), 427-436.
- Crawford, J. R., Sutherland, D., & Garthwaite, P. H. (2008). On the reliability and standard errors of measurement of contrast measures from the D-KEFS. *Journal of the International Neuropsychological Society*, *14*(6), 1069-1073.
- Crocker, L. D., Jurick, S. M., Thomas, K. R., Keller, A. V., Sanderson-Cimino, M., Boyd, B., ... & Jak, A. J. (2018). Worse baseline executive functioning is associated with dropout and poorer response to trauma-focused treatment for veterans with PTSD and comorbid traumatic brain injury. *Behaviour research and therapy*, *108*, 68-77.
- Dahlgren, C. L., & Rø, Ø. (2014). A systematic review of cognitive remediation therapy for anorexia nervosa-development, current state and implications for future research and clinical practice. *Journal of Eating Disorders*, *2*(1), 26.
- de Bruin, E. I., van der Zwan, J. E., & Bögels, S. M. (2016). A RCT comparing daily mindfulness meditations, biofeedback exercises, and daily

- physical exercise on attention control, executive functioning, mindful awareness, self-compassion, and worrying in stressed young adults. *Mindfulness*, 7(5), 1182-1192.
- Ehret, A. M., Joormann, J., & Berking, M. (2015). Examining risk and resilience factors for depression: The role of self-criticism and self-compassion. *Cognition and Emotion*, 29(8), 1496-1504.
- Engen, H. G., Bernhardt, B. C., Skottnik, L., Ricard, M., & Singer, T. (2018). Structural changes in socio-affective networks: Multi-modal MRI findings in long-term meditation practitioners. *Neuropsychologia*, 116, 26-33.
- Erb, S. R. (2016). *Investigation of self-compassion, shame, and self-blame in survivors of intimate partner violence* (Doctoral dissertation).
- Evans, D. E., & Rothbart, M. K. (2007). Developing a model for adult temperament. *Journal of Research in Personality*, 41(4), 868-888.
- Falconer, C. J., Slater, M., Rovira, A., King, J. A., Gilbert, P., Antley, A., & Brewin, C. R. (2014). Embodying compassion: a virtual reality paradigm for overcoming excessive self-criticism. *PloS one*, 9(11).
- Farnsworth, J. K., Mannon, K. A., Sewell, K. W., Connally, M. L., & Murrell, A. R. (2016). Exploration of caregiver behavior on fear of emotion, spirituality, and self-compassion. *Journal of Contextual Behavioral Science*, 5(3), 160-168.
- Fenster, R. J., Lebois, L. A., Ressler, K. J., & Suh, J. (2018). Brain circuit dysfunction in post-traumatic stress disorder: from mouse to man. *Nature Reviews Neuroscience*, 19(9), 535-551. .

- Finlay-Jones, A. L., Rees, C. S., & Kane, R. T. (2015). Self-compassion, emotion regulation and stress among Australian psychologists: Testing an emotion regulation model of self-compassion using structural equation modeling. *PloS one*, *10*(7), e0133481.
<https://doi.org/10.1371/journal.pone.0133481>
- Fonzo, G. A., Goodkind, M. S., Oathes, D. J., Zaiko, Y. V., Harvey, M., Peng, K. K., ... & Arnow, B. A. (2017). PTSD psychotherapy outcome predicted by brain activation during emotional reactivity and regulation. *American Journal of Psychiatry*, *174*(12), 1163-1174.
- Fox, K. C., Dixon, M. L., Nijeboer, S., Girn, M., Floman, J. L., Lifshitz, M., ... & Christoff, K. (2016). Functional neuroanatomy of meditation: A review and meta-analysis of 78 functional neuroimaging investigations. *Neuroscience & Biobehavioral Reviews*, *65*, 208-228.
- Galili-Weinstock, L., Chen, R., Atzil-Slonim, D., Bar-Kalifa, E., Peri, T., & Rafaeli, E. (2018). The association between self-compassion and treatment outcomes: Session-level and treatment-level effects. *Journal of Clinical Psychology*, *74*(6), 849-866.
- Geurts, D. E., Schellekens, M. P., Janssen, L., & Speckens, A. E. (2020). Mechanisms of Change in Mindfulness-Based Cognitive Therapy in Adults With ADHD. *Journal of Attention Disorders*, 1-12.
 DttOpsl://1d0o.i1.o1r7g/71/01.1018770/1504871059487916986965.
- Gilbert, P. (1998). The evolved basis and adaptive functions of cognitive distortions. *British Journal of Medical Psychology*, *71*(4), 447-463.
- Gilbert, P. (2009). Introducing compassion-focused therapy. *Advances in Psychiatric Treatment*, *15*(3), 199-208.

- Gilbert, P. (2010). An introduction to compassion focused therapy in cognitive behavior therapy. *International Journal of Cognitive Therapy*, 3(2), 97-112.
- Gilbert, P. (2014). The origins and nature of compassion focused therapy. *British Journal of Clinical Psychology*, 53(1), 6-41.
- Gilbert, P. (2017). Exploring Compassion Focused Therapy in forensic settings. *Individual psychological therapies in forensic settings: Research and practice*. Routledge.
- Gilbert, P., & Irons, C. (2009). Shame, self-criticism, and self-compassion in adolescence. *Adolescent Emotional Development and the Emergence of Depressive Disorders*, 1, 195-214.
- Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, 2(3), 271-299.
- Haaland, K. Y., Sadek, J. R., Keller, J. E., & Castillo, D. T. (2016). Neurocognitive correlates of successful treatment of PTSD in female veterans. *Journal of the International Neuropsychological Society*, 22(6), 643-651
- Hamrick, L. A., & Owens, G. P. (2019). Exploring the mediating role of self-blame and coping in the relationships between self-compassion and distress in females following the sexual assault. *Journal of Clinical Psychology*, 75(4), 766-779.
- Haukaas, R. B., Gjerde, I. B., Varting, G., Hallan, H. E., & Solem, S. (2018). A randomized controlled trial comparing the attention training technique and mindful self-compassion for students with symptoms of depression and anxiety. *Frontiers in Psychology*, 9, 827.

- Hayes, S. C., Villatte, M., Levin, M., & Hildebrandt, M. (2011). Open, aware, and active: Contextual approaches as an emerging trend in the behavioral and cognitive therapies. *Annual Review of Clinical Psychology, 7*, 141-168
- Hunsinger, M., Livingston, R., & Isbell, L. (2013). The impact of loving-kindness meditation on affective learning and cognitive control. *Mindfulness, 4*(3), 275-280.
- Inwood, E., & Ferrari, M. (2018). Mechanisms of change in the relationship between self-compassion, emotion regulation, and mental health: A systematic review. *Applied Psychology: Health and Well-Being, 10*(2), 215-235.
- Jeon, H., Lee, K., & Kwon, S. (2016). Investigation of the structural relationships between social support, self-compassion, and subjective well-being in Korean elite student athletes. *Psychological Reports, 119*(1), 39-54.
- Jermann, F., Van der Linden, M., d'Acremont, M., & Zermatten, A. (2006). Cognitive emotion regulation questionnaire (CERQ). *European Journal of Psychological Assessment, 22*(2), 126-131.
- Joeng, J. R., & Turner, S. L. (2015). Mediators between self-criticism and depression: Fear of compassion, self-compassion, and importance to others. *Journal of Counseling Psychology, 62*(3), 453.
- Juarascio, A. S., Manasse, S. M., Espel, H. M., Kerrigan, S. G., & Forman, E. M. (2015). Could training executive function improve treatment outcomes for eating disorders?. *Appetite, 90*, 187-193.

- Karatzias, T., Shevlin, M., Fyvie, C., Hyland, P., Efthymiadou, E., Wilson, D., ... & Cloitre, M. (2017). Evidence of distinct profiles of posttraumatic stress disorder (PTSD) and complex posttraumatic stress disorder (CPTSD) based on the new ICD-11 Trauma Questionnaire (ICD-TQ). *Journal of Affective Disorders*, *207*, 181-187.
- Karoly, P., & Ruhlman, L. S. (1995). Goal cognition and its clinical implications: Development and preliminary validation of four motivational assessment instruments. *Assessment*, *2*(2), 113-129.
- Khanna, M. M., Badura-Brack, A. S., McDermott, T. J., Embury, C. M., Wiesman, A. I., Shepherd, A., ... & Wilson, T. W. (2017). Veterans with post-traumatic stress disorder exhibit altered emotional processing and attentional control during an emotional Stroop task. *Psychological Medicine*, *47*(11).
- Kim, E. J., Bahk, Y. C., Oh, H., Lee, W. H., Lee, J. S., & Choi, K. H. (2018). Current status of cognitive remediation for psychiatric disorders: a review. *Frontiers in Psychiatry*, *9*, 461.
- Kim, J. J., Parker, S. L., Doty, J. R., Cunnington, R., Gilbert, P., & Kirby, J. N. (2020). Neurophysiological and behavioural markers of compassion. *Scientific Reports*, *10*(1), 1-9.
- Kirschner, H., Kuyken, W., Wright, K., Roberts, H., Brejcha, C., & Karl, A. (2019). Soothing Your Heart and Feeling Connected: A New Experimental Paradigm to Study the Benefits of Self-Compassion. *Clinical Psychological Science*, *7*(3), 545-565.
- Kozasa, E. H., Lacerda, S. S., Menezes, C., Wallace, B. A., Radvany, J., Mello, L. E., & Sato, J. R. (2015). Effects of a 9-day Shamatha

- Buddhist meditation retreat on attention, mindfulness and self-compassion in participants with a broad range of meditation experience. *Mindfulness*, 6(6), 1235-1241.
- Kuyken, W., Watkins, E., Holden, E., White, K., Taylor, R. S., Byford, S., ... & Dalgleish, T. (2010). How does mindfulness-based cognitive therapy work?. *Behaviour Research and Therapy*, 48(11), 1105-1112.
- Leary, M. R., Tate, E. B., Adams, C. E., Batts Allen, A., & Hancock, J. (2007). Self-compassion and reactions to unpleasant self-relevant events: the implications of treating oneself kindly. *Journal of Personality and Social Psychology*, 92(5), 887.
- Lee, M. S., & DePrince, A. P. (2017). Impact of executive function on efficacy obtaining resources following intimate partner violence. *Journal of Community Psychology*, 45(6), 704-714.
- Leppanen, J., Adamson, J., & Tchanturia, K. (2018). Impact of cognitive remediation therapy on neurocognitive processing in anorexia nervosa. *Frontiers in Psychiatry*, 9, 96.
- Lippa, S. M., & Davis, R. N. (2010). Inhibition/switching is not necessarily harder than inhibition: An analysis of the D-KEFS color-word interference test. *Archives of Clinical Neuropsychology*, 25(2), 146-152.
- Lippelt, D. P., Hommel, B., & Colzato, L. S. (2014). Focused attention, open monitoring and loving kindness meditation: effects on attention, conflict monitoring, and creativity—A review. *Frontiers in Psychology*, 5, 1083.
- Lueke, N., & Rubinow, D. (2019). Working memory of highly self-critical men is impaired by failure. *Applied Cognitive Psychology*, 33(5), 958-963.

- Lueke, N., & Skeel, R. (2017). The effect of self-criticism on working memory in females following success and failure. *Personality and Individual Differences, 111*, 318-323.
- MacBeth, A., & Gumley, A. (2012). Exploring compassion: A meta-analysis of the association between self-compassion and psychopathology. *Clinical Psychology Review, 32*(6), 545-552.
- Mahan, A. L., & Ressler, K. J. (2012). Fear conditioning, synaptic plasticity and the amygdala: implications for posttraumatic stress disorder. *Trends in Neurosciences, 35*(1), 24-35.
- Maheux, A., & Price, M. (2016). The indirect effect of social support on post-trauma psychopathology via self-compassion. *Personality and Individual Differences, 88*, 102-107.
- Mallen, C., Peat, G., & Croft, P. (2006). Quality assessment of observational studies is not commonplace in systematic reviews. *Journal of Clinical Epidemiology, 59*(8), 765-769.
- Masicampo, E. J., & Baumeister, R. F. (2007). Relating mindfulness and self-regulatory processes. *Psychological Inquiry, 18*(4), 255-258.
- May, C. J., Burgard, M., Mena, M., Abbasi, I., Bernhardt, N., Clemens, S., ... & Janz, A. (2011). Short-term training in loving-kindness meditation produces a state, but not a trait, alteration of attention. *Mindfulness, 2*(3), 143-153.
- McRae, K., & Gross, J. J. (2020). Emotion regulation. *Emotion, 20*(1), 1.
- Melby-Lervåg, M., & Hulme, C. (2013). Is working memory training effective? A meta-analytic review. *Developmental Psychology, 49*(2), 270.

- Melby-Lervåg, M., Redick, T. S., & Hulme, C. (2016). Working memory training does not improve performance on measures of intelligence or other measures of “far transfer” evidence from a meta-analytic review. *Perspectives on Psychological Science, 11*(4), 512-534.
- Merlo, K. L. (2015). The state-like and skillful aspects of mindfulness: The roles of working memory and self-regulation. *Industrial and Organizational Psychology, 8*(4), 633.
- Meyer, E. C., Frankfurt, S. B., Kimbrel, N. A., DeBeer, B. B., Gulliver, S. B., & Morrisette, S. B. (2018). The influence of mindfulness, self-compassion, psychological flexibility, and posttraumatic stress disorder on disability and quality of life over time in war veterans. *Journal of Clinical Psychology, 74*(7), 1272-1280.
- Miley, W. M., & Spinella, M. (2006). Correlations among measures of executive function and positive psychological attributes in college students. *The Journal of General Psychology, 133*(2), 175-182.
- Miklósi, M., Martos, T., Szabó, M., Kocsis-Bogár, K., & Forintos, D. P. (2014). Cognitive emotion regulation and stress: A multiple mediation approach. *Translational Neuroscience, 5*(1), 64-71.
- Mitchell, M., & Miller, L. S. (2008). Prediction of functional status in older adults: The ecological validity of four Delis–Kaplan Executive Function System tests. *Journal of Clinical and Experimental Neuropsychology, 30*(6), 683-690.
- Moadab, I. (2013). The Role of Mindfulness and Self-Compassion in the Neural Mechanisms of Attention and Self-Monitoring. (Dissertation)

- Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., ... & Sears, M. R. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the national Academy of Sciences*, *108*(7), 2693-2698.
- Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement*. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097
- Morgenstern, J., & Bates, M. E. (1999). Effects of executive function impairment on change processes and substance use outcomes in 12-step treatment. *Journal of Studies on Alcohol*, *60*(6), 846-855.
- Morley, R. H., Jantz, P. B., & Fulton, C. (2019). The intersection of violence, brain networks, and mindfulness practices. *Aggression and Violent Behavior*, *46*, 165-173..
- Mozzambani, A. C., Fuso, S. F., Malta, S. M., Ribeiro, R. L., Pupo, M. C., Flaks, M. K., & Mello, M. F. (2017). Long-term follow-up of attentional and executive functions of PTSD patients. *Psychology & Neuroscience*, *10*(2), 215.
- Neff, K. D. (2003). The development and validation of a scale to measure self-compassion. *Self and Identity*, *2*(3), 223-250.
- Neff, K. D. (2016). The self-compassion scale is a valid and theoretically coherent measure of self-compassion. *Mindfulness*, *7*(1), 264-274.
- Neff, K. D., & McGehee, P. (2010). Self-compassion and psychological resilience among adolescents and young adults. *Self and Identity*, *9*(3), 225-240.

- Neff, K. D., Kirkpatrick, K. L., & Rude, S. S. (2007). Self-compassion and adaptive psychological functioning. *Journal of Research in Personality, 41*(1), 139-154.
- Neff, K., & Tirch, D. (2013). Self-compassion and ACT. *Mindfulness, acceptance, and positive psychology: The seven foundations of well-being*, 78-106. New Harbinger Publications.
- Noël, X., Sferrazza, R., Van der Linden, M., Paternot, J., Verhas, M., Hanak, C., ... & Verbanck, P. (2002). Contribution of frontal cerebral blood flow measured by 99mTc-Bicisate SPECT and executive function deficits to predicting treatment outcome in alcohol-dependent patients. *Alcohol and Alcoholism, 37*(4), 347-354.
- National Institute for Health and Clinical Excellence, (2013). *The social care guidance manual: Process and methods* [PMG10]. Downloaded from: <https://www.nice.org.uk/process/pmg10/chapter/appendix-b-methodology-checklist-systematic-reviews-and-meta-analyses> (7/4/20)
- Ochsner, K. N., Bunge, S. A., Gross, J. J., & Gabrieli, J. D. (2002). Rethinking feelings: an fMRI study of the cognitive regulation of emotion. *Journal of Cognitive Neuroscience, 14*(8), 1215-1229.
- Ogilvie, J. M., Stewart, A. L., Chan, R. C., & Shum, D. H. (2011). Neuropsychological measures of executive function and antisocial behavior: A meta-analysis. *Criminology, 49*(4), 1063-1107.
- Palgi, S., Klein, E., & Shamay-Tsoory, S. G. (2016). Oxytocin improves compassion toward women among patients with PTSD. *Psychoneuroendocrinology, 64*, 143-149.

- Parsons, T. D., Carlew, A. R., Magtoto, J., & Stonecipher, K. (2017). The potential of function-led virtual environments for ecologically valid measures of executive function in experimental and clinical neuropsychology. *Neuropsychological Rehabilitation, 27*(5), 777-807.
- Patton, J. H., Stanford, M. S., & Barratt, E. S. (1995). Factor structure of the Barratt impulsiveness scale. *Journal of Clinical Psychology, 51*(6), 768-774.
- Petrocchi, N., Ottaviani, C., & Couyoumdjian, A. (2014). Dimensionality of self-compassion: translation and construct validation of the self-compassion scale in an Italian sample. *Journal of Mental Health, 23*(2), 72-77.
- Polak, A. R., Witteveen, A. B., Reitsma, J. B., & Olf, M. (2012). The role of executive function in posttraumatic stress disorder: A systematic review. *Journal of Affective Disorders, 141*(1), 11-21.
- Posner, M. I., & Rothbart, M. K. (2009). Toward a physical basis of attention and self-regulation. *Physics of Life Reviews, 6*(2), 103-120.
- Raque-Bogdan, T. L., Ericson, S. K., Jackson, J., Martin, H. M., & Bryan, N. A. (2011). Attachment and mental and physical health: Self-compassion and mattering as mediators. *Journal of Counseling Psychology, 58*(2), 272.
- Reis, N. A., Kowalski, K. C., Ferguson, L. J., Sabiston, C. M., Sedgwick, W. A., & Crocker, P. R. (2015). Self-compassion and women athletes' responses to emotionally difficult sport situations: An evaluation of a brief induction. *Psychology of Sport and Exercise, 16*, 18-25.

- Ren, X., Wang, T., & Jarrold, C. (2016). Individual differences in frequency of inner speech: Differential relations with cognitive and non-cognitive factors. *Frontiers in Psychology, 7*, 1675.
- Rochat, L., Billieux, J., & Van der Linden, M. (2012). Difficulties in disengaging attentional resources from self-generated thoughts moderate the link between dysphoria and maladaptive self-referential thinking. *Cognition & Emotion, 26*(4), 748-757.
- Roebers, C. M. (2017). Executive function and metacognition: Towards a unifying framework of cognitive self-regulation. *Developmental Review, 45*, 31-51.
- Roth, R. M., Isquith, P. K., & Gioia, G. A. (2005). Behavior rating inventory of executive function – adult version: Professional manual. Lutz, FL: *Psychological Assessment Resources*.
- Schanche, E., Vøllestad, J., Binder, P. E., Osnes, B., Visted, E., Svendsen, J. L., & Sørensen, L. (2020). Can clinical psychology students benefit from brief and intensive mindfulness training?. *Counselling and Psychotherapy Research, 20*(2), 311-324..
- Schmeichel, B. J., & Tang, D. (2015). Individual differences in executive functioning and their relationship to emotional processes and responses. *Current Directions in Psychological Science, 24*(2), 93-98.
- Scult, M. A., Knodt, A. R., Swartz, J. R., Brigidi, B. D., & Hariri, A. R. (2017). Thinking and feeling: individual differences in habitual emotion regulation and stress-related mood are associated with prefrontal executive control. *Clinical Psychological Science, 5*(1), 150-157.

- Seligowski, A. V., Miron, L. R., & Orcutt, H. K. (2015). Relations among self-compassion, PTSD symptoms, and psychological health in a trauma-exposed sample. *Mindfulness*, 6(5), 1033-1041.
- Sharp, P. B., Miller, G. A., & Heller, W. (2015). Transdiagnostic dimensions of anxiety: neural mechanisms, executive functions, and new directions. *International Journal of Psychophysiology*, 98(2), 365-377.
- Short, M. M., Mazmanian, D., Oinonen, K., & Mushquash, C. J. (2016). Executive function and self-regulation mediate dispositional mindfulness and well-being. *Personality and Individual Differences*, 93, 97-103.
- Sohlberg, M. M., & Mateer, C. A. (1987). Effectiveness of an attention-training program. *Journal of Clinical and Experimental Neuropsychology*, 9(2), 117-130.
- Spierer, L., Chavan, C., & Manuel, A. L. (2013). Training-induced behavioral and brain plasticity in inhibitory control. *Frontiers in Human Neuroscience*, 7, 427.
- Steinberg, L., Sharp, C., Stanford, M. S., & Tharp, A. T. (2013). New tricks for an old measure: The development of the Barratt Impulsiveness Scale–Brief (BIS-Brief). *Psychological Assessment*, 25(1), 216.
- Strauss, E., Sherman, E. M., & Spreen, O. (2006). *A compendium of neuropsychological tests: Administration, norms, and commentary*. American Chemical Society.
- Swanson, J. (2005). The Delis-Kaplan executive function system: a review. *Canadian Journal of School Psychology*, 20(1-2), 117-128.

- Tan, E. J., & Rossell, S. L. (2014). Building a neurocognitive profile of thought disorder in schizophrenia using a standardized test battery. *Schizophrenia Research*, *152*(1), 242-245.
- Tanaka, M., Wekerle, C., Schmuck, M. L., Paglia-Boak, A., & MAP Research Team. (2011). The linkages among childhood maltreatment, adolescent mental health, and self-compassion in child welfare adolescents. *Child Abuse & Neglect*, *35*(10), 887-898.
- Tang, Y. Y., Yang, L., Leve, L. D., & Harold, G. T. (2012). Improving executive function and its neurobiological mechanisms through a mindfulness-based intervention: Advances within the field of developmental neuroscience. *Child Development Perspectives*, *6*(4), 361-366.
- Tchanturia, K., Davies, H., Roberts, M., Harrison, A., Nakazato, M., Schmidt, U., ... & Morris, R. (2012). Poor cognitive flexibility in eating disorders: examining the evidence using the Wisconsin Card Sorting Task. *PloS one*, *7*(1).
- Tchanturia, K., Giombini, L., Leppanen, J., & Kinnaird, E. (2017). Evidence for cognitive remediation therapy in young people with anorexia nervosa: Systematic review and meta-analysis of the literature. *European Eating Disorders Review*, *25*(4), 227-236.
- Terry, M. L., & Leary, M. R. (2011). Self-compassion, self-regulation, and health. *Self and Identity*, *10*(3), 352-362.
- Thompson, B. L., & Waltz, J. (2008). Self-compassion and PTSD symptom severity. *Journal of Traumatic Stress: Official Publication of the International Society for Traumatic Stress Studies*, *21*(6), 556-558.

- Thompson, R., & Zuroff, D. C. (2004). The Levels of Self-Criticism Scale: comparative self-criticism and internalized self-criticism. *Personality and Individual Differences, 36*(2), 419-430.
- Toplak, M. E., Bucciarelli, S. M., Jain, U., & Tannock, R. (2008). Executive functions: performance-based measures and the behavior rating inventory of executive function (BRIEF) in adolescents with attention deficit/hyperactivity disorder (ADHD). *Child Neuropsychology, 15*(1), 53-72.
- Treasure, J., & Schmidt, U. (2013). The cognitive-interpersonal maintenance model of anorexia nervosa revisited: a summary of the evidence for cognitive, socio-emotional and interpersonal predisposing and perpetuating factors. *Journal of Eating Disorders, 1*(1), 13.
- Trompeter, H. R., de Kleine, E., & Bohlmeijer, E. T. (2017). Why does positive mental health buffer against psychopathology? An exploratory study on self-compassion as a resilience mechanism and adaptive emotion regulation strategy. *Cognitive Therapy and Research, 41*(3), 459-468.
- Turner, M. L., & Engle, R. W. (1989). Is working memory capacity task dependent?. *Journal of Memory and Language, 28*(2), 127-154.
- Unsworth, N., & Engle, R. W. (2005). Working memory capacity and fluid abilities: Examining the correlation between Operation Span and Raven. *Intelligence, 33*(1), 67-81.
- Unsworth, N., Heitz, R. P., Schrock, J. C., & Engle, R. W. (2005). An automated version of the operation span task. *Behavior Research Methods, 37*(3), 498-505.

- Van Dam, N. T., Sheppard, S. C., Forsyth, J. P., & Earleywine, M. (2011). Self-compassion is a better predictor than mindfulness of symptom severity and quality of life in mixed anxiety and depression. *Journal of Anxiety Disorders*, 25(1), 123-130.
- van der Horn, H. J., Liemburg, E. J., Aleman, A., Spikman, J. M., & van der Naalt, J. (2016). Brain networks subserving emotion regulation and adaptation after mild traumatic brain injury. *Journal of Neurotrauma*, 33(1), 1-9.
- van Noort, B. M., Kraus, M. K. A., Pfeiffer, E., Lehmkuhl, U., & Kappel, V. (2016). Neuropsychological and behavioural short-term effects of cognitive remediation therapy in adolescent anorexia nervosa: A pilot study. *European Eating Disorders Review*, 24(1), 69-74.
- van Passel, B., Danner, U. N., Dingemans, A. E., Aarts, E., Sternheim, L. C., Becker, E. S., ... & Cath, D. C. (2020). Cognitive remediation therapy does not enhance treatment effect in obsessive-compulsive disorder and anorexia nervosa: A randomized controlled trial. *Psychotherapy and Psychosomatics*, 1-14.
- Vasconcelos, A. G., Malloy-Diniz, L., & Correa, H. (2012). Systematic review of psychometric properties of Barratt Impulsiveness Scale Version 11 (BIS-11). *Clinical Neuropsychiatry*, 9(2).
- Vettese, L. C., Dyer, C. E., Li, W. L., & Wekerle, C. (2011). Does self-compassion mitigate the association between childhood maltreatment and later emotion regulation difficulties? A preliminary investigation. *International Journal of Mental Health and Addiction*, 9(5), 480.

- Wagner, S., Helmreich, I., Dahmen, N., Lieb, K., & Tadić, A. (2011). Reliability of three alternate forms of the trail making tests a and B. *Archives of Clinical Neuropsychology*, 26(4), 314-321.
- Walter, K. H., Palmieri, P. A., & Gunstad, J. (2010). More than symptom reduction: Changes in executive function over the course of PTSD treatment. *Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies*, 23(2), 292-295.
- Wang, Y., Fan, L., Zhu, Y., Yang, J., Wang, C., Gu, L., ... & Luo, S. (2019). Neurogenetic Mechanisms of Self-Compassionate Mindfulness: the Role of Oxytocin-Receptor Genes. *Mindfulness*, 10(9), 1792-1802.
- Webb, T. L., Miles, E., & Sheeran, P. (2012). Dealing with feeling: a meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation. *Psychological Bulletin*, 138(4), 775.
- Wieland, S. K. (2015). Genetic Influences on Executive Function and Self-Regulation of Body Mass Index. (Dissertation)
- Wood, L., Al-Khairulla, H., & Lask, B. (2011). Group cognitive remediation therapy for adolescents with anorexia nervosa. *Clinical Child Psychology and Psychiatry*, 16(2), 225-231.
- Wykes, T., & van der Gaag, M. (2001). Is it time to develop a new cognitive therapy for psychosis—cognitive remediation therapy (CRT)? *Clinical Psychology Review*, 21(8), 1227-1256.
- Zessin, U., Dickhäuser, O., & Garbade, S. (2015). The relationship between self-compassion and well-being: A meta-analysis. *Applied Psychology: Health and Well-Being*, 7(3), 340-364.

Zylowska, L., Smalley, S. L., & Schwartz, J. M. (2009). Mindful awareness and ADHD. In *Clinical Handbook of Mindfulness*(pp. 319-338). Springer, New York, NY.

Appendix A

Quality Assessment Tool for Quantitative Studies

QUALITY ASSESSMENT TOOL FOR QUANTITATIVE STUDIES



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

Quality Assessment Tool for Quantitative Studies Dictionary

The purpose of this dictionary is to describe items in the tool thereby assisting raters to score study quality. Due to under-reporting or lack of clarity in the primary study, raters will need to make judgements about the extent that bias may be present. When making judgements about each component, raters should form their opinion based upon information contained in the study rather than making inferences about what the authors intended.

- . **A) SELECTION BIAS (Q1)** Participants are more likely to be representative of the target population if they are randomly selected from a comprehensive list of individuals in the target population (score very likely). They may not be representative if they are referred from a source (e.g. clinic) in a systematic manner (score somewhat likely) or self-referred (score not likely). **(Q2)** Refers to the % of subjects in the control and intervention groups that agreed to participate in the study before they were assigned to intervention or control groups.

- . **B) STUDY DESIGN** In this section, raters assess the likelihood of bias due to the allocation process in an experimental study. For observational studies, raters assess the extent that assessments of exposure and outcome are likely to be independent. Generally, the type of design is a good indicator of the extent of bias. In stronger designs, an equivalent control group is present and the allocation process is such that the investigators are unable to predict the sequence. **Randomized Controlled Trial (RCT)** An experimental design where investigators randomly allocate eligible people to an intervention or control group. A rater should describe a study as an RCT if the randomization sequence allows each study participant to have the same chance of receiving each intervention and the investigators could not predict which intervention was next. If the investigators do not describe the allocation process and only use the words 'random' or 'randomly', the study is described as a controlled clinical trial. See below for more details. Was the study described as randomized? Score YES, if the authors used words such as random allocation, randomly assigned, and random assignment. Score NO, if no mention of randomization is made. Was the method of randomization described? Score YES, if the authors describe any method used to generate a random allocation sequence. Score NO, if the authors do not describe the allocation method or describe methods of allocation such as alternation, case record numbers, dates of birth, day of the week, and any allocation procedure that is entirely transparent before assignment, such as an open list of random numbers of

assignments. If NO is scored, then the study is a controlled clinical trial.

Was the method appropriate?

Score YES, if the randomization sequence allowed each study participant to have the same chance of receiving each intervention and the investigators could not predict which intervention was next. Examples of appropriate approaches include assignment of subjects by a central office unaware of subject characteristics, or sequentially numbered, sealed, opaque envelopes.

Score NO, if the randomization sequence is open to the individuals responsible for recruiting and allocating participants or providing the intervention, since those individuals can influence the allocation process, either knowingly or unknowingly.

If NO is scored, then the study is a controlled clinical trial.

Controlled Clinical Trial (CCT) An experimental study design where the method of allocating study subjects to intervention or control groups is open to individuals responsible for recruiting subjects or providing the intervention. The method of allocation is transparent before assignment, e.g. an open list of random numbers or allocation by date of birth, etc.

Cohort analytic (two group pre and post) An observational study design where groups are assembled according to whether or not exposure to the intervention has occurred. Exposure to the intervention is not under the control of the investigators. Study groups might be non-equivalent or not comparable on some feature that affects outcome.

Case control study A retrospective study design where the investigators gather 'cases' of people who already have the outcome of interest and 'controls' who do not. Both groups are then questioned or their records examined about whether they received the intervention exposure of interest.

Cohort (one group pre + post (before and after)) The same group is pretested, given an intervention, and tested immediately after the intervention. The intervention group, by means of the pretest, act as their own control group.

Interrupted time series A time series consists of multiple observations over time. Observations can be on the same units (e.g. individuals over time) or on different but similar units (e.g. student achievement scores for particular grade and school). Interrupted time series analysis requires knowing the specific point in the series when an intervention occurred.

C) CONFOUNDERS

By definition, a confounder is a variable that is associated with the intervention or exposure and causally related to the outcome of interest. Even in a robust study design, groups may not be balanced with respect to important variables prior to the intervention. The authors should indicate if confounders were controlled in the design (by stratification or matching) or in the analysis. If the allocation to intervention and control groups is randomized, the authors must report that the groups were balanced at baseline with respect to confounders (either in the text or a table).

D) BLINDING

(Q1) Assessors should be described as blinded to which participants were in the control and intervention groups. The purpose of blinding the outcome assessors (who might also be the care providers) is to protect against detection bias.

(Q2) Study participants should not be aware of (i.e. blinded to) the research question. The purpose of blinding the participants is to protect against reporting bias.

E) DATA COLLECTION METHODS

Tools for primary outcome measures must be described as reliable and valid. If ‘face’ validity or ‘content’ validity has been demonstrated, this is acceptable. Some sources from which data may be collected are described below:

Self reported data includes data that is collected from participants in the study (e.g. completing a questionnaire, survey, answering questions during an interview, etc.).

Assessment/Screening includes objective data that is retrieved by the researchers. (e.g. observations by investigators).

Medical Records/Vital Statistics refers to the types of formal records used for the extraction of the data.

Reliability and validity can be reported in the study or in a separate study. For example, some standard assessment tools have known reliability and validity.

- . **F) WITHDRAWALS AND DROP-OUTS** Score **YES** if the authors describe BOTH the numbers and reasons for withdrawals and drop-outs. Score **NO** if either the numbers or reasons for withdrawals and drop-outs are not reported. The percentage of participants completing the study refers to the % of subjects remaining in the study at the final data collection period in all groups (i.e. control and intervention groups).
- . **G) INTERVENTION INTEGRITY** The number of participants receiving the intended intervention should be noted (consider both frequency and intensity). For example, the authors may have reported that at least 80 percent of the participants received the complete intervention. The authors should describe a

method of measuring if the intervention was provided to all participants the same way. As well, the authors should indicate if subjects received an unintended intervention that may have influenced the outcomes. For example, co-intervention occurs when the study group receives an additional intervention (other than that intended). In this case, it is possible that the effect of the intervention may be over-estimated. Contamination refers to situations where the control group accidentally receives the study intervention. This could result in an under-estimation of the impact of the intervention.

- . **H) ANALYSIS APPROPRIATE TO QUESTION** Was the quantitative analysis appropriate to the research question being asked? An intention-to-treat analysis is one in which all the participants in a trial are analyzed according to the intervention to which they were allocated, whether they received it or not. Intention-to-treat analyses are favoured in assessments of effectiveness as they mirror the noncompliance and treatment changes that are likely to occur when the intervention is used in practice, and because of the risk of attrition bias when participants are excluded from the analysis.

Component Ratings of Study:

For each of the six components A – F, use the following descriptions as a roadmap.

- . **A) SELECTION BIAS** **Strong:** The selected individuals are very likely to be representative of the target population (Q1 is 1) **and** there is greater than 80% participation (Q2 is 1). **Moderate:** The selected individuals are at least somewhat likely to be representative of the target population (Q1 is 1 or 2); **and** there is 60 - 79% participation (Q2 is 2). ‘Moderate’ may also be assigned if Q1 is 1 or 2 and Q2 is 5 (can’t tell). **Weak:** The selected individuals are not likely to be representative of the target population (Q1 is 3); **or** there is less than 60% participation (Q2 is 3) **or** selection is not described (Q1 is 4); and the level of participation is not described (Q2 is 5).
- . **B) DESIGN** **Strong:** will be assigned to those articles that described RCTs and CCTs.
Moderate: will be assigned to those that described a cohort analytic study, a case control study, a cohort design, or an interrupted time series. **Weak:** will be assigned to those that used any other method or did not state the method used.
- . **C) CONFOUNDERS** **Strong:** will be assigned to those articles that controlled for at least 80% of relevant confounders (Q1 is 2); **or** (Q2 is 1). **Moderate:**

will be given to those studies that controlled for 60–79% of relevant confounders (Q1 is 1) **and** (Q2 is 2). **Weak:** will be assigned when less than 60% of relevant confounders were controlled (Q1 is 1) **and** (Q2 is 3) **or** control of confounders was not described (Q1 is 3) **and** (Q2 is 4).

- . **D) BLINDING Strong:** The outcome assessor is not aware of the intervention status of participants (Q1 is 2); **and** the study participants are not aware of the research question (Q2 is 2). **Moderate:** The outcome assessor is not aware of the intervention status of participants (Q1 is 2); **or** the study participants are not aware of the research question (Q2 is 2); **or** blinding is not described (Q1 is 3 and Q2 is 3). **Weak:** The outcome assessor is aware of the intervention status of participants (Q1 is 1); **and** the study participants are aware of the research question (Q2 is 1).
- . **E) DATA COLLECTION METHODS Strong:** The data collection tools have been shown to be valid (Q1 is 1); **and** the data collection tools have been shown to be reliable (Q2 is 1). **Moderate:** The data collection tools have been shown to be valid (Q1 is 1); **and** the data collection tools have not

been shown to be reliable (Q2 is 2) **or** reliability is not described (Q2 is 3). **Weak:** The data collection tools have not been shown to be valid (Q1 is 2) **or** both reliability and validity

described (Q1 is 3 and Q2 is 3).

F) WITHDRAWALS AND DROP-OUTS - a rating of: Strong: will be assigned when the follow-up rate is 80% or greater (Q2 is 1). **Moderate:** will be assigned when the follow-up rate is 60 – 79% (Q2 is 2) **OR** Q2 is 5 (N/A).

are not

Weak: will be assigned when a follow-up rate is less than 60% (Q2 is 3) or if the withdrawals and drop-outs were not described (Q2 is 4).

Appendix C

Preparation Guidelines for The Journal of Positive Psychology

Preparing Your Paper

Structure

Your paper should be compiled in the following order: title page; abstract; keywords; main text introduction, materials and methods, results, discussion; acknowledgments; declaration of interest statement; references; appendices (as appropriate); table(s) with caption(s) (on individual pages); figures; figure captions (as a list).

Word Limits

Please include a word count for your paper.

A typical paper for this journal should be no more than 7500 words, inclusive of tables, references, figure captions, endnotes.

Article layout guide

Font: Times New Roman, 12-point, double-line spaced. Use margins of at least 2.5 cm (or 1 inch). Guidance on how to insert special characters, accents and diacritics is available [here](#).

Title: Use bold for your article title, with an initial capital letter for any proper nouns.

Abstract: Indicate the abstract paragraph with a heading or by reducing the font size. Check whether the journal requires a structured abstract or graphical abstract by reading the Instructions for Authors. The Instructions for Authors may also give word limits for your abstract. Advice on writing abstracts is available [here](#).

Keywords: Please provide keywords to help readers find your article. If the Instructions for Authors do not give a number of keywords to provide, please give five or six. Advice on selecting suitable keywords is available [here](#).

Headings: Please indicate the level of the section headings in your article:

1. First-level headings (e.g. Introduction, Conclusion) should be in bold, with an initial capital letter for any proper nouns.

2. Second-level headings should be in bold italics, with an initial capital letter for any proper nouns.
3. Third-level headings should be in italics, with an initial capital letter for any proper nouns.
4. Fourth-level headings should be in bold italics, at the beginning of a paragraph. The text follows immediately after a full stop (full point) or other punctuation mark.
5. Fifth-level headings should be in italics, at the beginning of a paragraph. The text follows immediately after a full stop (full point) or other punctuation mark.

Tables and figures: Indicate in the text where the tables and figures should appear, for example by inserting [Table 1 near here]. You should supply the actual tables either at the end of the text or in a separate file and the actual figures as separate files. You can find details of the journal Editor's preference in the Instructions for Authors or in the guidance on the submission system. Ensure you have permission to use any tables or figures you are reproducing from another source.

Please take notice of the advice on this site about [obtaining permission for third party material](#), [preparation of artwork](#), and [tables](#).

Running heads and **received dates** are not required when submitting a manuscript for review; they will be added during the production process.

Spelling and punctuation: Each journal will have a preference for spelling and punctuation, which is detailed in the Instructions for Authors. Please ensure whichever spelling and punctuation style you use, you apply consistently.

Format-free submission

An increasing number of Taylor & Francis journals allow [format-free submission](#), which means that, as long as your article is consistent and includes everything necessary for review, you can submit work without needing to worry about formatting your manuscript to meet that journal's requirements. The 'Instructions for authors' for your chosen journal will tell you whether it operates format-free submission.

SCHOOL OF PSYCHOLOGY
DOCTORATE IN CLINICAL PSYCHOLOGY

EMPIRICAL PAPER

**Skills for Self-Compassion After Trauma: The Role of Executive
Function**

Trainee Name: **Tamsin Miles**

Primary Research Supervisor: **Dr Anke Karl**
Associate Professor & Group Lead, Clinical
Psychology Research Group, Mood
Disorders Centre, University of Exeter

Secondary Research Supervisor: **Dr Alicia Smith**
Research Tutor, Clinical Psychology
Doctorate Programme, University of Exeter

Target Journal: Journal of Traumatic Stress

Word Count: 7998 words (excluding abstract, table of
contents, list of figures, references,
footnotes, appendices)

**Submitted in partial fulfilment of requirements for the Doctorate Degree
in Clinical Psychology, University of Exeter**

Abstract

Objective: PTSD is known to cause significant impairments to social interactions and general functioning. It is associated with poor self-image and low levels of self-compassion. Cognitive difficulties associated with the disorder include deficiencies in levels of executive function (EF). Low self-compassion and poor EF skills are suggested to be involved in the maintenance of PTSD. Despite this, little is known about the association between self-compassion and EF, and still less of their combined role in PTSD. To address this gap, the association of trait and state levels of self-compassion, with EF skills was investigated in a population who had experienced traumatic events.

Methods: Fifty-two adults ($M=33.71$ years; $SD = 17.01$) participated in the study. Of this, 33 met a current diagnosis of PTSD (26 women, 7 men) and 19 had symptoms below the diagnostic threshold (13 women, 6 men). The participants completed measures of trait self-compassion, PTSD symptoms and a self-report EF measure before completing Trails and Stroop tests to assess specific attention switching and inhibition skills. State levels of self-compassion were measured before and after listening to a recording of a self-compassion induction.

Results: Findings showed that (1) state levels of self-compassion increased significantly following the induction, but the degree of change was not predictable from the other factors, (2) PTSD symptom severity was predicted independently and significantly by both the trait measure of self-compassion and the self-report measure of EF, furthermore (3) levels of trait self-

compassion were associated to, and predicted by, self-report measures of EF.

Conclusion: The study did not confirm any factors that could predict change in levels of state self-compassion; however, it demonstrated that PTSD symptoms were associated with both EF and self-compassion, increasing support for interventions to target these areas. In addition, the association of EF skills to levels of self-compassion increases our understanding of the role of cognitive functions in supporting well-being.

Keywords: PTSD, self-compassion, executive function

Introduction

Posttraumatic stress disorder (PTSD) is a disorder resulting from direct exposure to, or witnessing of, a traumatic event such as violence, crime, disaster or accidents (American Psychiatric Association [APA], 2017). It is known to cause significant impairments to social interactions and general functioning due to intrusive memories, flashbacks and nightmares of the event itself, as well as the subsequent efforts to avoid these and anything that may trigger them. The impact on lives can be severe with reduced quality of life in terms of physical and psychological health (Olatinji, Cisler, & Tolin, 2007; Schnurr & Lunney, 2016), and detrimental effects on relationships and social functioning (Beck, Grant, Clapp, & Palyo, 2008; Gladis, Gosch, Dishuk, & Crits-Christoph, 1999; Pagotto et al., 2015).

The prevalence of PTSD is estimated to be between 0.2 and 3.8% of the population (varying by country) meeting diagnostic criteria in a given year (Shalev et al., 2014). Of those experiencing a significantly traumatic event, it has been suggested that between 3.4 and 24.2% will experience PTSD at some point (Lowell et al., 2018). The number and type of traumas experienced can affect the risk and severity of PTSD symptoms (Karam et al., 2014; Lukashek et al., 2012), but not all individuals who experience traumas will go on to develop PTSD (Lukashek et al., 2012).

According to the diagnostic and statistical manual of mental health disorders, 5th edition, (DSM5; American Psychiatric Association, 2013) there are four groups of criteria to be met for a formal diagnosis of PTSD: exposure

(direct or indirect) to a significantly stressful event involving harm to the person; re-experiencing of the event in terms of memories, flashbacks or distress; avoidance of trauma related stimuli; negative thoughts or feelings from or increased since the event; and increased reactivity or emotional arousal. These symptoms need to have been on-going for over a month and have a significant impact on normal functioning.

Self-Compassion as a Protective Factor for PTSD

When distressing events happen, the impact on the lives and wellbeing of those affected is both normal and non-pathological. Some have suggested that this should only be viewed as a disorder if the stress responses continue over a long time and there is a lack of longer term recovery (Ehlers & Clark, 2000). Individual differences in the appraisal of both traumatic events and their sequelae can determine whether the initial stress reactions develop into more persistent PTSD symptoms (Ehlers & Clark, 2000; Koehler, Goebel, Maercker, & Pedersen, 2019). Ehlers and Clark's model of PTSD (2000) connects prior experiences of coping and beliefs about the self to the experience of trauma and its sequelae. Persistent PTSD symptoms allow those trauma experiences to update or reinforce existing beliefs such that they become fixed and stable ideas about the self, others or the world around (Abramson & Seligman, 1978; Berntsen & Rubin, 2006).

Accordingly, PTSD symptoms are associated with high levels of self-criticism and self-blame (Harman & Lee, 2010; Holliday, Holder, & Suris, 2018; Ullman, Townsend, Filipas, & Starzynski, 2007) as well as other negative cognitions about the self which both predispose individuals to experience PTSD and help to maintain its course (Ehlers & Clark, 2000; Irons & Lad, 2017).

Self-Compassion (SC) has been defined by Neff (2003) as holding kindness rather than criticism for oneself, particularly in times of pain or distress, and accepting that all experiences are part of a collective human condition. It allows for the acceptance of distressing feelings, without overly identifying with them (Neff, Kirkpatrick & Rude, 2007). It has been associated with higher wellbeing and moderates the effect of negative events and emotions on wellbeing (Leary, Tate, Adams, Batts-Allen, & Hancock, 2007).

Lower levels of self-compassion have been associated with an increased risk of PTSD (Cazeau, 2015; Maheux & Price, 2015; Valdez & Lilly, 2016; Zeller, Yural, Nitzan-Assayag, & Bernstein, 2014) and it has been found to mitigate the relationship between trauma exposure and PTSD symptoms (Barlow, Goldsmith Turow, & Gerhart, 2017; Hamrick & Owens, 2018; Tanaka, Wekerle, Schmuck, & The MAP Research Team, 2011). Self-compassion has been negatively correlated with symptoms experienced (Maheux & Price, 2015; Palgi, Klein, & Shamay Tsoory, 2016), particularly those of avoidance behaviours (Thompson & Waltz, 2008).

Critically, levels of self-compassion can be influenced by events from an early age, with both early life caregiver behaviours (Farnsworth, Mannon, Sewell, Connolly & Murrell, 2016) and other adverse childhood experiences impacting trait self-compassion (Bistrecky et al., 2017; Boykin et al., 2018).

Higher trait levels of self-compassion may buffer the impact of symptoms of PTSD on overall quality of life (Meyer et al., 2018; Seligowski, Miron, & Orcutt, 2017). Proposed mechanisms of protective function include the role of self-compassion in appraising negative stimuli (Barlow et al., 2017; Vania, 2017) and its association with negative affect (Kaurin, Schonfelder, & Wessa,

2018; Reis et al., 2015). Low self-compassion is associated with a struggle to manage or suppress unpleasant emotions resulting from traumatic experiences (Johns, Inzlicht, & Schmader, 2008; Teper, Segal, & Inzlicht, 2013). Self-compassion has been seen as a self-regulation strategy for mitigating the effect of negative self-directed emotions. Levels of self-compassion have mediated the impact of childhood trauma on later levels of emotional dysregulation (Vettese, Dyer, Li, & Wekerle, 2011).

Karatzias et al. (2017) concluded that difficulties with self-compassion relate to a disturbance in self-organisation, something associated with more complex presentations of PTSD. Disturbances in self-organisation describe psychological difficulties that are more pervasive in nature and include difficulties with emotion regulation, negative self-concept, and difficulties with relationships.

The Role of Executive Function in PTSD

It has been suggested that emotion regulation is the mechanism by which self-compassion promotes resilience after trauma (Trompetter, deKleine, & Bohlmeijer, 2017). Self-compassion supports the ability to disengage from negative thought patterns (Bernstein, Heeren, & McNally, 2017). This requires effortful control of attention (Posner & Rothbart, 2009; Zylowska, Smally, & Schwartz, 2009).

There are specific cognitive skills associated with the ability to regulate emotions, including the ability to shift attention and inhibit automatic responses, as well as the use of working memory (Dickson & Ciesla, 2018; Khanna et al., 2017; Schmeichel & Tang, 2015; Scult, Knodt, Swartz, Brigid, & Hariri, 2017;

van der Horn, Liemburg, Aleman, Spikman, & van der Naalt, 2017). These are executive function (EF) skills, an area also known to be impacted in PTSD (Fenster, Lebois, Ressler, & Suh, 2018; Finlay-Jones, Rees, & Kane, 2015; Inwood & Ferrari, 2018).

Specific brain regions, particularly sub regions of the prefrontal cortex (PFC) and the anterior cingulate cortex (ACC) are associated with these skills (Aupperle, Melrose, Stein, & Paulus, 2012; Fenster et al., 2018; Van Rooij & Jovanovic, 2019). Both performance in tasks assessing these skills, and scans indicating activation within these brain structures, have shown them to be reduced in PTSD (Aupperle et al., 2012; Clausen et al., 2017; LaGarde, Doyon, & Brunet, 2010; Van Rooij & Jovanovic, 2019). Activation in these regions has demonstrated the ability to both predict symptom severity (Guthrie & Bryant, 2006; Lanius et al., 2010; Nijdam, Martens, Reitsma, Gersons, & Olf, 2018) and treatment outcomes (Joshi et al., 2020).

The amygdala, which receives inputs from other sensory cortices and regulates fear responses, appears hyperactive in people with PTSD (Mahan & Ressler, 2012, Parsons & Ressler, 2013, Schiller & Delgado, 2010) and promotes fast fear reactions to aversive stimuli (Harnett, Goodman, & Knight, 2020). In contrast, the PFC and ACC, along with the hippocampus, appear underactive, and less able to exert control over the amygdala (Protopopescu et al., 2005, Williams et al., 2006) and inhibit those automatic fear responses (Van Rooij & Jovanovic, 2019). Reduced control from the PFC and ACC enables trauma memory intrusions to trigger fear responses and help maintain the disorder (DeGutis, et al., 2015; Fenster et al., 2018; Haaland, Sadek, Keller, & Castillo, 2016). The changes in the brain activity and structure can be explained

by the high levels of catecholamine being released into the PFC during times of stress, which leads to atrophy in that area, all the while, the fear responses in the amygdala are being reinforced (Arnsten & Li, 2005; Lin, Tung, Lin, Huang, & Lin, 2016; Southwick, Rasmusson, Barron, & Arnsten, 2005). This can only be counteracted by periods of non-stress and noradrenergic release (Arnsten et al., 2015).

Performance in tasks measuring EF has correlated negatively with PTSD symptom severity (DeGutis et al., 2015; Flaks et al., 2014; Lee & DePrince, 2017), and improvements in these functions have been associated with improvements in symptoms (Arnsten, Raskind, Taylor, & Connor, 2015; Mozzambani et al., 2017; Nijdam et al., 2018). This finding suggests that deficits in EF can both increase the risk of PTSD and also help maintain symptoms (Ainamani, Elbert, Olema, & Hecker, 2017).

An individual with high self-compassion is able to disengage from negative thought patterns in order to promote self-kindness (Neff, 2003). Levels of self-compassion are impacted by trauma and associated with symptoms of PTSD (Vettese et al., 2011). Interventions aiming to increase self-compassion have led to reduced activation in the amygdala (Kim et al., 2020; Kirschner et al., 2019). The overactive amygdala and reduced PFC seen in PTSD (Akiki, Averill & Abdallah, 2017; Harnett et al., 2020) could also be associated with reduced levels of self-compassion. It is predicted that the deficits in EF and self-compassion following trauma, would be related to each other.

PTSD Treatment approaches

Evidence suggests that the most effective treatment for PTSD has a specific trauma focus (National Institute for Health and Care Excellence [NICE],

2018) such as trauma-focused cognitive behavioural therapy (Arroyo, Lundahl, Butters, Vanderloo, & Wood, 2015; Bisson & Andrew, 2007; Creech et al., 2017; Ehlers et al., 2014) or other exposure related interventions (Bisson & Andrew, 2007; Steenkamp, Litz, Hoge, & Marmar, 2015). Recent reviews have concluded that exposure therapies are most effective in treating PTSD (Cusack et al., 2016; Schnyder et al., 2015).

Despite evidence that there can be significant improvement in symptoms, there are records of poorer outcomes, including non-response to therapy of 25-50% (Brady, Warnock-Parkes, Barker, & Ehlers, 2015) and up to two thirds retaining a clinical level of PTSD following treatment (Steenkamp et al., 2015). In addition, there are high drop out rates for traditional trauma focussed cognitive approaches, with levels as high as 25% (Steenkamp et al., 2015). It has been suggested that this may be due to the difficulty in tolerating the content of such interventions (Bisson & Andrew, 2007) as the ability to switch attention away from negative trauma related thoughts is diminished and the emotional threat response is therefore continually activated (Joshi et al., 2020).

This aligns with the view that cognitive deficits may be associated with intervention outcomes in people affected by trauma (Clausen et al., 2017; Haaland et al., 2016; Narita-Ohtaki et al., 2018). This can be at a global level or with more specific deficits e.g. verbal memory (Combs et al., 2015), broad EF skills (Flaks et al., 2014; Lee & DePrince, 2017), or more specific sub areas such as attention switching (Williams, Murphy, Dore, Evans, & Zonderman, 2017). One study that investigated activation within brain regions during emotional interference tasks, found that increased PFC activation related to

better inhibition of the left amygdala which correlated with improved intervention outcomes (Fonzo et al., 2017).

This decreased ability to allocate attention and inhibit responses associated with PTSD, which affects the regulation of emotion, supports other research indicating that both dropout rates and poorer outcomes amongst those completing an intervention have been associated with lower performance in tests of EF (Crocker et al., 2018; Fonzo et al., 2017).

In addition to executive difficulties impeding recovery, there is evidence to suggest that low levels of self-compassion associated with trauma, can both affect an individual's ability to tolerate therapy and also their motivation to alter some of the negative self-criticisms and shame associated with it (Kaurin et al., 2018; Tesh, Learman, & Pulliam, 2015). Within a clinical population, it was seen to correlate negatively with negative affect (Reis et al., 2015) and avoidance behaviours, which may otherwise enable those with higher self-compassion to go through a more natural exposure process (Thompson & Waltz, 2008). In addition, levels of self-compassion were able to predict emotional and cognitive responses to negatively perceived events (Leary et al., 2007). Low self-compassion has also been related to emotion regulation difficulties in non-clinical populations (Finlay-Jones et al., 2015).

Increases in self-compassion during an intervention have been associated with better outcomes at both an individual session and overall treatment level (Galili-Weinstock et al., 2017). This has been associated with an increased ability to approach traumatic experiences without judgement (Bermudez et al., 2013).

Therefore there is evidence to suggest that the very factors that increase the risk of PTSD are also involved in maintaining it and limiting recovery. The traumatic event may lead to increasingly negative views of the self (and reinforcing any such prior views), which may dominate any early attempts to challenge these during exposure therapy (Ehlers et al., 1998). The ability to increase self-compassion may increase an individual's ability to disengage from negative stimuli and turn towards a more positive perspective (Vania, 2017). However, disturbances in EF may restrict the ability to regulate emotions, switch attention towards positive stimuli and thus address these difficulties during therapy.

Compassion Focused Interventions

As would be expected, self-compassion interventions have demonstrated change in levels of self-compassion (Kearney et al., 2013; Neff & Germer, 2013). Even a single intervention such as a compassion based writing task demonstrated increases in reported levels of self-compassion (Arch, Landy, Schneider, Koban, & Andrews, 2018; Tesh et al., 2013), as well as facilitating faster disengaging from negative stimuli and orienting towards positive stimuli (Vania, 2017).

Interventions that increase levels of self-compassion have been found to reduce anxiety levels and reduce activation within the amygdala so associated with hyper arousal in PTSD (Leung et al., 2017). They have been associated with overall PTSD symptom reduction (Ashworth, Clarke, Jones, Jennings & Longworth, 2014; Au et al., 2017; Lang et al., 2017). Improvements in measures

of self-compassion have also been observed in short, single, experimental inductions (Kirschner, 2016; Kirschner et al., 2019; Storr, 2015;), enabling people to activate self-soothing strategies in the face of negative stimuli.

The evidence appears to support the fact that interventions that target increases in self-compassion may prove a useful intervention to those individuals who may struggle with therapies involving exposure (Kearney et al., 2014; Leung et al., 2017; McLean, Steindl, & Bambling, 2017; Scoglio et al., 2015). Supporting this, adding compassion-based approaches to existing exposure-based therapies has been seen to improve outcomes (Beaumont, Durkin, McAndrew, & Martin, 2016; Beaumont & Hollins-Martin, 2013; Beaumont, Jenkins, & Galpin, 2012) However, some individuals appear to have struggled with the approach itself and the emotional content of the therapy (Lawrence & Lee. 2014). Repeated failed attempts to resolve mental health problems can result in increased difficulties with new messages around being “unhelp-able” adding to a negative self-image and increasing distress (Zepinic, 2015).

In those cases, it has been suggested that programmes focussing on enhancing specific EF skills may prove a useful alternative intervention. These have included attention training (Haukaas, Gjerds, Varting, Hallan, & Solem, 2018; McDermott et al., 2016; Nassif & Wells, 2014); interventions focussed on improving working memory (Imburgio & Orr, 2018); and broader EF skills programmes (Bettis et al., 2017; Clausen et al., 2019). Improvements in measures of EF have then correlated with improvements on symptom scales (Bettis et al., 2017; Clausen et al., 2019; McDermott et al., 2016; Mozzambani et al., 2017).

There is also evidence of self-compassion related interventions providing improvements on measures of EF such as working memory (Harris, Harris, & Miles, 2017), attentional control (de Bruin, van der Zwan, & Bogels, 2016; Haukaas et al., 2018; Schanche et al., 2019) and inhibition (Harris et al., 2017; Hunsinger, Livingstone, & Isbell, 2012; Schanche et al., 2019). However, there is limited literature exploring the potential for compassion-based approaches to be used where levels of self-compassion are low, despite the evidence for low levels of self-compassion reducing efficacy of traditional exposure-based interventions (Karatzias et al., 2017). There is also little research investigating the role of EF in trauma treatment outcomes, and less still linked with self-compassion measures. The impact of these two factors on treatment outcomes highlights the value of increasing our understanding of their impact such that the most appropriate interventions are offered in the first instance.

The Association Between PTSD Severity, Self-Compassion and Executive Function

Executive function and self-compassion both affect the likelihood of PTSD and are in turn, individually impacted by PTSD. Improvements in either area have correlated with symptom improvement. The relationship between self-compassion and EF in PTSD is not yet fully understood.

Aims and Hypotheses

Low self-compassion and deficits in EF (EF) are both associated with poorer treatment outcomes for PTSD. Suggestions have been made that a self-compassion intervention could be an appropriate preparatory step, prior to commencing trauma focused therapy (Karatzias et al., 2019). Evidence also suggests that interventions focused on increasing EF also have a beneficial effect on self-compassion, as well as self-compassion training increasing EF (Haukaas et al., 2018). It might be possible for a range of treatment avenues to support people following trauma, depending on their presenting difficulties and preferences.

People are not typically screened for EF difficulties in services and from the existing research we do not fully understand the relationship between EF and self-compassion. Initial steps could focus on either EF or self-compassion and it would be useful to understand if there is any way to use screening to indicate which might be most effective.

This is particularly important to avoid the potential damaging effect of failed or incomplete interventions (Zepinic, 2015). If there were those for whom EF interventions may be more effective, it would be useful to be able to screen this in a simple and non-invasive manner.

This study examined EF skills and levels of trait self-compassion in participants with a history of trauma. Measures of state self-compassion were taken before and after a self-compassion induction. It was predicted that this would result in increased state self-compassion.

Measures of EF included attention switching / control, inhibition control and a self-report measure of EF difficulties. Improvements in inhibition and switching

have both been associated with improvements in symptom severity following exposure therapy (Haaland et al., 2016).

Research Questions (RQ)

RQ 1. Can measures of trait self-compassion, EF and PTSD symptoms predict changes in state self-compassion following a one-off compassion-based induction?

H1: Higher levels on a measure of trait self-compassion will be significantly associated with higher temporary increases in state self-compassion.

H2: Lower levels on a measure of posttraumatic stress symptoms levels will be significantly associated with higher temporary increases in self-compassion.

H3: Higher scores in measures of EF will be significantly associated with higher temporary increases in self-compassion.

RQ 2. What is the relationship between levels of self-compassion and EF and how does it relate to PTSD symptom severity?

H4: Lower scores on EF scales will be associated with greater posttraumatic stress symptom severity.

H5: Lower scores on self-compassion scales will be associated with greater posttraumatic stress symptom severity.

H6: Lower scores on self-compassion scales will be associated with lower EF scores.

Method

Design

This was an exploratory study using a cross-sectional design due to there being limited evidence describing the relationship between self-compassion and EF available. Predictor variables differed between the different hypotheses and included: posttraumatic symptom severity, base level self-compassion, and EF. Outcome variables included changes in state levels of self-compassion as well as posttraumatic symptom severity, and level of EF.

Participants. 62 participants were recruited through social media advertising in collaboration with the National Centre for Mental Health (NCMH).

Participants were also recruited through an undergraduate research participation scheme at Exeter University (SONA). All participants met the criteria of being adults over the age of 18 who had experienced a trauma or an extremely stressful life event according to DSM 5, as determined by completion of the Life Events Checklist (LEC-5; Gray, Litz, Hsu, & Lombardo, 2004).

Ten participants did not complete all measures for the study. Three individuals were excluded following the initial screening call due to subsequent episodes of acute psychiatric illness. One person did not pass the screening due not meeting inclusion criteria. Six individuals requested to participate in the study but were not followed up due to the impact of the Corona Virus pandemic restrictions (March – May 2020). Complete data from a total of 52 participants was included in the study.

Participants were required to be fluent in English, although it was not necessary for it to be their first language. Participants were offered entry into a draw to receive vouchers, or (in the case of undergraduate participants) to receive research credits for their participation in the study.

Exclusion criteria included: participants suffering from acute mental ill health or having active suicidal ideation; current substance dependence; or having a significant impairment to hearing or sight.

Descriptive Statistics of the population included are summarised in Table 1. The mean age of participants was 33.71 ($SD = 17.01$), the range of ages was wide (18 – 65 years) but the average represents the fact that just over half of the participants were current undergraduates. All participants had experienced at least one traumatic event and nearly two thirds would meet a current diagnosis of PTSD accordingly to the PCL-5 measure.

Table 1.

Participant Descriptive Statistics

	Gender				Total	
	Female		Male			
Education Level Attained						
GSCE	1	3%	0	0%	1	2%
Current Undergrad	21	54%	8	62%	29	56%
Graduate	10	26%	2	15%	12	23%
Postgraduate	7	18%	3	23%	10	19%
Experience of Head Injury						
No	30	77%	7	54%	37	71%
Yes	9	23%	6	46%	15	29%
Number of Traumatic Events Experienced						
Single event	7	18%	0	0%	7	13%
2-3	11	28%	2	15%	13	25%

4 or more	21	54%	11	85%	32	62%
Meeting PCL-5 criteria for PTSD Diagnosis						
Yes	26	67%	7	54%	33	63%
No	13	33%	6	46%	19	37%
<hr/>						
Total	39		13		52	

Power calculation. A power analysis was conducted using G*Power3 (Faul, Erdfelder, Lang, & Buchner, 2007) to determine the sample size required for a medium effect size ($r = .30$) correlation, and an alpha of .05. Result showed that a total sample of 55 participants would be required to enable a power of 0.8.

Ethical Approval. Ethical approval was gained from the University of Exeter Psychology Ethics Committee. (Appendix A) Participants were provided with information sheets regarding the aims of the research and the requirements for their participation (Appendix B). All participants provided formal written consent and were also reminded of their ability to withdraw from the study at any time.

Measures and Materials

Screening measures. The Life Events Checklist (LEC-5; Gray, Litz, Hsu & Lombardo, 2004) ascertains the type, frequency and impact of significantly distressing life events (Appendix E).

The patient health questionnaire (PHQ-9) was completed as a measure of the participant's current mood and to identify any risks associated with depression (Kroenke & Spitzer, 2002). This assesses symptoms associated with current depression and was used to screen for risk of suicide and acute mental distress. This measure has been found to have good validity and is sensitive to change (Kroenke, Spitzer, Williams, & Löwe, 2010).

Trait Self Compassion. The Self-Compassion Scale – short form (Neff, 2003) is used to measure trait levels of self-compassion and self-criticism. The questionnaire has 12 questions which are all answered on a scale of 1 (almost never) to 5 (almost always). It has been validated across different patient groups (Costa, Maroco, Pinto-Gouveia, Ferreira, & Castillio, 2016; Neff, 2016; Neff, Whittaker, & Karl, 2017) and reported to have good reliability (cronbach's alpha = 0.89-0.91) and a medium effect size for criterion validity (Costa et al., 2016).

Measures of Executive Function. The Stroop and Trail Making tests were both taken from the Delis Kaplan Executive Function System and are measures of executive functioning (D-KEFS; Delis, Kaplan, & Kramer, 2001). The Stroop test is a measure of inhibitory control and attention shifting (Alvarez & Emory, 2006; Lippa & Davis, 2010; Sue Baron, 2004). During this, the participant is presented with four pages, initially being asked to read words or blocks of colour. The inhibition trial requires participants to inhibit the urge to read the typewritten words in favour of reading the colour of the ink they are

printed in. The task is to read the lines as quickly and accurately as possible. The final trial involves switching between reading the ink colour and the word. The Trails test is used as a measure of attention switching (Sue Baron, 2004; Williams et al., 2017). Participants are asked to complete five conditions during which they are to draw lines connecting circles with numbers and letters in sequence. The key measure being the condition where they are required to switch between numbers and letters in sequence.

Scores for both of these tests are based upon the time taken to complete the task and the number of errors made. Both have been used to measure these areas within a PTSD population (Aupperle et al., 2017; Flaks et al., 2014; LaGarde et al., 2010) and are considered to have adequate internal validity and test-retest reliability (Delis, Kramer, Kaplan, & Holdnack, 2004; Strauss, Sherman, & Spreen, 2006).

The behaviour-rating inventory of executive function (BRIEF; Roth, Isquith, & Gioia, 2005) was administered as a self-report measure of aspects of everyday EF skills. This is a 75 question measure that asks whether a range of difficulties associated with EF have been experienced over the preceding month, answering never, sometimes or often. Total scores could range from zero to 225 with higher scores associated with increased EF difficulties. This is proposed to measure EF factors such as emotional regulation, behavioural regulation and metacognitive skills (Roth, Lance, Isquith, Fischer, & Giancola, 2013). It has demonstrated good reliability with cronbach's alpha = 0.96 and 0.94 (Waid-Ebbs, Wen, Heaton, Donovan, & Velozo, 2012). A recent review found little significant evidence correlating this measure with performance measures such as the Stroop and Trails tests (Toplak, West & Stanovich,

2013), however, its simplicity would have advantages clinically should it prove to have predictive power for these purposes here. An additional benefit of this measure is that it can be completed remotely, either prior to the face-to-face meeting, or while waiting.

Measure of posttraumatic stress symptoms. The Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5) (Weathers et al., 2013) has been updated to reflect changes in diagnostic guidelines (APA 2013; see Appendix F). There are 20 questions related to PTSD symptoms and individuals are asked the frequency of experiencing each over the previous month. Answers range from 0 (not at all) to 4 (extremely). The measure is considered to have strong internal consistency ($\alpha = 0.94$), convergent ($r_s = .74$ to $.85$) and discriminant ($r_s = .31$ to $.60$) validity, and test-retest reliability ($r = 0.82$; Blevins, Weathers, Davis, Witte, & Domino, 2015). There are different cut-off ranges advised (30-60), which can be higher when screening for treatment access (Wilkins, Lang, & Norman, 2011) but overall, this correlates highly with DSM-5 PTSD diagnostic criteria (Bovin et al., 2015).

Measures of state levels of self-compassion. Visual Analogue Scales (VAS) were used to measure: mood, self-compassion, positive affect and self-criticism, both before and after the compassion induction. This was assessed using seven questions with Visual Analogue Scales where opposing statements were at either end of a 0 to 10 scale (Kirschner, 2016; Kirschner et al., 2019). These have been used to measure a variety of traits including compassion (Odou & Brinker, 2013). They have been found to have adequate

validity and reliability and show good sensitivity to change (Abend, San, Maoz, Raz, & Bar-Haim, 2014).

Compassion Induction. Participants listened to a 12 minute compassionate guided meditation, played through either a computer speaker or a smartphone. The recording had been previously developed and used by the research team (Kirschner et al., 2019). This paradigm was been developed as an experimental approach to building self-compassion and has been shown to increase state levels of self-compassion (Kirschner, 2016).

Procedure

Volunteers for the study were provided with a participant information sheet via email and asked for contact details. Participants were contacted via phone to complete screening measures (LEC-5 and PHQ-9) and demographic questions. Face to face appointments were arranged either to occur on Exeter University premises, or arranged at the home of participants. One participant requested a neutral local for the meeting and so a local clinic room was obtained for the purpose. Should it not have been practical or possible for participants to meet the researcher face to face, participants were offered a remote research session to be conducted via Skype. Additional risk protocols were put in place to support this (Appendix C).

SCS, BRIEF and PCL-5 measures were made available online using Qualtrics software, Version April 2020 of Qualtrics (Qualtrics, Provo, UT). Participants were asked to complete these during the week prior to the research meeting.

If this was not possible for any reason, those measures were completed on paper at the start of the research meeting.

During the research meeting formal written consent was gained and then any remaining trait measures were completed. Participants were then guided through the two timed tests EF tests before completing the first of two measures of state self-compassion using Visual Analogue Scales. This was repeated following participants listening to a recording of a 12 minute long self-compassion induction.

The participants were able to ask questions following completion of all the measures. Participants were then provided with a debrief sheet (Appendix D) to take away, including contact details for the main researcher and support organisations.

Data Analysis

Data was analysed using IBM SPSS v 23 for Mac. Initially, descriptive statistics assessed the distribution of data and to check for outliers. Linear regression analysis was then used to understand the effect of the input variables on the outcome variables. Where multiple variables were included in a model, multiple linear regression analysis was employed using the enter method. For Hypotheses 1, 2 and 3, a regression analysis was conducted with the change in state level of self-compassion as the outcome measure, and trait self-compassion, EF measures and PTSD symptom severity as predictor variables. For hypotheses 4 and 5, the outcome measure used was PTSD symptom severity with predictor variables of EF measures and trait self-compassion. Finally, hypothesis 6 was tested using a regression model with

trait self-compassion as the outcome variable and the various EF measures as predictor variables.

Results

Preliminary Analyses

The data was initially screened for parametric assumptions. Tests of normality demonstrated that a number of the independent variables (the Stroop and Trails tests, plus three subscales of the BRIEF) were not normally distributed. A log transformation was conducted on these variables which did not correct the distribution for normality and accordingly, a non-parametric test was used for zero-order correlations.

An assessment of Z scores identified extreme outliers (Z score > 3.29) within scores on the SCS scale. Outliers were replaced with the adjacent non-outlying score (Tabachnik & Fidell, 2007).

Manipulation Checks. There was an increase in levels of self-compassion following the self-compassion induction as measured by the VAS, from a mean baseline score of 5.65 ($SD = 1.39$) to 6.40 ($SD = 1.45$) out of 10. A t-test demonstrated that this change was statistically significant $t(51) = -4.89$, $p < 0.001$. The effect size was calculated to be medium to large (Cohen's $d = .68$).

Hypotheses Testing

A correlation analysis was conducted on the scores for self-compassion (state and trait), PTSD symptoms and EF tests to measure the associations between these variables (see Table 2).

Three multiple regression analyses were conducted to answer the research questions. All dependent variables were normally distributed as assessed by the Shapiro-Wilk test. The data fulfilled the prerequisites for regression (normal distribution of residuals, homoscedacity, non co-linearity of independent variables).

Table 2*Zero Order Correlations (Spearman's rho Coefficient)*

Variable	Correlations									
	Mean	SD	Median	VAS Difference	SCS	PCL5	BRIEF Total	Stroop Main	Stroop In/Switch	Trails
VAS Difference ^a	5.25	7.74	5.00	1.00	0.11	-0.06	-0.06	.26*	0.23	0.06
SCS ^b	2.69	0.86	2.80	0.11	1.00	-.38**	-.51**	-0.08	-0.06	-0.22
PCL-5 ^c	43.85	19.75	40.50	-0.06	-.38**	1.00	.49**	0.17	0.18	0.08
BRIEF Total	63.71	12.63	61.00	-0.06	-.51**	.49**	1.00	0.23	0.17	-0.01
Stroop Main ^d	12.27	1.92	12.00	.26*	-0.08	0.17	0.23	1.00	.39**	0.22
Stroop In/Switch ^e	10.48	2.36	10.00	0.23	-0.06	0.18	0.17	.39**	1.00	0.22
Trails ^f	9.27	2.39	9.00	0.06	-0.22	0.08	-0.01	0.22	0.22	1.00

*. Correlation is significant at the 0.05 level (1-tailed).

** . Correlation is significant at the 0.01 level (1-tailed).

a. VAS - Visual Analogue Scales, standardised residuals of the change in state self-compassion scores except for Mean & SD

b. SCS - Self-compassion scale (short-form)

c. PCL-5 - PTSD checklist for DSM V

d. Stroop Main - Main contrast score for inhibition

e. Stroop In/Switch - Secondary contrast score for inhibition / switch

f. Trails - Main contrast score for attention switch

Research Question 1

The first research question enquired whether the level of change in self-compassion could be predicted by measures of EF, trait self-compassion or PTSD symptoms as anticipated in Hypotheses 1, 2 and 3. Results of a Spearman correlation indicate that only one measure of EF (the Stroop test, inhibit score) had a significant association with the change in state levels of self-compassion (see Table 2). This implied that higher scores in tests of inhibition were associated with greater levels of change in self-compassion,

A multiple regression analysis was conducted to test hypotheses 1-3. The model was non significant ($F(1,50) = 2.41, p = 0.13, R^2 = .05, R^2_{\text{adjusted}} = .03$). Thus, hypotheses 1 and, 2 were not supported. Although the Stroop score was significantly correlated with the change in state self-compassion, the effect was small-to-medium and did not significantly predict the model following regression analysis. Thus, support for hypothesis 3 was partial and weak.

Research Question 2

The second research question addressed the relationship between measures of EF, trait self-compassion or PTSD symptoms. Table 2 shows that there were significant correlations between the BRIEF measure of EF and PTSD symptoms, and also between the SCS and PTSD symptoms.

The enter method of regression analysis found that a collective model of the BRIEF measure of EF and self-compassion was predictive of PTSD symptom severity ($F(2,49) = 9.51, p = 0.001, R^2 = .28, R^2_{\text{adjusted}} = .25$). Both variables contributed significantly to this model, the BRIEF score (Beta = .35, $t(49) = 2.62, p < 0.01$) to a slightly greater degree than the SCS score (Beta = -.27, $t(49) = -$

2.02, $p = 0.05$). The other measures of EF were not significantly associated with PTSD symptoms (see Table 2) and so were not included in the regression model. Hypothesis 5 was therefore confirmed and Hypothesis 4 was partially confirmed.

The final hypothesis investigated the relationship between scores of self-compassion and EF. There was a significant and large sized correlation between the BRIEF measure of EF and the SCS (Table 2). None of the other measures of EF were correlated with SCS. A regression model confirmed that the BRIEF score predicted 19% of variance in the SCS measure $F(1,50) = 11.49$, $p = .001$. Hypothesis 6 was therefore partially confirmed.

Additional Preliminary Analysis. Further preliminary investigations were conducted using the subscales of the BRIEF and a correlation analysis showed all nine subscales to be significantly correlated with both the SCS and PCL-5 (Appendix G). A regression analysis for PCL-5 scores, including all BRIEF subscales and the SCS scores within the model, found that after controlling for the other factors, the Emotional Control subscale was the only factor able to significantly predict changes in the PCL-5 scores (Beta = .4, $t(41) = 2.29$, $p = .03$). The model itself accounted for a greater amount of variation in PCL score than using the total BRIEF score, $F(10,41) = 2.96$, $p = 0.007$, $R^2 = .42$ and the unique contribution of the Emotion Control subscale was semi-partial $r^2 = .07$.

In contrast, using all BRIEF subscales for a regression model with SCS as the dependent variable, only the Planning and Organising subscale had significant predictive ability (Beta = .58, $t(42) = 2.37$, $p = .02$). The overall model was again significant, $F(9,42) = 3.93$, $p = 0.001$, $R^2 = .46$.

Discussion

This study aimed to investigate the associations between self-compassion, executive function (EF) and PTSD symptoms in individuals who had experienced psychological trauma. A further aim was to understand whether any of these factors could predict the degree of change in state self-compassion following a brief compassion induction.

The findings support the prediction that trait levels of self-compassion and self-reported EF, are associated with and predictive of, levels of PTSD symptoms. In addition, findings demonstrate a significant association between EF and self-compassion.

Self-Compassion and PTSD

The sample population showed a mean and median trait level of self-compassion lower than the general population mean of 3 (Neff, 2003). This would be expected in a population who had experienced trauma and exhibited symptoms of PTSD (Tanaka et al., 2011, Thompson & Waltz, 2008). The brief self-compassion induction resulted in a significant increase in levels of state self-compassion within this population. This effect was medium to large in size. Given participants were drawn from a population that is usually associated with lower levels of self-compassion and increased self-criticism this is a positive finding. Evidence suggests that increasing levels of self-compassion is associated with improvements in PTSD symptoms (Hoffart, Økstedalen, & Langkaas, 2015).

Contrary to hypotheses 1-3, this change in state self-compassion could not be predicted by levels of trait self-compassion or by any of the measures of EF included in this study. Only one EF variable, the Stroop test inhibition score, had a significant medium sized association with self-compassion change. Yet in the regression model, this failed to significantly predict changes in self-compassion. Explained variance levels for all factors were low, and so it is believed that this was not purely attributable to the sample size. If there are factors that could predict the level of change, they were not measured within this particular study.

The finding that dispositional self-compassion was negatively associated with PTSD symptoms (medium effect size) is in line with existing evidence. Higher levels of self-compassion have been associated with both reduced symptoms of PTSD (Barlow, Goldsmith, Turow, & Gerhart, 2017; Maheaux & Price, 2015; Palgi et al., 2016), and a lesser reliance on unhelpful maintaining behaviours such as avoidance (Thompson & Waltz, 2008). These findings contribute to the emerging evidence that self-compassion is an important protective factor in trauma recovery.

Significant and/or persistent trauma has been demonstrated to effect changes in how a person views safety in other people, the world, and in themselves (Berntsen & Rubin, 2006; Kohler et al., 2019). The Ehlers and Clark (2000) model of PTSD proposes that prior beliefs about the self contribute to appraisal of the trauma and can also be updated by the traumatic experience. According to Neff (2003), self-compassion involves an acceptance of distressing or uncomfortable experiences, while being able to view those

experiences in a non self-critical way and strive to alleviate the distress. Low levels of self-compassion have been associated with increased avoidance strategies in response to trauma. One explanation could be that the prospect of managing the self-criticism associated with the traumatic event becomes the key distress to avoid. The struggle to avoid this can then itself maintain symptoms of PTSD

Executive Function and PTSD

As expected, self-report measures of EF (BRIEF - large positive effect size) were significantly associated with PTSD symptom severity. This is in line with existing findings that correlate EF negatively with PTSD symptoms (Flaks et al., 2014; Lee & DePrince, 2017). The BRIEF taps into a wide range of EF skills including inhibition, attention switching and working memory. The tool uses self-report and is considered to measure EF as it affects everyday functioning (Roth et al., 2013; Waid Ebbs et al., 2012).

Previous research has identified that people with PTSD may experience difficulties with EF skills which has been linked to functional and structural changes in the brain. Imaging research has connected an increased threat response in people with PTSD, with a hyperactive amygdala (Harnett et al., 2020; Joshi et al., 2020). The hypoactive PFC, ACC and hippocampus also found in people with PTSD is then associated with a reduced ability to inhibit responses, and plan for cognitive strategies to help break the maintenance pattern (Ford, Ayers, & Bradley, 2010; Joshi et al., 2020; van Rooij & Jovanovic, 2019). PTSD symptoms have been associated with a range of EF skills including working memory (WM; Ainimani et al., 2017; Flanagan et al., 2018), inhibition and attention switching (Haaland et al., 2016; Walter,

Palmieri, & Gunstad, 2010). PTSD symptoms have been said to be maintained by a reduced ability to control interference caused by intrusive memories and as such, training to increase competency in these skills has lead to reduced symptoms (Bomyea, Stein, & Lang, 2015).

Contrary to expectations, test-based measures of EF such as the Stroop and Trails tests, were not associated with PTSD symptom severity. Previous research using neuropsychological tests in traumatised samples with PTSD has revealed mixed results. While the Stroop has been used to demonstrate EF deficits in PTSD (MacLeod, 2005) a review found that the absence of significant associations between low Stroop scores and PTSD was not unusual (Kimble, Frueh, & Marks, 2009). The Trails test has demonstrated significant associations between lower scores and PTSD symptoms (Beckham et al., 1998). Polak's (2012) review of a range of EF measures showed a significant effect of PTSD on Trails scores, but not on Stroop. A significant population included in this study would meet the criteria for PTSD diagnosis and so an effect might be expected. However, additional evidence suggests there may be strong influence from educational level on performance in both of these tests (Bayard, Erkes, & Moroni, 2011; Fine, Delis, & Holnack, 2011). The norms used for scoring these tests were those provided within the D-KEFS manual (Delis et al., 2001) and were based on a broad population. The authors have since acknowledged that educational factors need to be taken into account and developed adapted norms (Fine et al., 2011). The population tested here were overwhelmingly university educated (96%) and this may have had a significant effect on performance.

The BRIEF measure, which correlated strongly with PTSD symptoms is broad in its range, with 75 questions covering nine subscales. Given the strong correlation between the BRIEF measure and PCL-5 scores, further preliminary analysis was conducted to explore which particular subscales of BRIEF were most associated with both trait self-compassion and PTSD symptoms.

A preliminary regression review of the nine subscales of the BRIEF demonstrated them to all be significantly correlated with both the SCS and PCL-5 (Appendix G). The regression model for PCL-5 scores, including all BRIEF subscales (and the SCS scores), found that after controlling for the other factors, the Emotional Control subscale was the only factor able to significantly predict changes in the PCL-5 scores. This subscale referred to problems such as having angry or emotional outbursts.

Different measures of EF were associated with each of the PTSD symptoms, trait, and state self-compassion measures. There was a significant association between the Trails and Stroop tests (Table 2) however, there were no significant associations found between these and the self-report measure (BRIEF). This points to one of the issues in measuring EF consistently (Strauss et al., 2006). Continued work is needed to align specific skills and measurements with a definitive model of EF (Karr, 2017). Some previous studies have found correlations between the BRIEF self-report measure and performance based tests such as Trails and Stroop (Qian & Wang, 2007) however this has not been consistent (Sørensen, Plessen, Adolphsdottir, & Lundervold, 2014; Toplak et al., 2008). Further research concluded that the performance tests and self-report measures of EF were assessing different elements of EF (Toplak et al., 2013). Much of the research comparing BRIEF

to other EF performance measures focussed on adolescent populations, and particularly those with ADHD (Qian & Wang, 2007; Sorenson et al., 2014; Toplak et al., 2008) and as such would may not be applicable for an adult population. No such association was found between self-report and performance based measures in this study supporting the view that tests of performance and self-report measure different aspects of EF.

Self-Compassion, Executive Function and PTSD Symptoms

This research has shown above that both self-compassion and self-reported executive functioning independently explained levels of PTSD severity, suggesting that both areas are involved in the maintenance of PTSD as a disorder. The new understanding from this study is that not only are they moderately related to each other but that they both make an independent contribution to explaining PTSD symptom severity. Multiple regression analysis indicates that with a model of both SCS and EF predicting PTSD symptoms was moderate in size, with both SCS and BRIEF contributing uniquely to variance. This provides hope that interventions aimed at improving self-compassion and/or EF could lead to a reduction in PTSD symptom as has been found in some studies (Galili-Weinstock et al., 2017; Haaland et al., 2016; Walter et al., 2010).

Although EF did not explain changes in state self-compassion, trait levels of self-compassion were strongly associated with the self-report measure of EF (large effect size). Previous research has found signs associations between these constructs with levels of both EF and self-compassion improving as a result of the same intervention (Haukaas et al., 2018; Schanche et al., 2019).

However a recent review found little direct research into this association with only scant evidence to support associations between a negative measure of self-compassion (self-criticism) and the working memory element of EF (Miles, 2020).

Models such as the emotion regulation process model (Gross, 1998) provide a proposed link between the tripartite model of affect, associated with self-compassion (Gilbert, 2014) and more specific descriptions of EF skills. Both models list the importance of strategies to support better emotion (or affect) regulation and describe similar contributions from what could easily be defined as EF skills. Both theories would define effective emotion regulation as including strategies to direct attention to where is most helpful, deploy cognitive reappraisal approaches to interpret situations in a constructive way, and enable the inhibition of emotional expression (Gilbert, 2014; McRae & Gross, 2020). These models suggest an association of specific EFs skills with self-compassion and this study adds support to that model.

An additional regression analysis to show the relative influence of the BRIEF subscales on the SCS scores showed that the only subscale to have significant predictive ability towards changes in SCS scores, was that of Planning and Organising. This scale grouped together issues associated with being goal directed and task oriented. Braunsteen, Gross and Ochsner (2017) suggest that strategies for emotion regulation can be categorised into explicit and implicit goal functions, as well and automatic versus controlled strategies. With the Stroop test, for example, the inhibit score shows how well we can interrupt an automatic process towards a goal directed outcome. This is not a conscious process. On the other hand, a self-report measure asks people to identify what

behaviours or difficulties they are aware of. These could be skewed by environment and social circles in terms of what is perceived to be normal/abnormal. This would support a closer association of EF skills associated with planning and organising, and living in a more self-compassionate way.

Limitations and Strengths

The study has several limitations. First, it was exploratory in design and there was little existing evidence to support some of the proposed relationships and guide the research. Although the appropriate sample size was recruited for the hypotheses, a correlational design with many subscales would benefit from a much larger sample size in order to be able to identify associations with confidence, particularly if small effect sizes were to be found.

Differences in measures of EF can be problematic in terms of reliability and validity (Karr, 2017). While BRIEF measures had large and significant correlations with SCS and PCL-5, much of the available normed data for this measure is relating to child populations (Roth et al., 2013). There are considered to be difficulties gaining strong measures of reliability and validity on measures of EF, re-test affects are significantly impacted by practice effects and the breadth of the EF concept can mean that face validity is not often supported by construct validity (Strauss et al., 2006). More work is needed to clarify specific skills in this area.

The risk of bias within this study would potentially come from participants aiming to please the researcher by increasing VAS scores following the self-

compassion induction. The compassion induction was pleasant to listen to, and the expectation would have been that this would lead to improved scores. Finally, there were additional factors that could have been controlled for within this study. Medication for symptoms of depression is frequently prescribed to people with PTSD in the UK (NICE, 2018) and there is evidence to suggest that certain antidepressant medications may have a detrimental effect on cognitive processes (Marazziti et al., 2019).

The study also had a number of strengths. Firstly, it addresses an important gap in the literature which related to the cognitive maintenance factors associated with levels of self-compassion and PTSD. There is limited research into the direct association of self-compassion and EF skills, despite the common ground between them in theories of emotion regulation (Gilbert, 2014, McRae & Gross 2020). This research provides a unique starting point from which to develop the understanding in this field to a greater degree. Secondly, the inclusion of a clinical population has enabled the self-compassion and EF measures to be directly associated with PTSD symptom levels. In addition, incorporating both performance and self-report measures of EF has enabled the comparison of everyday levels of EF to specific neuropsychological tests. The issues found with correlations between these measures enables these measures to potentially be used to examine different constructs.

Implications

This study adds to the current body of evidence that suggests both self-compassion and EF are diminished in PTSD. The findings suggest that both low levels of self-compassion and EF can contribute to the maintenance of PTSD symptoms, and, that these deficits are related to each other. Evidence suggests that some interventions aimed at increasing self-compassion levels, also result in improvements to EF skills (Haukaas et al., 2018; Hunsinger et al., 2012; May, Burgard, Mena, Abbasi, & Bernhardt, 2011). Furthermore, training interventions to improve EF skills have also been seen to result in increases in levels of self-compassion (Callinan, Johnson, & Well, 2015; Haukaas et al., 2018).

The implication of this study in combination with the above, could be that there would be benefit in offering interventions to people with PTSD that address both the EF and self-compassion difficulties. This could be offered as a standalone intervention, or perhaps more appropriately as a first level of support, prior to commencing trauma focussed exposure work. The advantage of this approach would be that some of the difficulties associated with poorer outcomes of trauma therapy, such as low self-compassion or EF difficulties, could be approached in advance.

This might be particularly important in allowing individuals to have greater choice over the kind of intervention they engage with. Previous studies have identified that some people with PTSD may find it hard to accept compassion or meditation related interventions (Pigeon, Allen, Possemato, Bergen-Cico & Treatman, 2015; Mitchell, Whittingham, Steindl & Kirby, 2018). Providing alternative approaches to interventions might enable more people to feel

comfortable in embarking upon a programme of treatment. This study, together with Hunsinger et al.'s (2012) findings, would support offering training to target EF skills as a potential alternative first intervention for those who find compassion interventions a bit daunting.

There is evidence to support the use of interventions that target improving cognitive skills both in cases of cognitive impairment due to brain injury and as a route to gaining improvements in other psychological disorders. Work with survivors of brain injury have demonstrated the value of various cognitive rehabilitation approaches to improve a wide range of cognitive skills (Barman, Chatterjee & Bhide, 2016; Kim et al., 2018). There is evidence supporting a range of cognitive rehabilitation approaches that address attention dysfunction and EF skills through intensive programmes of training (De Luca et al., 2020; Doig, Fleming & Ownsworth, 2020; Markovic et al., 2020), however evidence is still limited in volume and effect sizes often small (Blaker et al., 2020). A recent meta-analysis concluded that cognitive rehabilitation programmes using virtual reality based training, demonstrated the greatest effect in improving EF skills (Blaker et al., 2020).

Cognitive Remediation Therapy (CRT) is a cognitive training approach that has been used to support individuals with psychological disorders such as anorexia nervosa (Kim et al., 2018). The maintenance of anorexia is also believed to be associated with poorer EF (Juarascio, Manasse, Espel, Kerrigan & Forman, 2015). CRT purports to teach thinking and 'metacognitive' skills including EF skills (Wykes & van der Gaag, 2001). While developed for use with individuals experiencing psychological disorders, the programmes focus on addressing those cognitive skills rather than the personal experience of participants

(Wykes & van der Gaag, 2001). Although the training does not refer to aspects of psychological distress, research has demonstrated that improvements in cognitive skills have subsequently been associated with improvements in symptom severity (Dahlgren, Lask, Landro & Ro, 2013; Sproch, Anderson, Sherman, Crawford & Brandt, 2019; Van Noort, Kraus, Pfeiffer, Lehmkuhl & Kappel, 2015).

This research field is still young, and much of what is reported comes from case studies or small scale research, however positive, if small, effect sizes have been noted (Dahlgren & Ro, 2014; Kim et al., 2018; Tchanturia, Giombini, Leppanen & Kinnaird, 2017). Some studies demonstrated improvements in EF task performance (Dahlgren & Ro, 2014; Tchanturia, Danes & Campbell, 2007; Van Noort et al., 2015) while others reported improvements in experienced EF skills, as measured by tools such as the BRIEF (Dahlgren et al., 2013; Van Noort et al., 2015). What is important in the light of this research is to note where there is an association between such improvements in cognitive skill and psychological symptom severity (Juarascio et al., 2015; Sproch et al., 2019). In addition to this, there is support for these approaches having high levels of acceptability for the target population with good engagement and low drop out figures reported (Dahlgren & Ro, 2014; Tchanturia et al., 2017; Wood, Al-Khairulla & Lask, 2011).

Indications that such training programmes can not only improve EF skills but also promote improvement in symptoms of other disorders as a result, would support the further investigation of such an intervention to individuals with PTSD. Future research could valuably compare the effects of self-compassion interventions with those of cognitive rehabilitation or remediation, within a

population with PTSD. Changes in measures of self-compassion, EF and symptom severity associated with the interventions, would provide valuable input to future service provision as well as contribute to the theory that these skills are muscles that can be trained in a variety of ways.

These findings also suggest that understanding levels of EF and self-compassion would be a useful contribution to a psychological assessment of individuals experiencing PTSD. Not only would this help any difficulties experience to be identified and supported, but would contribute to the formulation of that person's current difficulties and the factors that could be helping to maintain them. Helping people to understand some of the mechanisms behind the difficulties they experience, can help to normalise their experience and reduce associated levels of shame and stigma (Johnstone, 2018).

This research was exploratory in nature and future research could help clarify a number of elements of the association found. Expanding the existing study to a population with a more normal range of educational background could help to understand whether performance tests of EF could contribute to the understanding of the relationship between EF and self-compassion.

In addition, this research highlights a potential to use different intervention options to support people with PTSD, including self-compassion and EF related training. Research could helpfully investigate the usefulness of these approaches. There would also be an opportunity for qualitative studies to

broaden out themes associated with engagement in and successful completion of trauma focussed therapies.

In conclusion, the aim of this research was to understand more about relationships between self-compassion and EF associated with PTSD in order to contribute to the evidence for increasing the range of effective interventions. In this respect, the self-compassion induction did result in increased state self-compassion levels indicating that this might be a useful intervention for those who are experiencing symptoms of PTSD. The findings indicated that EF and self-compassion were significantly associated to each other, and both, independently, to levels of PTSD. This provides useful avenues to explore new ways to support people with PTSD.

An additional aim was to understand whether there might be a way to understand which people may benefit from a self-compassion intervention, versus those for whom a cognitive skills intervention may be recommended, if self-compassion work was not indicated. This was not supported by the findings.

References

- Abend, R., Dan, O., Maoz, K., Raz, S., & Bar-Haim, Y. (2014). Reliability, validity and sensitivity of a computerized visual analog scale measuring state anxiety. *Journal of Behavior Therapy and Experimental Psychiatry*, *45*(4), 447-453.
- Abramson, L. Y., Seligman, M. E., & Teasdale, J. D. (1978). Learned helplessness in humans: Critique and reformulation. *Journal of Abnormal Psychology*, *87*(1), 49.
- Ainamani, H. E., Elbert, T., Olema, D. K., & Hecker, T. (2017). PTSD symptom severity relates to cognitive and psycho-social dysfunctioning—a study with Congolese refugees in Uganda. *European Journal of Psychotraumatology*, *8*(1), 1283086.
- Akiki, T. J., Averill, C. L., & Abdallah, C. G. (2017). A network-based neurobiological model of PTSD: evidence from structural and functional neuroimaging studies. *Current Psychiatry Reports*, *19*(11), 81.
- Alvarez, J. A., & Emory, E. (2006). Executive function and the frontal lobes: a meta-analytic review. *Neuropsychology review*, *16*(1), 17-42.
- American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.). Washington, DC: Author.
- Arch, J. J., Landy, L. N., Schneider, R. L., Koban, L., & Andrews-Hanna, J. R. (2018). Self-compassion induction enhances recovery from social stressors: Comparing adults with social anxiety disorder and healthy controls. *Anxiety, Stress, & Coping*, *31*(5), 594-609.

- Arnsten, A. F., & Li, B. M. (2005). Neurobiology of executive functions: catecholamine influences on prefrontal cortical functions. *Biological Psychiatry*, *57*(11), 1377-1384.
- Arnsten, A. F., Raskind, M. A., Taylor, F. B., & Connor, D. F. (2015). The effects of stress exposure on prefrontal cortex: Translating basic research into successful treatments for post-traumatic stress disorder. *Neurobiology of Stress*, *1*, 89-99.
- Arroyo, K., Lundahl, B., Butters, R., Vanderloo, M., & Wood, D. S. (2017). Short-term interventions for survivors of intimate partner violence: A systematic review and meta-analysis. *Trauma, Violence, & Abuse*, *18*(2), 155-171.
- Ashworth, F., Clarke, A., Jones, L., Jennings, C., & Longworth, C. (2015). An exploration of compassion focused therapy following acquired brain injury. *Psychology and Psychotherapy: Theory, Research and Practice*, *88*(2), 143-162.
- Au, T. M., Sauer-Zavala, S., King, M. W., Petrocchi, N., Barlow, D. H., & Litz, B. T. (2017). Compassion-based therapy for trauma-related shame and posttraumatic stress: Initial evaluation using a multiple baseline design. *Behavior Therapy*, *48*(2), 207-221.
- Aupperle, R. L., Melrose, A. J., Stein, M. B., & Paulus, M. P. (2012). Executive function and PTSD: disengaging from trauma. *Neuropharmacology*, *62*(2), 686-694.
- Balkin, R. S., & LPC-S, N. C. C. (2008). Multiple regression. Retrieved from http://www.balkinresearchmethods.com/Balkin_Research_Methods/Research_Methods_and_Statistics_files/Multiple%20Regression%20slides.pdf

- Barlow, M. R., Turow, R. E. G., & Gerhart, J. (2017). Trauma appraisals, emotion regulation difficulties, and self-compassion predict posttraumatic stress symptoms following childhood abuse. *Child Abuse & Neglect, 65*, 37-47.
- Barman, A., Chatterjee, A., & Bhide, R. (2016). Cognitive impairment and rehabilitation strategies after traumatic brain injury. *Indian Journal of Psychological Medicine, 38*(3), 172.
- Bayard, S., Erkes, J., & Moroni, C. (2011). Victoria Stroop Test: normative data in a sample group of older people and the study of their clinical applications in the assessment of inhibition in Alzheimer's disease. *Archives of Clinical Neuropsychology, 26*(7), 653-661.
- Beaumont, E. A., Durkin, M., McAndrew, S. L., & Martin, C. (2016). Using Compassion Focused Therapy as an adjunct to Trauma-Focused CBT for fire service personnel suffering with symptoms of trauma. *Cognitive Behaviour Therapist, 9*, e34.
- Beaumont, E., & Hollins Martin, C. J. (2013). Using compassionate mind training as a resource in EMDR: A case study. *Journal of EMDR Practice and Research, 7*(4), 186-199.
- Beaumont, E. A., Jenkins, P., & Galpin, A. J. (2012). 'Being kinder to myself': a prospective comparative study, exploring post-trauma therapy outcome measures, for two groups of clients, receiving either cognitive behaviour therapy or cognitive behaviour therapy and compassionate mind training. *Counselling Psychology Review, 27*(1), 31-43.
- Beck, J. G., Grant, D. M., Read, J. P., Clapp, J. D., Coffey, S. F., Miller, L. M., & Palyo, S. A. (2008). The Impact of Event Scale-Revised: Psychometric

properties in a sample of motor vehicle accident survivors. *Journal of Anxiety Disorders*, 22(2), 187-198.

- Beckham, J. C., Crawford, A. L., & Feldman, M. E. (1998). Trail making test performance in Vietnam combat veterans with and without posttraumatic stress disorder. *Journal of Traumatic Stress*, 11(4), 811-819.
- Bermudez, D., Benjamin, M. T., Porter, S. E., Saunders, P. A., Myers, N. A. L., & Dutton, M. A. (2013). A qualitative analysis of beginning mindfulness experiences for women with post-traumatic stress disorder and a history of intimate partner violence. *Complementary Therapies in Clinical Practice*, 19(2), 104-108.
- Bernstein, E. E., Heeren, A., & McNally, R. J. (2017). Unpacking rumination and executive control: A network perspective. *Clinical Psychological Science*, 5(5), 816-826
- Berntsen, D., & Rubin, D. C. (2006). The centrality of event scale: A measure of integrating a trauma into one's identity and its relation to post-traumatic stress disorder symptoms. *Behaviour Research and Therapy*, 44(2), 219-231.
- Bettis, A. H., Coiro, M. J., England, J., Murphy, L. K., Zelkowitz, R. L., Dejardins, L., ... & Compas, B. E. (2017). Comparison of two approaches to prevention of mental health problems in college students: Enhancing coping and executive function skills. *Journal of American College Health*, 65(5), 313-322.
- Bishop, T. L. (2010). *Relationship between performance-based measures of executive function and the Behavior Rating Inventory of Executive Function (BRIEF), a parent rating measure*. Illinois Institute of Technology.
- Bistricky, S. L., Gallagher, M. W., Roberts, C. M., Ferris, L., Gonzalez, A. J., & Wetterneck, C. T. (2017). Frequency of Interpersonal Trauma Types,

Avoidant Attachment, Self-Compassion, and Interpersonal Competence: A Model of Persisting Posttraumatic Symptoms. *Journal of Aggression, Maltreatment & Trauma*, 26(6), 608-625.

Bisson, J., & Andrew, M. (2007). *Psychological treatment of post-traumatic stress disorder (PTSD)* (p. 16). New York, NY: Wiley.

Blaker, C., Curry, A., Dickerson, S., Johnson, K., Santangelo, M., Tasman, A. T., ... & Potvin, M. C. (2020). Efficacy of Cognitive and Metacognitive Interventions on Executive Functioning Post Traumatic Brain Injury to Enhance Occupational Performance.

Blevins, C. A., Weathers, F. W., Davis, M. T., Witte, T. K., & Domino, J. L. (2015). The posttraumatic stress disorder checklist for DSM-5 (PCL-5): Development and initial psychometric evaluation. *Journal of Traumatic Stress*, 28(6), 489-498.

Bomyea, J., Stein, M. B., & Lang, A. J. (2015). Interference control training for PTSD: A randomized controlled trial of a novel computer-based intervention. *Journal of Anxiety Disorders*, 34, 33-42.

Bovin, M. J., Marx, B. P., Weathers, F. W., Gallagher, M. W., Rodriguez, P., Schnurr, P. P., & Keane, T. M. (2016). Psychometric properties of the PTSD checklist for diagnostic and statistical manual of mental disorders—fifth edition (PCL-5) in veterans. *Psychological Assessment*, 28(11), 1379.

Boykin, D. M., Himmerich, S. J., Pinciotti, C. M., Miller, L. M., Miron, L. R., & Orcutt, H. K. (2018). Barriers to self-compassion for female survivors of childhood maltreatment: The roles of fear of self-compassion and psychological inflexibility. *Child Abuse & Neglect*, 76, 216-224.

- Brady, F., Warnock-Parkes, E., Barker, C., & Ehlers, A. (2015). Early in-session predictors of response to trauma-focused cognitive therapy for posttraumatic stress disorder. *Behaviour Research and Therapy, 75*, 40-47.
- Braunstein, L. M., Gross, J. J., & Ochsner, K. N. (2017). Explicit and implicit emotion regulation: a multi-level framework. *Social Cognitive and Affective Neuroscience, 12*(10), 1545-1557
- Callinan, S., Johnson, D., & Wells, A. (2015). A randomised controlled study of the effects of the attention training technique on traumatic stress symptoms, emotional attention set shifting and flexibility. *Cognitive Therapy and Research, 39*(1), 4-13
- Cazeau, S. (2015). Taking the Victim Out of Sexual Assault: The Effect of Self-Compassion on Sexual Assault Survivors.
- Chen, J. Y. (1997). How should the Stroop interference effect be measured? Further evidence from alternative versions of the Stroop task. *Perceptual and Motor Skills, 84*(3_suppl), 1123-1133.
- Clausen, A. N., Thelen, J., Francisco, A. J., Bruce, J., Martin, L., McDowd, J., & Aupperle, R. L. (2019). Computer-based executive function training for combat veterans with PTSD: a pilot clinical trial assessing feasibility and predictors of dropout. *Frontiers in Psychiatry, 10*, 62.
- Combs, H. L., Berry, D. T., Pape, T. L., Babcock-Parziale, J., Smith, B., Schleenbaker, R., ... & High Jr, W. M. (2015). The effects of mild TBI, PTSD, and combined mild TBI/PTSD on returning veterans. *Journal of Neurotrauma, 32*(13), 956-966.
- Costa, J., Marôco, J., Pinto-Gouveia, J., Ferreira, C., & Castilho, P. (2016). Validation of the psychometric properties of the Self-Compassion Scale.

Testing the factorial validity and factorial invariance of the measure among borderline personality disorder, anxiety disorder, eating disorder and general populations. *Clinical Psychology & Psychotherapy*, 23(5), 460-468.

Creech, S. K., Macdonald, A., Benzer, J. K., Poole, G. M., Murphy, C. M., & Taft, C. T. (2017). PTSD symptoms predict outcome in trauma-informed treatment of intimate partner aggression. *Journal of Consulting and Clinical Psychology*, 85(10), 966.

Crocker, L. D., Jurick, S. M., Thomas, K. R., Keller, A. V., Sanderson-Cimino, M., Boyd, B., ... & Jak, A. J. (2018). Worse baseline executive functioning is associated with dropout and poorer response to trauma-focused treatment for veterans with PTSD and comorbid traumatic brain injury. *Behaviour Research and Therapy*, 108, 68-77.

Cusack, K., Jonas, D. E., Forneris, C. A., Wines, C., Sonis, J., Middleton, J. C., ... & Weil, A. (2016). Psychological treatments for adults with posttraumatic stress disorder: A systematic review and meta-analysis. *Clinical Psychology Review*, 43, 128-141.

Dahlgren, C. L., Lask, B., Landrø, N. I., & Rø, Ø. (2013). Neuropsychological functioning in adolescents with anorexia nervosa before and after cognitive remediation therapy: a feasibility trial. *International Journal of Eating Disorders*, 46(6), 576-581.

Dahlgren, C. L., & Rø, Ø. (2014). A systematic review of cognitive remediation therapy for anorexia nervosa-development, current state and implications for future research and clinical practice. *Journal of Eating Disorders*, 2(1), 26.

de Bruin, E. I., van der Zwan, J. E., & Bögels, S. M. (2016). A RCT comparing daily mindfulness meditations, biofeedback exercises, and daily physical exercise

on attention control, executive functioning, mindful awareness, self-compassion, and worrying in stressed young adults. *Mindfulness*, 7(5), 1182-1192.

De Luca, R., Portaro, S., Le Cause, M., De Domenico, C., Maggio, M. G., Cristina Ferrera, M., ... & Calabrò, R. S. (2020). Cognitive rehabilitation using immersive virtual reality at young age: A case report on traumatic brain injury. *Applied Neuropsychology: Child*, 9(3), 282-287.

DeGutis, J., Esterman, M., McCulloch, B., Rosenblatt, A., Milberg, W., & McGlinchey, R. (2015). Posttraumatic psychological symptoms are associated with reduced inhibitory control, not general executive dysfunction. *Journal of the International Neuropsychological Society*, 21(5), 342-352.

Delis, D. C., Kaplan, E., Kramer, J. H., Delis, D., & Kramer, J. (2001). Delis-Kaplan executive function system (D-KEFS). Examiner's manual.

Delis, D. C., Kramer, J. H., Kaplan, E., & Holdnack, J. (2004). Reliability and validity of the Delis-Kaplan Executive Function System: an update. *Journal of the International Neuropsychological Society*, 10(2), 301-303.

Dickson, K. S., & Ciesla, J. A. (2018). Executive Functioning and Negative Affect: an Examination of the Meditational Effects of Emotion Regulation. *International Journal of Cognitive Therapy*, 11(3), 272-286.

Doig, E. J., Fleming, J., & Ownsworth, T. (2020). Evaluation of an occupation-based metacognitive intervention targeting awareness, executive function and goal-related outcomes after traumatic brain injury using single-case experimental design methodology. *Neuropsychological Rehabilitation*, 1-30.

- Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy*, 38(4), 319-345.
- Ehlers, A., Clark, D. M., Dunmore, E., Jaycox, L., Meadows, E., & Foa, E. B. (1998). Predicting response to exposure treatment in PTSD: The role of mental defeat and alienation. *Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies*, 11(3), 457-471.
- Ehlers, A., Hackmann, A., Grey, N., Wild, J., Liness, S., Albert, I., ... & Clark, D. M. (2014). A randomized controlled trial of 7-day intensive and standard weekly cognitive therapy for PTSD and emotion-focused supportive therapy. *American Journal of Psychiatry*, 171(3), 294-304.
- Etkin, A., Maron-Katz, A., Wu, W., Fonzo, G. A., Huemer, J., Vértes, P. E., ... & Ramos-Cejudo, J. (2019). Using fMRI connectivity to define a treatment-resistant form of post-traumatic stress disorder. *Science Translational Medicine*, 11(486), eaal3236.
- Farnsworth, J. K., Mannon, K. A., Sewell, K. W., Connally, M. L., & Murrell, A. R. (2016). Exploration of caregiver behavior on fear of emotion, spirituality, and self-compassion. *Journal of Contextual Behavioral Science*, 5(3), 160-168.
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175-191.
- Fenster, R. J., Lebois, L. A., Ressler, K. J., & Suh, J. (2018). Brain circuit dysfunction in post-traumatic stress disorder: from mouse to man. *Nature Reviews Neuroscience*, 1.

- Fine, E. M., Delis, D. C., & Holdnack, J. (2011). Normative adjustments to the D-KEFS trail making test: corrections for education and vocabulary level. *The Clinical Neuropsychologist*, *25*(8), 1331-1344.
- Finlay-Jones, A. L., Rees, C. S., & Kane, R. T. (2015). Self-compassion, emotion regulation and stress among Australian psychologists: Testing an emotion regulation model of self-compassion using structural equation modeling. *PLoS one*, *10*(7).
- Flaks, M. K., Malta, S. M., Almeida, P. P., Bueno, O. F., Pupo, M. C., Andreoli, S. B., ... & Bressan, R. A. (2014). Attentional and executive functions are differentially affected by post-traumatic stress disorder and trauma. *Journal of Psychiatric Research*, *48*(1), 32-39.
- Flanagan, J. C., Hand, A., Jarnecke, A. M., Maria, M. S., Megan, M., Brady, K. T., & Joseph, J. E. (2018). Effects of oxytocin on working memory and executive control system connectivity in posttraumatic stress disorder. *Experimental and Clinical Psychopharmacology*, *26*(4), 391.
- Fonzo, G. A., Goodkind, M. S., Oathes, D. J., Zaiko, Y. V., Harvey, M., Peng, K. K., ... & Arnow, B. A. (2017). PTSD psychotherapy outcome predicted by brain activation during emotional reactivity and regulation. *American Journal of Psychiatry*, *174*(12), 1163-1174.
- Ford, E., Ayers, S., & Bradley, R. (2010). Exploration of a cognitive model to predict post-traumatic stress symptoms following childbirth. *Journal of Anxiety Disorders*, *24*(3), 353-359.
- Galili-Weinstock, L., Chen, R., Atzil-Slonim, D., Bar-Kalifa, E., Peri, T., & Rafaeli, E. (2018). The association between self-compassion and treatment outcomes:

Session-level and treatment-level effects. *Journal of Clinical Psychology*, 74(6), 849-866.

Gilbert, P. (2014). The origins and nature of compassion focused therapy. *British Journal of Clinical Psychology*, 53(1), 6-41.

Gladis, M. M., Gosch, E. A., Dishuk, N. M., & Crits-Christoph, P. (1999). Quality of life: Expanding the scope of clinical significance. *Journal of Consulting and Clinical Psychology*, 67(3), 320.

Gray, M. J., Litz, B. T., Hsu, J. L., & Lombardo, T. W. (2004). Psychometric properties of the life events checklist. *Assessment*, 11(4), 330-341.

Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, 2(3), 271-299.

Guthrie, R. M., & Bryant, R. A. (2006). Extinction learning before trauma and subsequent posttraumatic stress. *Psychosomatic medicine*, 68(2), 307-311.

Haaland, K. Y., Sadek, J. R., Keller, J. E., & Castillo, D. T. (2016). Neurocognitive correlates of successful treatment of PTSD in female veterans. *Journal of the International Neuropsychological Society*, 22(6), 643-651.

Hamrick, L. A., & Owens, G. P. (2019). Exploring the mediating role of self-blame and coping in the relationships between self-compassion and distress in females following the sexual assault. *Journal of Clinical Psychology*, 75(4), 766-779.

Harman, R., & Lee, D. (2010). The role of shame and self-critical thinking in the development and maintenance of current threat in post-traumatic stress disorder. *Clinical Psychology & Psychotherapy: An International Journal of Theory & Practice*, 17(1), 13-24.

- Harnett, N. G., Goodman, A. M., & Knight, D. C. (2020). PTSD-related neuroimaging abnormalities in brain function, structure, and biochemistry. *Experimental Neurology*, 113331.
- Harris, P. S., Harris, P. R., & Miles, E. (2017). Self-affirmation improves performance on tasks related to executive functioning. *Journal of Experimental Social Psychology*, 70, 281-285.
- Haukaas, R. B., Gjerde, I. B., Varting, G., Hallan, H. E., & Solem, S. (2018). A randomized controlled trial comparing the attention training technique and mindful self-compassion for students with symptoms of depression and anxiety. *Frontiers in Psychology*, 9, 827.
- Hoffart, A., Øktedalen, T., & Langkaas, T. F. (2015). Self-compassion influences PTSD symptoms in the process of change in trauma-focused cognitive-behavioral therapies: a study of within-person processes. *Frontiers in Psychology*, 6, 1273.
- Holliday, R., Holder, N., & Surís, A. (2018). Reductions in self-blame cognitions predict PTSD improvements with cognitive processing therapy for military sexual trauma-related PTSD. *Psychiatry Research*, 263, 181-184.
- Hunsinger, M., Livingston, R., & Isbell, L. (2013). The impact of loving-kindness meditation on affective learning and cognitive control. *Mindfulness*, 4(3), 275-280.
- Houx, P. J., Jolles, J., & Vreeling, F. W. (1993). Stroop Interference: Aging effects associated with the Stroop Color-Word Test. *Experimental Aging Research*, 19, 209-224.

- Imburgio, M. J., & Orr, J. M. (2018). Effects of Prefrontal tDCS on Executive Function: Methodological Considerations Revealed by Meta-Analysis. *Neuropsychologia*, 117, 156-166.
- Inwood, E., & Ferrari, M. (2018). Mechanisms of Change in the Relationship between Self-Compassion, Emotion Regulation, and Mental Health: A Systematic Review. *Applied Psychology: Health and Well-Being*
- Irons, C., & Lad, S. (2017). Using compassion focused therapy to work with shame and self-criticism in complex trauma. *Australian Clinical Psychologist*, 3(1), 1743.
- Johns, M., Inzlicht, M., & Schmader, T. (2008). Stereotype threat and executive resource depletion: Examining the influence of emotion regulation. *Journal of Experimental Psychology: General*, 137(4), 691.
- Johnstone, L. (2018). Psychological formulation as an alternative to psychiatric diagnosis. *Journal of Humanistic Psychology*, 58(1), 30-46.
- Joshi, S. A., Duval, E. R., Sheynin, J., King, A. P., Phan, K. L., Martis, B., ... & Rauch, S. A. (2020). Neural correlates of emotional reactivity and regulation associated with treatment response in a randomized clinical trial for posttraumatic stress disorder. *Psychiatry Research: Neuroimaging*, 111062.
- Juarascio, A. S., Manasse, S. M., Espel, H. M., Kerrigan, S. G., & Forman, E. M. (2015). Could training executive function improve treatment outcomes for eating disorders?. *Appetite*, 90, 187-193.
- Karam, E. G., Friedman, M. J., Hill, E. D., Kessler, R. C., McLaughlin, K. A., Petukhova, M., ... & De Girolamo, G. (2014). Cumulative traumas and risk thresholds: 12-month PTSD in the World Mental Health (WMH) surveys. *Depression and Anxiety*, 31(2), 130-142.

- Karatzias, T., Shevlin, M., Fyvie, C., Hyland, P., Efthymiadou, E., Wilson, D., ... & Cloitre, M. (2017). Evidence of distinct profiles of posttraumatic stress disorder (PTSD) and complex posttraumatic stress disorder (CPTSD) based on the new ICD-11 Trauma Questionnaire (ICD-TQ). *Journal of Affective Disorders, 207*, 181-187.
- Karr, J. E. (2017). *Towards a multivariate assessment of executive functions* (Doctoral dissertation).
- Kaurin, A., Schönfelder, S., & Wessa, M. (2018). Self-compassion buffers the link between self-criticism and depression in trauma-exposed firefighters. *Journal of Counseling Psychology, 65*(4), 453.
- Kearney, D. J., McManus, C., Malte, C. A., Martinez, M. E., Felleman, B., & Simpson, T. L. (2014). Loving-kindness meditation and the broaden-and-build theory of positive emotions among veterans with posttraumatic stress disorder. *Medical Care, 52*, S32-S38.
- Khanna, M. M., Badura-Brack, A. S., McDermott, T. J., Embury, C. M., Wiesman, A. I., Shepherd, A., ... & Wilson, T. W. (2017). Veterans with post-traumatic stress disorder exhibit altered emotional processing and attentional control during an emotional Stroop task. *Psychological Medicine, 47*(11).
- Kim, E. J., Bahk, Y. C., Oh, H., Lee, W. H., Lee, J. S., & Choi, K. H. (2018). Current status of cognitive remediation for psychiatric disorders: a review. *Frontiers in Psychiatry, 9*, 461.
- Kim, J. J., Parker, S. L., Doty, J. R., Cunnington, R., Gilbert, P., & Kirby, J. N. (2020). Neurophysiological and behavioural markers of compassion. *Scientific Reports, 10*(1), 1-9.

- Kimble, M. O., Frueh, B. C., & Marks, L. (2009). Does the modified Stroop effect exist in PTSD? Evidence from dissertation abstracts and the peer reviewed literature. *Journal of Anxiety Disorders, 23*(5), 650-655.
- Kirschner, H. (2016). Compassion for the Self and Well-Being: Psychological and Biological Correlates of a New Concept (Doctoral thesis).
- Kirschner, H., Kuyken, W., Wright, K., Roberts, H., Brejcha, C. & Karl, A. (in press). Soothing your heart and feeling connected – a new experimental paradigm to study the benefits of self-compassion. *Clinical Psychological Science*.
- Koehler, M., Goebel, S., Maercker, A., & Pedersen, A. (2020). Disclosure of Grief Questionnaire (DGQ): Development and Validation of a Questionnaire to Assess Communication Patterns After Bereavement. *DIAGNOSTICA, 66*(1), 25-36.
- Kroenke, K., & Spitzer, R. L. (2002). The PHQ-9: a new depression diagnostic and severity measure. *Psychiatric Annals, 32*(9), 509-515.
- Kroenke, K., Spitzer, R. L., Williams, J. B., & Löwe, B. (2010). The patient health questionnaire somatic, anxiety, and depressive symptom scales: a systematic review. *General Hospital Psychiatry, 32*(4), 345-359.
- LaGarde, G., Doyon, J., & Brunet, A. (2010). Memory and executive dysfunctions associated with acute posttraumatic stress disorder. *Psychiatry Research, 177*(1-2), 144-149.
- Lang, A. J., Casmar, P., Hurst, S., Harrison, T., Golshan, S., Good, R., ... & Negi, L. (2017). Compassion Meditation for Veterans with Posttraumatic Stress Disorder (PTSD): a Nonrandomized Study. *Mindfulness, 1*-12.
- Lanius, R. A., Frewen, P. A., Tursich, M., Jetly, R., & McKinnon, M. C. (2015). Restoring large-scale brain networks in PTSD and related disorders: a

proposal for neuroscientifically-informed treatment interventions. *European Journal of Psychotraumatology*, 6(1), 273-13.

Lawrence, V. A., & Lee, D. (2014). An exploration of people's experiences of compassion-focused therapy for trauma, using interpretative phenomenological analysis. *Clinical Psychology & Psychotherapy*, 21(6), 495-507.

Leary, M. R., Tate, E. B., Adams, C. E., Batts Allen, A., & Hancock, J. (2007). Self-compassion and reactions to unpleasant self-relevant events: the implications of treating oneself kindly. *Journal of Personality and Social Psychology*, 92(5), 887.

Lee, M. S., & DePrince, A. P. (2017). Impact of executive function on efficacy obtaining resources following intimate partner violence. *Journal of Community Psychology*, 45(6), 704-714.

Lezak, M. D., Howieson, D. B., & Loring, D. W. (2004). *Neuropsychological assessment* (4th ed.). New York: Oxford University Press.

Leung, M. K., Lau, W. K., Chan, C. C., Wong, S. S., Fung, A. L., & Lee, T. M. (2018). Meditation-induced neuroplastic changes in amygdala activity during negative affective processing. *Social Neuroscience*, 13(3), 277-288.

Lin, C. C., Tung, C. S., Lin, P. H., Huang, C. L., & Liu, Y. P. (2016). Traumatic stress causes distinctive effects on fear circuit catecholamines and the fear extinction profile in a rodent model of posttraumatic stress disorder. *European Neuropsychopharmacology*, 26(9), 1484-1495.

Lippa, S. M., & Davis, R. N. (2010). Inhibition/switching is not necessarily harder than inhibition: An analysis of the D-KEFS color-word interference test. *Archives of Clinical Neuropsychology*, 25(2), 146-152.

- Lowell, A., Suarez-Jimenez, B., Helpman, L., Zhu, X., Durosky, A., Hilburn, A., ... & Neria, Y. (2018). 9/11-related PTSD among highly exposed populations: a systematic review 15 years after the attack. *Psychological Medicine, 48*(4), 537-553.
- Lukaschek, K., Kruse, J., Emeny, R. T., Lacruz, M. E., von Eisenhart Rothe, A., & Ladwig, K. H. (2013). Lifetime traumatic experiences and their impact on PTSD: a general population study. *Social Psychiatry and Psychiatric Epidemiology, 48*(4), 525-532.
- MacBeth, A., & Gumley, A. (2012). Exploring compassion: A meta-analysis of the association between self-compassion and psychopathology. *Clinical Psychology Review, 32*(6), 545-552.
- MacLeod, C. M. (1991). Half a century of research on the Stroop effect: an integrative review. *Psychological Bulletin, 109*(2), 163.
- MacLeod, C. (2005). The Stroop Task in Clinical Research. In *Cognitive methods and their application to clinical research*.(pp. 41-62). American Psychological Association.
- Mahan, A. L., & Ressler, K. J. (2012). Fear conditioning, synaptic plasticity and the amygdala: implications for posttraumatic stress disorder. *Trends in Neurosciences, 35*(1), 24-35.
- Maheux, A., & Price, M. (2016). The indirect effect of social support on post-trauma psychopathology via self-compassion. *Personality and Individual Differences, 88*, 102-107
- Marazziti, D., Mucci, F., Tripodi, B., Carbone, M. G., Muscarella, A., Falaschi, V., & Baroni, S. (2019). Emotional blunting, cognitive impairment, bone fractures,

and bleeding as possible side effects of long-term use of SSRIs. *Clinical Neuropsychiatry*, 16(2).

Markovic, G., Bartfai, A., Ekholm, J., Nilsson, C., Schult, M. L., & Löfgren, M. (2020).

Daily management of attention dysfunction two–four years after brain injury and early cognitive rehabilitation with attention process training: a qualitative study. *Neuropsychological Rehabilitation*, 30(3), 523-544.

May, C. J., Burgard, M., Mena, M., Abbasi, I., Bernhardt, N., Clemens, S., ... & Janz, A. (2011). Short-term training in loving-kindness meditation produces a state, but not a trait, alteration of attention. *Mindfulness*, 2(3), 143-153.

McDermott, T. J., Badura-Brack, A. S., Becker, K. M., Ryan, T. J., Bar-Haim, Y., Pine, D. S., ... & Wilson, T. W. (2016). Attention training improves aberrant neural dynamics during working memory processing in veterans with PTSD. *Cognitive, Affective, & Behavioral Neuroscience*, 16(6), 1140-1149.

McLean, L., Steindl, S. R., & Bambling, M. (2018). Compassion-focused therapy as an intervention for adult survivors of sexual abuse. *Journal of Child Sexual Abuse*, 27(2), 161-175.

McRae, K., & Gross, J. J. (2020). Emotion regulation. *Emotion*, 20(1), 1.

Meyer, E. C., Frankfurt, S. B., Kimbrel, N. A., DeBeer, B. B., Gulliver, S. B., & Morrisette, S. B. (2018). The influence of mindfulness, self-compassion, psychological flexibility, and posttraumatic stress disorder on disability and quality of life over time in war veterans. *Journal of Clinical Psychology*, 74(7), 1272-1280

Miles, T. L. (2020). How are self-compassion, self-criticism and self-blame, related to executive function skills: A systematic Review (Doctoral Thesis)

- Mitchell, M., & Miller, L. S. (2008). Prediction of functional status in older adults: The ecological validity of four Delis–Kaplan Executive Function System tests. *Journal of Clinical and Experimental Neuropsychology*, *30*(6), 683-690.
- Mitchell, A. E., Whittingham, K., Steindl, S., & Kirby, J. (2018). Feasibility and acceptability of a brief online self-compassion intervention for mothers of infants. *Archives of women's mental health*, *21*(5), 553-561.
- Mozzambani, A. C., Fuso, S. F., Malta, S. M., Ribeiro, R. L., Pupo, M. C., Flaks, M. K., & Mello, M. F. (2017). Long-term follow-up of attentional and executive functions of PTSD patients. *Psychology & Neuroscience*, *10*(2), 215.
- Narita-Ohtaki, R., Hori, H., Itoh, M., Lin, M., Niwa, M., Ino, K., ... & Kunugi, H. (2018). Cognitive function in Japanese women with posttraumatic stress disorder: Association with exercise habits. *Journal of Affective Disorders*, *236*, 306-312.
- Nassif, Y., & Wells, A. (2014). Attention training reduces intrusive thoughts cued by a narrative of stressful life events: A controlled study. *Journal of Clinical Psychology*, *70*(6), 510-517.
- Neff, K. D. (2003). The development and validation of a scale to measure self-compassion. *Self and Identity*, *2*(3), 223-250
- Neff, K. D. (2016). The self-compassion scale is a valid and theoretically coherent measure of self-compassion. *Mindfulness*, *7*(1), 264-274.
- Neff, K. D., & Germer, C. K. (2013). A pilot study and randomized controlled trial of the mindful self-compassion program. *Journal of Clinical Psychology*, *69*(1), 28-44.
- Neff, K. D., Kirkpatrick, K. L., & Rude, S. S. (2007). Self-compassion and adaptive psychological functioning. *Journal of Research in Personality*, *41*(1), 139-154.

- Neff, K. D., Whittaker, T. A., & Karl, A. (2017). Examining the factor structure of the self-compassion scale in four distinct populations: Is the use of a total scale score justified?. *Journal of Personality Assessment*, *99*(6), 596-607.
- NICE (2018). Post-traumatic stress disorder. NICE guideline [NG116]. Retrieved from:
<https://www.nice.org.uk/guidance/ng116>
- Nijdam, M. J., Martens, I. J., Reitsma, J. B., Gersons, B. P., & Olf, M. (2018). Neurocognitive functioning over the course of trauma-focused psychotherapy for PTSD: Changes in verbal memory and executive functioning. *British Journal of Clinical Psychology*, *57*(4), 436-452.
- Odou, N., & Brinker, J. (2014). Exploring the relationship between rumination, self-compassion, and mood. *Self and Identity*, *13*(4), 449-459.
- Olatunji, B. O., Cisler, J. M., & Tolin, D. F. (2007). Quality of life in the anxiety disorders: a meta-analytic review. *Clinical Psychology Review*, *27*(5), 572-581.
- Pagotto, L. F., Mendlowicz, M. V., Coutinho, E. S. F., Figueira, I., Luz, M. P., Araujo, A. X., & Berger, W. (2015). The impact of posttraumatic symptoms and comorbid mental disorders on the health-related quality of life in treatment-seeking PTSD patients. *Comprehensive Psychiatry*, *58*, 68-73.
- Palgi, S., Klein, E., & Shamay-Tsoory, S. G. (2016). Oxytocin improves compassion toward women among patients with PTSD. *Psychoneuroendocrinology*, *64*, 143-149.
- Parsons, R. G., & Ressler, K. J. (2013). Implications of memory modulation for post-traumatic stress and fear disorders. *Nature Neuroscience*, *16*(2), 146.

- Pigeon, W., Allen, C., Possemato, K., Bergen-Cico, D., & Treatman, S. (2015). Feasibility and acceptability of a brief mindfulness program for veterans in primary care with posttraumatic stress disorder. *Mindfulness*, 6(5), 986-995.
- Polak, A. R., Witteveen, A. B., Reitsma, J. B., & Olf, M. (2012). The role of executive function in posttraumatic stress disorder: A systematic review. *Journal of Affective Disorders*, 141(1), 11-21.
- Posner, M. I., & Rothbart, M. K. (2009). Toward a physical basis of attention and self-regulation. *Physics of Life Reviews*, 6(2), 103-120.
- Protopopescu, X., Pan, H., Tuescher, O., Cloitre, M., Goldstein, M., Engelien, W., ... & Silbersweig, D. (2005). Differential time courses and specificity of amygdala activity in posttraumatic stress disorder subjects and normal control subjects. *Biological Psychiatry*, 57(5), 464-473.
- Qian, Y., & Wang, Y. F. (2007). Reliability and validity of behavior rating scale of executive function parent form for school age children in China. *Beijing da xue xue bao. Yi xue ban= Journal of Peking University. Health sciences*, 39(3), 277-283.
- Reis, N. A., Kowalski, K. C., Ferguson, L. J., Sabiston, C. M., Sedgwick, W. A., & Crocker, P. R. (2015). Self-compassion and women athletes' responses to emotionally difficult sport situations: An evaluation of a brief induction. *Psychology of Sport and Exercise*, 16, 18-25.
- Rodríguez Barreto, L. C., Pulido, N. D. C., & Pineda Roa, C. A. (2016). Psychometric Properties of the Stroop color-word Test in non-pathological Colombian Population. *Universitas Psychologica*, 15(2), 255-272.

- Roth, R. M., Isquith, P. K., & Gioia, G. A. (2005). *Behavior rating inventory of executive function – adult version: Professional manual*. Lutz, FL: Psychological Assessment Resources.
- Roth, R. M., Lance, C. E., Isquith, P. K., Fischer, A. S., & Giancola, P. R. (2013). Confirmatory factor analysis of the behavior rating inventory of executive function-adult version in healthy adults and application to attention-deficit/hyperactivity disorder. *Archives of Clinical Neuropsychology*, 28(5), 425-434.
- Schanche, E., Vøllestad, J., Binder, P. E., Osnes, B., Visted, E., Svendsen, J. L., & Sørensen, L. (2020). Can clinical psychology students benefit from brief and intensive mindfulness training?. *Counselling and Psychotherapy Research*, 20(2), 311-324.
- Schiller, D., & Delgado, M. R. (2010). Overlapping neural systems mediating extinction, reversal and regulation of fear. *Trends in cognitive sciences*, 14(6), 268-276.
- Schmeichel, B. J., & Tang, D. (2015). Individual differences in executive functioning and their relationship to emotional processes and responses. *Current Directions in Psychological Science*, 24(2), 93-98.
- Schnurr, P. P., & Lunney, C. A. (2016). Symptom benchmarks of improved quality of life in PTSD. *Depression and Anxiety*, 33(3), 247-255.
- Schnyder, U., Ehlers, A., Elbert, T., Foa, E. B., Gersons, B. P., Resick, P. A., ... & Cloitre, M. (2015). Psychotherapies for PTSD: what do they have in common?. *European Journal of Psychotraumatology*, 6(1), 28186.

- Scoglio, A. A., Rudat, D. A., Garvert, D., Jarmolowski, M., Jackson, C., & Herman, J. L. (2018). Self-compassion and responses to trauma: The role of emotion regulation. *Journal of Interpersonal Violence, 33*(13), 2016-2036.
- Scult, M. A., Knodt, A. R., Swartz, J. R., Brigidi, B. D., & Hariri, A. R. (2017). Thinking and feeling: individual differences in habitual emotion regulation and stress-related mood are associated with prefrontal executive control. *Clinical Psychological Science, 5*(1), 150-157.
- Seligowski, A. V., Miron, L. R., & Orcutt, H. K. (2015). Relations among self-compassion, PTSD symptoms, and psychological health in a trauma-exposed sample. *Mindfulness, 6*(5), 1033-1041.
- Shalev, A., Liberzon, I., & Marmar, C. (2017). Post-traumatic stress disorder. *New England Journal of Medicine, 376*(25), 2459-2469.
- Shilling, V. M., Chetwynd, A., & Rabbitt, P. M. A. (2002). Individual inconsistency across measures of inhibition: An investigation of the construct validity of inhibition in older adults. *Neuropsychologia, 40*(6), 605-619.
- Smith, S. R., Servesco, A. M., Edwards, J. W., Rahban, R., Barazani, S., Nowinski, L. A., ... & Green, J. G. (2008). Exploring the validity of the comprehensive trail making test. *The Clinical Neuropsychologist, 22*(3), 507-518.
- Sørensen, L., Plessen, K. J., Adolphsdottir, S., & Lundervold, A. J. (2014). The specificity of the Stroop interference score of errors to ADHD in boys. *Child Neuropsychology, 20*(6), 677-691.
- Southwick, S., Rasmusson, A., Barron, J., & Arnsten, A. (2005). Neurobiological and neurocognitive alterations in PTSD. *Neuropsychology of PTSD: Biological, cognitive, and Clinical Perspectives, 7*, 27-58.

- Sproch, L. E., Anderson, K. P., Sherman, M. F., Crawford, S. F., & Brandt, H. A. (2019). A randomized controlled trial of group cognitive remediation therapy for anorexia nervosa: Effects on set-shifting tasks for inpatient adults and adolescents. *International Journal of Eating Disorders, 52*(9), 1004-1014.
- Stanczak, D. E., Lynch, M. D., McNeil, C. K., & Brown, B. (1998). The expanded trail making test: rationale, development, and psychometric properties. *Archives of Clinical Neuropsychology, 13*(5), 473-487.
- Steenkamp, M. M., Litz, B. T., Hoge, C. W., & Marmar, C. R. (2015). Psychotherapy for military-related PTSD: a review of randomized clinical trials. *Jama, 314*(5), 489-500.
- Stevens, J. S., Jovanovic, T., Fani, N., Ely, T. D., Glover, E. M., Bradley, B., & Ressler, K. J. (2013). Disrupted amygdala-prefrontal functional connectivity in civilian women with posttraumatic stress disorder. *Journal of Psychiatric Research, 47*(10), 1469-1478.
- Stevens, J. S., Ely, T. D., Sawamura, T., Guzman, D., Bradley, B., Ressler, K. J., & Jovanovic, T. (2016). Childhood maltreatment predicts reduced inhibition-related activity in the rostral anterior cingulate in PTSD, but not trauma-exposed controls. *Depression and Anxiety, 33*(7), 614-622.
- Storr, J. (2015). Psychophysiological responses to a self-compassion meditation in trauma-exposed individuals (Doctoral thesis).
- Strauss, E., Sherman, E. M., & Spreen, O. (2006). *A compendium of neuropsychological tests: Administration, norms, and commentary*. American Chemical Society.
- Sue Baron, I. (2004). Delis-Kaplan executive function system. *Child Neuropsychology, 10*(2), 147-152.

- Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). *Using multivariate statistics* (Vol. 5). Boston, MA: Pearson.
- Tanaka, M., Wekerle, C., Schmuck, M. L., Paglia-Boak, A., & MAP Research Team. (2011). The linkages among childhood maltreatment, adolescent mental health, and self-compassion in child welfare adolescents. *Child Abuse & Neglect, 35*(10), 887-898
- Tchanturia, K., Davies, H., & Campbell, I. C. (2007). Cognitive remediation therapy for patients with anorexia nervosa: preliminary findings. *Annals of General Psychiatry, 6*(1), 14.
- Tchanturia, K., Giombini, L., Leppanen, J., & Kinnaird, E. (2017). Evidence for cognitive remediation therapy in young people with anorexia nervosa: Systematic review and meta-analysis of the literature. *European Eating Disorders Review, 25*(4), 227-236.
- Teper, R., Segal, Z. V., & Inzlicht, M. (2013). Inside the mindful mind: How mindfulness enhances emotion regulation through improvements in executive control. *Current Directions in Psychological Science, 22*(6), 449-454.
- Tesh, M., Learman, J., & Pulliam, R. M. (2015). Mindful self-compassion strategies for survivors of intimate partner abuse. *Mindfulness, 6*(2), 192-201.
- Thompson, B. L., & Waltz, J. (2008). Self-compassion and PTSD symptom severity. *Journal of Traumatic Stress: Official Publication of the International Society for Traumatic Stress Studies, 21*(6), 556-558.
- Toplak, M. E., Bucciarelli, S. M., Jain, U., & Tannock, R. (2008). Executive functions: performance-based measures and the behavior rating inventory of executive function (BRIEF) in adolescents with attention deficit/hyperactivity disorder (ADHD). *Child Neuropsychology, 15*(1), 53-72.

- Toplak, M. E., West, R. F., & Stanovich, K. E. (2013). Practitioner review: Do performance-based measures and ratings of executive function assess the same construct?. *Journal of Child Psychology and Psychiatry*, *54*(2), 131-143.
- Trompetter, H. R., de Kleine, E., & Bohlmeijer, E. T. (2017). Why does positive mental health buffer against psychopathology? An exploratory study on self-compassion as a resilience mechanism and adaptive emotion regulation strategy. *Cognitive Therapy and Research*, *41*(3), 459-468.
- Ullman, S. E., Townsend, S. M., Filipas, H. H., & Starzynski, L. L. (2007). Structural models of the relations of assault severity, social support, avoidance coping, self-blame, and PTSD among sexual assault survivors. *Psychology of Women Quarterly*, *31*(1), 23-37.
- Valdez, C. E., & Lilly, M. M. (2016). Self-compassion and trauma processing outcomes among victims of violence. *Mindfulness*, *7*(2), 329-339.
- van der Horn, H. J., Liemburg, E. J., Aleman, A., Spikman, J. M., & van der Naalt, J. (2016). Brain networks subserving emotion regulation and adaptation after mild traumatic brain injury. *Journal of Neurotrauma*, *33*(1), 1-9.
- van Noort, B. M., Kraus, M. K. A., Pfeiffer, E., Lehmkuhl, U., & Kappel, V. (2016). Neuropsychological and behavioural short-term effects of cognitive remediation therapy in adolescent anorexia nervosa: A pilot study. *European Eating Disorders Review*, *24*(1), 69-74.
- Vania, Y. T. (2017). *Self-compassion and attention: Self-compassion Facilitates Disengagement from Negative Stimuli* (Doctoral dissertation).
- van Rooij, S. J., & Jovanovic, T. (2019). Impaired inhibition as an intermediate phenotype for PTSD risk and treatment response. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, *89*, 435-445.

- Vettese, L. C., Dyer, C. E., Li, W. L., & Wekerle, C. (2011). Does self-compassion mitigate the association between childhood maltreatment and later emotion regulation difficulties? A preliminary investigation. *International Journal of Mental Health and Addiction, 9*(5), 480
- Waid-Ebbs, J. K., Wen, P. S., Heaton, S. C., Donovan, N. J., & Velozo, C. (2012). The item level psychometrics of the behaviour rating inventory of executive function-adult (BRIEF-A) in a TBI sample. *Brain Injury, 26*(13-14), 1646-1657.
- Wagner, S., Helmreich, I., Dahmen, N., Lieb, K., & Tadić, A. (2011). Reliability of three alternate forms of the trail making tests a and B. *Archives of Clinical Neuropsychology, 26*(4), 314-321.
- Walter, K. H., Palmieri, P. A., & Gunstad, J. (2010). More than symptom reduction: Changes in executive function over the course of PTSD treatment. *Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies, 23*(2), 292-295
- Weathers, F. W., Litz, B. T., Keane, T. M., Palmieri, P. A., Marx, B. P., & Schnurr, P. P. (2013). The ptsd checklist for dsm-5 (pcl-5). *Scale available from the National Center for PTSD at www.ptsd.va.gov.*
- Wilkins, K. C., Lang, A. J., & Norman, S. B. (2011). Synthesis of the psychometric properties of the PTSD checklist (PCL) military, civilian, and specific versions. *Depression and Anxiety, 28*(7), 596-606.
- Williams, L. M., Kemp, A. H., Felmingham, K., Barton, M., Olivieri, G., Peduto, A., ... & Bryant, R. A. (2006). Trauma modulates amygdala and medial prefrontal responses to consciously attended fear. *Neuroimage, 29*(2), 347-357.
- Williams, M. R., Murphy, C. M., Dore, G. A., Evans, M. K., & Zonderman, A. B. (2017). Intimate partner violence victimization and cognitive function in a

mixed-sex epidemiological sample of urban adults. *Violence and Victims*, 32(6), 1133-1148.

Wood, L., Al-Khairulla, H., & Lask, B. (2011). Group cognitive remediation therapy for adolescents with anorexia nervosa. *Clinical Child Psychology and Psychiatry*, 16(2), 225-231.

Woodruff, S. C., Glass, C. R., Arnkoff, D. B., Crowley, K. J., Hindman, R. K., & Hirschhorn, E. W. (2014). Comparing self-compassion, mindfulness, and psychological inflexibility as predictors of psychological health. *Mindfulness*, 5(4), 410-421.

Wykes, T., & van der Gaag, M. (2001). Is it time to develop a new cognitive therapy for psychosis—cognitive remediation therapy (CRT)? *Clinical Psychology Review*, 21(8), 1227-1256.

Zeller, M., Yuval, K., Nitzan-Assayag, Y., & Bernstein, A. (2015). Self-compassion in recovery following potentially traumatic stress: Longitudinal study of at-risk youth. *Journal of Abnormal Child Psychology*, 43(4), 645-653.

Zepinic, V. (2015). Treatment resistant symptoms of complex PTSD caused by torture during war. *Canadian Social Science*, 11(9), 26-32.

Zylowska, L., Smalley, S. L., & Schwartz, J. M. (2009). Mindful awareness and ADHD. In *Clinical handbook of mindfulness* (pp. 319-338). Springer, New York, NY.

Parts of the output for this paper was generated using Qualtrics software, Version March 2020 of Qualtrics. Copyright © 2020 Qualtrics. Qualtrics and all other Qualtrics product or service names are registered trademarks or trademarks of Qualtrics, Provo, UT, USA. <https://www.qualtrics.com>

Appendix A

Ethics Approval

ethics@exeter.ac.uk

Tue 22/10/2019 17:48

To: Miles, Tamsin

Cc: Karl, Anke



Dear Tamsin Miles,

Application ID: **eCLESPsy001022 v8.1**

Title: **Do differences in executive function alter the effectiveness of self-compassion inductions in PTSD?**

Your e-Ethics application has been reviewed by the CLES Psychology Ethics Committee.

The outcome of the decision is: **Favourable**

Potential Outcomes

<i>Favourable:</i>	The application has been granted ethical approval by the Committee. The application will be flagged as Closed in the system. To view it again, please select the tick box: View completed
---------------------------	---

Appendix B

Information and consent forms



Participant Information Sheet

Title of Project: Do differences in executive function alter the effectiveness of self-compassion inductions in PTSD?

Researcher name: Tamsin Miles

Invitation and brief summary:

Thank you for your interest in supporting this study.

My name is Tamsin Miles and I am a Trainee Clinical Psychologist based at the University of Exeter. I am doing research to understand how different effects associated with experiencing significantly stressful life events, can affect the effectiveness of particular therapeutic interventions.

I would like to invite you to take part in this follow-up study. However, before you make a decision whether or not you would like to take part, please read this information sheet carefully. Please take time to consider the information carefully and to discuss it with family or friends if you wish. If you have any questions after reading this, please feel free to contact me directly (contact details are given below). *Thank you for taking the time to read this.*

Purpose of the research:

We know that stressful life events can affect our ability to show ourselves compassion. We also know that they can affect different functions in the brain such as thinking skills and how we regulate our emotions. This study aims to investigate how those difference in thinking affects the ability to increase self-compassion. This could be useful to help support people who have experienced traumatic life events and who are struggling to make use of some of the resources available.

What would taking part involve?

Taking part in this follow-up study involves having a short telephone conversation to complete some screening questions, this should take no more than 10 minutes.

Following this you will be sent details of a questionnaire to complete at home, this should take around 10-15 minutes. A meeting would then follow, taking no more than an hour, to go through a number of questionnaires and for you to listen to a short recording. We would meet at a mutually convenient location.

Any information collected from you as a result of the call and meeting, will be anonymised and kept in a secure database. All details will remain confidential and secure.

What are the possible benefits of taking part?

We hope that this research will contribute to our understanding of how best to support people who are experiencing distress as a result of traumatic experiences. It is envisaged that this can inform which interventions may be most helpful.

What are the possible disadvantages and risks of taking part?

Being part of this research will involve you giving up your time to complete the questions over the phone, and face to face with me. Some individuals may find some of the questions difficult or upsetting, in that case. If for any reason you find the survey distressing or you have concerns, please contact myself as soon as possible. If we determine that additional support is necessary, we will support you to access immediate support, e.g. through your GP.

These help lines and websites may also be helpful:

- Combat Stress. Helpline: 0800 1381 619 (24 hours)
- Post-traumatic stress disorder. www.ptsd.org.uk. For ex-servicemen and women, and anyone who has PTSD.
- Anxiety UK. Helpline: 08444 775 774 (Monday to Friday 9.30am to 5.30pm), www.anxietyuk.org.uk. Provides fact sheets for anxiety disorders (including PTSD).
- ASSIST trauma care. Helpline: 01788 560 800, www.assisttraumacare.org.uk. Support, understanding and therapy for people experiencing PTSD, and families and carers.

What will happen if I don't want to carry on with the study?

It is up to you whether or not to take part. If you do decide to take part, please return the enclosed 'consent to participate' sheet to me. I will then contact you via telephone to discuss the research with you in more detail and give you the opportunity to ask any questions.

If you decide to take part you are still free to end your participation at any time and without giving a reason. Should you wish to withdraw, any information already collected can be destroyed. Taking part in the study will have no effect on any treatment you currently receive.

How will my information be kept confidential?

The University of Exeter processes personal data for the purposes of carrying out research in the public interest. The University will endeavour to be transparent about its processing of your personal data and this information sheet should provide a clear explanation of this. If you do have any queries about the University's processing of your personal data that cannot be resolved by the research team, further information may be obtained from the University's Data Protection Officer by emailing dataprotection@exeter.ac.uk or at www.exeter.ac.uk/dataprotection

Information will be collected by me or by a research colleague also adhering to these guidelines. This will be by phone and in face to face appointments. All data collected will be anonymised and stored within a password protected spreadsheet database.

The password protected database of personal data will be stored solely on an Exeter university computer and may only be accessed by the lead researcher and their supervisor. Completed consent forms will be scanned to a password protected file on the same computer and the originals destroyed. These files will then be destroyed within 5 years of the data collection. Only anonymised data will be held and manipulated outside of this computer. Should you wish to withdraw your data, it will be possible to do so by contacting the lead researcher at any time until April 2020. Following the completion of data analysis and publication, it will no longer be possible to remove your data from the research file.

Please indicate on the consent sheet if you would like to be informed of outcomes of the study. If so, your contact details will be kept in a secure database which will be secured separately from the research data.

Should we need to break confidentiality, for example if you were to inform us of a risk to your own or others safety, we would always inform you prior to breaking confidence.

Will I receive any payment for taking part?

Participants in the study will be entered into a draw to receive one of two vouchers to the value of £100. Other than this, there will be no financial compensation for your participation in this project.

What will happen to the results of this study?

The aim is to use this information to publish the work in an academic journal. Upon request, I will provide you with a summary about the results of the research. Please indicate on the consent sheet if you would like to be informed of outcomes of the study. Your identity will not be revealed in any report or publication.

Who is organising and funding this study?

This study has been organised and supported by the Clinical Psychology Doctorate Programme at Exeter University. The lead investigator is a trainee Clinical Psychologist within the programme.

Who has reviewed this study?

This project has been reviewed by the Research Ethics Committee at the University of Exeter (Reference Number: eCLESPsy001022 v4.4), and the NCMH research committee.

Further information and contact details

If you have any further questions about the study, please feel free to contact Tamsin Miles, the study's Principal Investigator, at tm473@exeter.ac.uk.

If you would like any advice about participating in research you can contact the Association for Research Ethics, an organization that offers information and advice on research. The address is Office 13, Cherry Drive, Durham, DH6 2BG. Telephone- 0191 520 9500. Email- info@arec.org.uk, website- <http://www.arec.org.uk/>

If you are unhappy with any aspect of the study or its communications, please contact the Chair of Psychology Ethics (Nick Moberly) on N.J.Moberly@exeter.ac.uk.

Thank you for your interest in this project



Participant Identification Number:

CONSENT FORM

Title of Project: **Do differences in executive function alter the effectiveness of self-compassion inductions in PTSD?**

Name of Researcher: Tamsin Miles

1. I confirm that I have read the information sheet dated 09/09/19 (version no.1.0) for the above project. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without my legal rights being affected.

3. I understand that relevant sections of the data collected during the study, may be looked at by members of the research team, individuals from the University of Exeter, University of Cardiff, or NCMH or [regulatory authorities], where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records.

4. I understand that taking part involves anonymised questionnaire responses to be used for the purposes of :
 - inclusion in an archive for a period of up to 2 years
 - shared with other researchers for use in future research projects
 - reports published in an academic publication

5. I agree to take part in the above project.

Name of Participant	Date	Signature
Name of researcher	Date	Signature

taking consent

When completed: 1 copy for participant; 1 copy for researcher/project file

Appendix C

Additional Protocol and Consent Forms for Remote Data Collection

Protocol for remote Data collection via Skype

Criteria:

Within EU but outside of reasonable travel distance

English as first language

Availability of Skype as a video call

Confirmation of participant's physical location at point of arrangement and reconfirmed at start of data collection session.

Availability of local contact points for risk management: Local support group, therapist, contact details for GP (per MDC risk protocol) and local emergency services.

Exclusion criteria:

Any concerns regarding the sharing of the above

Preparation for the session:

Information sharing, addendum to the consent form for remote collection.

Sending of physical material to the physical address.

Researcher to trial conducting the session over skype 2+ times prior to the first session.

Trial Skype session with participant to confirm data speed and technical setup.

Risk protocol:

At start of session physical location and risk protocol will be discussed. Should any risk be identified, the participant will be informed that the risk protocol will be conducted and local support involved as appropriate. Should contact be lost, then attempts will be made to re-contact and if this is not possible, the GP or emergency services will be contacted.

Consent to this approach will be obtained prior to continuing with the interview.



Participant Identification Number:

CONSENT FORM

Title of Project: **Do differences in executive function alter the effectiveness of self-compassion inductions in PTSD?**

Name of Researcher: Tamsin Miles

Please initial box

- 1. I confirm that I have read the information sheet dated 09/09/19 (version no.1.0) for the above project. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
- 2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without my legal rights being affected.
- 3. I understand that in order to participate via Skype, I will need to provide a home address and details of my GP. These will be kept separately from all other research information.
- 4. I understand that relevant sections of the data collected during the study, may be looked at by members of the research team, individuals from the University of Exeter, University of Cardiff, or NCMH or [regulatory authorities], where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records.
- 5. I understand that taking part involves anonymised questionnaire responses to be used for the purposes of :
 - inclusion in an archive for a period of up to 2 years
 - shared with other researchers for use in future research projects
 - reports published in an academic publication
- 6. I agree to take part in the above project.

Name of Participant Date Signature

Name of researcher taking consent Date Signature

When completed: 1 copy for participant; 1 copy for researcher/project file

Appendix D

Participant Debrief Sheet



Participant Debrief Sheet

Title of Project: Do differences in executive function alter the effectiveness of self-compassion inductions in PTSD? Researcher name: Tamsin Miles

Thank you for taking the time to support this study.

Aims of the research:

We hope to be able to understand how differences in certain cognitive skills, such as executive function, can affect how people are able to benefit from therapeutic interventions and in particular, interventions that aim to improve levels of self-compassion. This could be useful to help support people who have experienced traumatic life events and who are struggling to make use of some of the resources available.

What should I do if I feel that I need support?

Some individuals may find some of the questions difficult or upsetting, if for any reason you find completing the research distressing or you have concerns, please contact myself as soon as possible. If we determine that additional support is necessary, we will support you to access immediate support, e.g. through your GP. These help lines and websites may also be helpful:

- Combat Stress. Helpline: 0800 1381 619 (24 hours)
- Post-traumatic stress disorder. www.ptsd.org.uk. For ex-servicemen and women, and anyone who has PTSD.
- Anxiety UK. Helpline: 08444 775 774 (Monday to Friday 9.30am to 5.30pm), www.anxietyuk.org.uk. Provides fact sheets for anxiety disorders (including PTSD).
- ASSIST trauma care. Helpline: 01788 560 800, www.assisttraumacare.org.uk. Support, understanding and therapy for people experiencing PTSD, and families and carers.

What will happen if I wish to remove my data from the study?

Even after you have participated, you are still free to end your participation at any time and without giving a reason up until March 2020 at which time the data analysis will be complete. Should you wish to withdraw, please inform me and any information already collected can be destroyed up until that time. All information collected will be anonymised before use and at no point will your name be referenced.

Further information and contact details

If you have any further questions about the study, please feel free to contact Tamsin Miles, the study's Principal Investigator, at tm473@exeter.ac.uk.

Thank you again for your time

Appendix E

LEC-5 Sample

LEC-5

Listed below are a number of difficult or stressful things that sometimes happen to people. For each event check one or more of the boxes to the right to indicate that: (a) it *happened to you* personally; (b) you *witnessed it* happen to someone else; (c) you *learned about it* happening to a close family member or close friend; (d) you were exposed to it as *part of your job* (for example, paramedic, police, military, or other first responder); (e) you're *not sure* if it fits; or (f) it *doesn't apply* to you.

Be sure to consider your *entire life* (growing up as well as adulthood) as you go through the list of events.

	<i>Event</i>	<i>Happened to me</i>	<i>Witnessed it</i>	<i>Learned about it</i>	<i>Part of my job</i>	<i>Not Sure</i>	<i>Doesn't Apply</i>
1.	Natural disaster (for example, flood, hurricane, tornado, earthquake)						
2.	Fire or explosion						
3.	Transportation accident (for example, car accident, boat accident, train wreck, plane crash)						
4.	Serious accident at work, home, or during recreational activity						
5.	Exposure to toxic substance (for example, dangerous chemicals, radiation)						
6.	Physical assault (for example, being attacked, hit, slapped, kicked, beaten up)						
7.	Assault with a weapon (for example, being shot, stabbed, threatened with a knife, gun, bomb)						
8.	Sexual assault (rape, attempted rape, made to perform any type of sexual act through force or threat of harm)						
9.	Other unwanted or uncomfortable sexual experience						
10.	Combat or exposure to a war-zone (in the military or as a civilian)						
11.	Captivity (for example, being kidnapped, abducted, held hostage, prisoner of war)						
12.	Life-threatening illness or injury						
13.	Severe human suffering						
14.	Sudden violent death (for example, homicide, suicide)						
15.	Sudden accidental death						
16.	Serious injury, harm, or death you caused to someone else						
17.	Any other very stressful event or experience						

Appendix F

PCL-5 Sample

PCL-5

Instructions: Below is a list of problems that people sometimes have in response to a very stressful experience. Please read each problem carefully and then circle one of the numbers to the right to indicate how much you have been bothered by that problem in the past month.

<i>In the past month, how much were you bothered by:</i>	<i>Not at all</i>	<i>A little bit</i>	<i>Moderately</i>	<i>Quite a bit</i>	<i>Extremely</i>
1. Repeated, disturbing, and unwanted memories of the stressful experience?	0	1	2	3	4
2. Repeated, disturbing dreams of the stressful experience?	0	1	2	3	4
3. Suddenly feeling or acting as if the stressful experience were actually happening again (<i>as if you were actually back there reliving it</i>)?	0	1	2	3	4
4. Feeling very upset when something reminded you of the stressful experience?	0	1	2	3	4
5. Having strong physical reactions when something reminded you of the stressful experience (<i>for example, heart pounding, trouble breathing, sweating</i>)?	0	1	2	3	4
6. Avoiding memories, thoughts, or feelings related to the stressful experience?	0	1	2	3	4
7. Avoiding external reminders of the stressful experience (<i>for example, people, places, conversations, activities, objects, or situations</i>)?	0	1	2	3	4
8. Trouble remembering important parts of the stressful experience?	0	1	2	3	4
9. Having strong negative beliefs about yourself, other people, or the world (<i>for example, having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous</i>)?	0	1	2	3	4
10. Blaming yourself or someone else for the stressful experience or what happened after it?	0	1	2	3	4
11. Having strong negative feelings such as fear, horror, anger, guilt, or shame?	0	1	2	3	4
12. Loss of interest in activities that you used to enjoy?	0	1	2	3	4
13. Feeling distant or cut off from other people?	0	1	2	3	4
14. Trouble experiencing positive feelings (<i>for example, being unable to feel happiness or have loving feelings for people close to you</i>)?	0	1	2	3	4
15. Irritable behavior, angry outbursts, or acting aggressively?	0	1	2	3	4
16. Taking too many risks or doing things that could cause you harm?	0	1	2	3	4
17. Being "superalert" or watchful or on guard?	0	1	2	3	4
18. Feeling jumpy or easily startled?	0	1	2	3	4
19. Having difficulty concentrating?	0	1	2	3	4
20. Trouble falling or staying asleep?	0	1	2	3	4

Appendix G

Additional Correlation Analysis

Correlations (Spearman's rho)

	SCS	PCL5	BRIEF Inhibit	BRIEF Shift	BRIEF Emotional Control	BRIEF Self Monitor	BRIEF Initiate	BRIEF WM	BRIEF Plan Organise	BRIEF Task Monitor	BRIEF Organisation of Materials
SCS	1.00	-.38**	-.41**	-.57**	-.53**	-.40**	-.39**	-.45**	-.24*	-.44**	-.34**
PCL5	-.38**	1.00	.46**	.37**	.57**	.40**	.36**	.43**	.36**	.24*	0.15
BRIEF Inhibit	-.41**	.46**	1.00	.50**	.60**	.56**	.50**	.70**	.60**	.68**	.49**
BRIEF Shift	-.57**	.37**	.50**	1.00	.61**	.58**	.44**	.70**	.49**	.48**	0.22
BRIEF Emotional Control	-.53**	.57**	.60**	.61**	1.00	.56**	.45**	.49**	.40**	.34**	.26*
BRIEF Self Monitor	-.40**	.40**	.56**	.58**	.56**	1.00	.40**	.54**	.59**	.40**	.43**
BRIEF Initiate	-.39**	.36**	.50**	.44**	.45**	.40**	1.00	.56**	.75**	.47**	.45**
BRIEF WM	-.45**	.43**	.70**	.70**	.49**	.54**	.56**	1.00	.65**	.63**	.27*
BRIEF Plan Organise	-.24*	.36**	.60**	.50**	.40**	.59**	.75**	.65**	1.00	.613*	.48**
BRIEF Task Monitor	-.44**	.24*	.68**	.48**	.34**	.40**	.47**	.63**	.61**	1.00	.55**
BRIEF Organisation of Materials	-.34**	0.15	.49**	0.22	.26*	.43**	.45**	.27*	.48**	.55**	1.00

** . Correlation is significant at the 0.01 level (1-tailed).

* . Correlation is significant at the 0.05 level (1-tailed).

Appendix H

Preparation Guidelines for the Journal of Traumatic Stress

Author Guidelines

1. Online Submissions: The *Journal of Traumatic Stress* accepts submission of manuscripts online at:

<http://mc.manuscriptcentral.com/jots>

Information about how to create an account or submit a manuscript may be found online on the Manuscript Central homepage in the "User Tutorials" section or, on the Author Dashboard, via the "Help" menu in the upper right corner of the screen. Personal assistance also is available by calling 434-964-4100.

2. Article Formats: Three article formats are accepted for consideration by JTS. All page counts should include references, tables, and figures. *Regular articles* (30 pages maximum, inclusive of all text, abstract, references, tables, and figures) include research studies, quantitative systematic reviews, and theoretical articles. Purely descriptive articles or narrative-based literature reviews are rarely accepted. In extraordinary circumstances, the editors may consider longer manuscripts that describe highly complex designs or statistical procedures but authors should seek approval prior to submitting manuscripts longer than 30 pages. *Brief reports* (18 pages maximum) are appropriate for pilot studies or uncontrolled trials of an intervention, preliminary data on a new problem or population, condensed findings from a study that does not merit a full article, or methodologically oriented papers that replicate findings in new populations or report preliminary data on new instruments. *Commentaries* (1,000 words or less) involve responses to previously published *JTS* Response commentaries, submitted no later than 8 weeks after the original article is published (12 weeks if outside the U.S.), must be content-directed and use tactful language. The original author is given the opportunity to respond to accepted commentaries.

3. Double-Blind Review: As of January 1, 2017, the Journal of Traumatic Stress utilizes a double-blind review process in which reviewers receive manuscripts with no authors' names or affiliations listed in order to ensure unbiased review. To facilitate blinded review, the title page should be uploaded as a separate document from the body of the manuscript, identified as "Title Page," and should include the title of the article, the running head (maximum 50 characters) in uppercase flush left, author(s) byline and institutional affiliation, and author note (see pp. 30-37 of the APA 7th manual). Within the main body of the manuscript, tables, and figures, authors should ensure that any identifying information (i.e., author names, affiliations, institutions where the work was performed, university whose ethics committee approved the project) is blinded; a simple way to accomplish this is by replacing the identifying text with the phrase "[edited out for blind review]". In addition, language should be used that avoids revealing the identity of the authors; e.g., rather than stating, "In other research by our lab (Bennett & Kerig, 2014), we found ..." use phrases such as, "In a previous study, Bennett and Kerig (2014) found ..." Please note that if you have uploaded the files correctly, you will **not** be able to view the title page in the PDF and HTML proofs of your manuscript; however, the Editor and JTS editorial office staff can view this information.

4. Preferred and Non-Preferred Reviewers: During the submission process, authors may suggest the names of preferred reviewers; authors also may request that specific individuals not be selected as reviewers.

5. Publication Style: JTS follows the style recommendations of the 2020 *Publication Manual of the American Psychological Association* (APA; 7th edition) and submitted manuscripts must conform to these formatting guidelines. Manuscripts should use non-sexist language. Manuscripts must be formatted using letter or A4 page size, with 1 inch (2.54 cm) margins on all sides, in an APA-approved font (i.e., 10-point Lucinda Sans Unicode or Computer Modern; 11-point Arial, Calibri, or Georgia; 12-point Times New Roman). All text within figures should be formatted in a sans serif font (e.g., Arial or Calibri) with a type size between 8 and 14 points. The title page, abstract, references, table title and notes, and figure title and notes should be double-spaced; text within tables and figures can be single or double spaced based on the layout of the information. Submit your manuscript in .doc or .docx format, **not as a PDF**.

For assistance with APA style, in addition to consulting the manual itself, please note these helpful online sources that are freely available: <https://apastyle.apa.org/style-grammar-guidelines/index> and <https://owl.english.purdue.edu/owl/section/2/10/>

6. APA and JTS Style Pointers: In addition to consulting the APA 7th edition Publication Manual, the resources indexed above, and the JTS Style Sheet posted online, please consider these pointers when formatting each section of the manuscript:

1.
 1. **Tense:** Throughout the manuscript, please use past tense for everything that has already happened, including the collection and analyses of the data being reported.
 2. **Abstract:** The Main Document of the manuscript should begin with an abstract no longer than 250 words, placed on a separate page. In addition, JTS house style requires the reporting of an effect size for each finding discussed in the abstract; if there are many findings, present the range.
 3. **Participants:** Please include in this subsection of the Method section information on sample characteristics, subsample comparisons, and analyses that describe the sample but are not focused on testing the hypotheses that are the aims of your manuscript.
 4. **Procedure:** Please describe the procedure in sufficient detail so that it could be comprehended and replicated by another investigator. Identify by name the IRB or ethics committee (edited out for blind review in the submitted manuscript) that approved the research, and the manner in which consent was obtained.
 5. **Measures:** In addition to providing citations, psychometric, and validation data for each measure administered, please provide coefficient alpha from your data for each measure for which this is appropriate.
 6. **Data Analysis:** Include a separate subsection with this header in the Method section in which you describe the analyses performed, the software program(s) used, and make an explicit statement about missing data in your data set. If there are no missing data, so state; otherwise describe the extent of missing data and how they were handled in the data analyses.
 7. **Results** (and throughout): Present percentages to 1 decimal place, means and *SDs* to 2 decimal places, and exact *p* values to 3 decimal

places except for any $< .001$. Include leading zeros (e.g., 0.92) when reporting any statistic that can be greater than 1.00 (or less than -1.00). For example, there is no leading zero used when reporting correlations, coefficient alphas, standardized betas, p values, or fit indices (e.g., $r = .47$, not 0.47). Report effect sizes for analyses conducted wherever possible and appropriate.

8. **References:** Format the references using APA 7th edition style: (a) begin the reference list on a new page following the text, (b) double-space, (c) use hanging indent format, (d) italicize the journal name or book title, and (e) list alphabetically by last name of first author. If a reference has a Digital Object Identifier (doi), it must be included as the last element of the reference