University of Southampton

Faculty of Medicine, Health and Life Sciences

School of Psychology

Empathy and Self-Compassion in Posttraumatic Stress Disorder

by

Victoria Rose

(Volume 1 of 1)

This thesis is submitted in partial fulfilment of the
Degree of Doctor of Clinical Psychology

May 2008

19,106 words
(excluding abstracts, references, appendices and footnotes)

Thesis Abstract

The area of posttraumatic stress disorder (PTSD) has attracted a large amount of research interest. Research has attempted to explore both what may contribute towards an individual developing symptoms following exposure to traumatic stressor, and what may protect against severe symptoms. This thesis considers models of PTSD, together with research exploring potential risk or protective factors associated with the onset and maintenance of symptoms of PTSD. The relationship between empathy and PTSD has attracted little research, however, studies exploring vicarious or secondary traumatisation, suggest that empathy may be a risk factor for developing symptoms. An exploration of empathy and its consistent parts, including the skills of emotion recognition required in order to interact successfully and respond appropriately to others, is considered.

The empirical study examined the role of empathy and self-compassion within primary PTSD. Measures of empathy were provided in the form of a self-report scale and ratings of pleasantness and arousal when viewing emotional facial expressions. An emotion recognition task (following the paradigm of Joormann & Gotlib, 2006) was also completed to explore the association between levels of empathy and the skills of emotion recognition. It was predicted that participants with PTSD would have higher levels of empathy and lower self-compassion than accident exposed individuals with no PTSD and a non-accident exposed group. These predicted differences were not found, however, correlations revealed a positive relationship between symptom severity and some empathy subscales. Results are discussed and suggestions for future research made.

List of Contents

Posttraumatic Stress Disorder, Empathy, Emotion Recognition and Self-Compassion: A Review of the Literature.

Abstract 2

1. Introduction. 3

2. Posttraumatic Stress Disorder. 4

2.1. Diagnostic criteria for PTSD. 4

2.1.1. Reexperiencing. 5

2.1.2. Avoidance and numbing. 5

2.1.3. Increased arousal. 6

2.1.4. Duration of symptoms and type of trauma. 6

2.2. Lifetime incidence of PTSD. 6

2.3. Comorbidity. 7

2.4. Sub-clinical type. 8

3. Models of PTSD. 8

3.1. Cognitive model of PTSD. 9

3.1.2. Research exploring the cognitive model of PTSD. 10

3.2. Dual representation model. 12

3.2.1. A neurocognitive account of PTSD. 13

3.3. Overall limitations of the models of PTSD. 14

3.3.1. Empirical evidence. 15

4. Risk and protective factors that influence PTSD and symptom severity. 16

4.1. Pre-traumatic factors influencing PTSD and symptom severity. 17

4.2. Peri-traumatic components influencing PTSD and symptom severity. 18

4.3. Post-traumatic factors influencing PTSD and symptom severity. 18

4.4. Summary and limitations. 21

5. PTSD and social factors. 22

6. Empathy. 24

6.1. Why is empathy important? 25

6.2. The Interpersonal Reactivity Index (IRI). 25

6.3. Association between empathy and PTSD. 26

6.4. Neuro-cognitive mechanisms. 27

7. Emotion Recognition. 29

7.1. Populations studied using emotion recognition tasks. 29

7.2. Research designs. 30

7.3. Empirical evidence. 31

7.3.1. Gender differences in emotion recognition. 31

7.3.2. Deficits in emotion recognition. 32

7.3.3. Bias in emotion recognition. 33

7.3.4. Effect of mood and anxiety. 35

7.4. Neuroimaging studies. 35

7.5. Emotion recognition, empathy and prosocial behaviour. 37

8. Self-compassion. 38

8.1. Definition of self-compassion. 38

8.2. Self-compassion and PTSD. 39

8.3. Self-compassion and psychological therapy. 40

9. Discussion. 41

9.1. Clinical implications. 44

9.2. Future research. 45

9.3. Overall summary. 46

10. References. 47

An exploration of empathy, emotion recognition and self-compassion in posttraumatic stress disorder following a motor vehicle accident.

Abstract. 60

1. Introduction. 61

1.1. Posttraumatic Stress Disorder. 61

1.2. Empathy. 62

1.3. Emotion Recognition. 63

1.4. Self-Compassion. 65

1.5. Current study. 66

1.6. Hypotheses. 68

2. Method. 69

2.1. Design. 69

2.2. Ethics. 70

2.3. Participants. 70

2.4. Materials and Procedure. 72

2.4.1.1. Emotion Recognition Task: Materials. 72

2.4.1.2. Emotion Recognition Task: Procedure. 73

2.4.2.1. Valence and Arousal Rating Computer Task: Materials. 74

2.4.2.2. Valence and Arousal Rating Computer Task: Procedure. 74

2.4.3. Interpersonal Reactivity Index (IRI) (Davis, 1980). 75

2.4.4. Self-Compassion Scale (SCS) (Neff, 2003). 76

2.4.5. Social Phobia Inventory (SPIN) (Connor et al., 2000). 77

2.4.6. Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983). 77

2.4.7. Marlowe-Crowne Social Desirability (Crowne & Marlowe, 1960). 78

2.4.8. Procedure for the session. 78

3. Results. 80

3.1. Social desirability. 80

3.2. PTSD and Emotion Recognition. 80

3.2.1. PTSD and emotion identification accuracy. 80

3.2.2. PTSD and emotion expression intensity. 80

3.3. PTSD and Empathy. 82

3.3.1. PTSD and the Interpersonal Reactivity Index. 82

3.3.2. PTSD and ratings of mirrored pleasantness and mirrored arousal. 82

3.3.2.1. Mirrored Pleasantness Ratings. 83

3.3.2.2. Mirrored Arousal Ratings. 83

3.4. PTSD and self-compassion. 84

3.5. Association: PTSD, emotion recognition, empathy and self-compassion. 84

3.5.1. PTSD, emotion recognition and empathy. 84

3.5.2. PTSD and self-compassion. 86

4. Discussion. 86

4.1. Summary of the findings. 87

4.2. Interpretation of the findings. 88

4.3. Limitations and strengths of the study. 90

4.3.1. Statistical power calculations. 91

4.4. Clinical implications. 92

4.5. Future directions. 93

5. References. 94

List of the Appendices. 100

Appendix A - Information for authors: Clinical Psychology Review. 101

Appendix B - Interpersonal Reactivity Index – Further Information 104

Appendix C - Information for authors: Behaviour Research & Therapy. 106

Appendix D - Note of Ethical Approval. 112

Appendix E - Participant Consent Form. 113

Appendix F - Information Sheet. 114

Appendix G - Verbal Instructions for Emotion Recognition Task. 118

Appendix H - Visual Aid for Emotion Recognition Task Instructions. 119

Appendix I - Visual Aid for Pleasantness and Arousal Ratings. 120

Appendix J - Participant Debriefing Statement. 121

Appendix K - Results Table 1 – Emotion Recognition Task and Mirrored Ratings. 122

Appendix L - Results Table 2 – Empathy and Self-Compassion. 124

Appendix M - Results Table 3 – PTSD Symptom Severity, Empathy, Mirrored Ratings and Intensity of Expression 126

Appendix N - Results Table 4 – PTSD Symptom Severity and Self-Compassion 127

References for Appendices. 128

Acknowledgements

I would like to express my thanks to my research supervisor, Dr. Anke Karl, who has provided support and advice throughout the research process. I would also like to thank Jutta Joormann and Ian Gotlib for kindly providing their emotion recognition paradigm for use in this study, and to Dr. Matt Garner and Jin Zhang for their technical assistance in this regard. I would like to thank Anna Jepson for her support and contribution within the wider investigation of the psychological consequences of motor vehicle accidents, together with thanks to Amanda and Sandra. A special thank you to my partner, Christopher Burfoot, for giving me the time and the encouragement to complete the work. Finally, I am very grateful to everyone who participated in the study.

Posttraumatic Stress Disorder, Empathy, Emotion Recognition and Self-Compassion: A Review of the Literature.

Victoria Rose

Doctoral Programme in Clinical Psychology

School of Psychology

University of Southampton

(Prepared for submission to the Clinical Psychology Review

see Appendix A for instructions to authors).

Posttraumatic Stress Disorder, Empathy, Emotion Recognition and Self-Compassion: A Review of the Literature.

Abstract

As not everybody who is exposed to a traumatic stressor goes on to develop posttraumatic stress disorder (PTSD), researchers have attempted to explore potential vulnerability factors. This review provides an account of the literature examining pre-trauma, peri-traumatic and post-traumatic components that may influence the onset and maintenance of PTSD. A link between social elements and PTSD is highlighted before introducing and exploring the association between empathy and emotion recognition, and the development and maintenance of symptoms of PTSD. Moving away from social components, self-compassion is defined and explored as a factor that might provide protection to an individual during times of adversity, such as following exposure to a traumatic stressor.

Posttraumatic Stress Disorder, Empathy, Emotion Recognition and Self-Compassion: A Review of the Literature.

1. Introduction.

Posttraumatic stress disorder (PTSD) may develop in individuals who have been exposed to a traumatic event and is characterised by symptoms of reexperiencing, hyperarousal and emotional numbing. Theorists have proposed different models of PTSD, the focuses of which have considered different elements of the disorder. These include the influence of dysfunctional thoughts (Ehlers & Clark, 2000) and consideration of internal processes and memory (Brewin, Dalgleish, & Joseph, 1996; Brewin, 2001).

The impact of PTSD symptomatology on the individual and on their interpersonal relationships has attracted some research interest. Researchers such as Riggs, Byrne, Weathers, and Litz (1998) have reported that individuals with PTSD may experience difficulties within their intimate relationships. Two examples of this are the impact of the symptoms of emotional numbing on the individual and their daily life and activities, and hyperarousal symptoms which may lead to misunderstanding when relating to others, resulting in conflict (Riggs et al., 1998).

This review will offer an outline of research into PTSD, empathy and the association between the two. The first part will offer a description of PTSD and its diagnostic criteria as symptoms will be revisited throughout the review, before moving on to look at different models of PTSD to provide a theoretical framework within which to

contextualise the subsequent risk factors associated with its onset and maintenance. The latter part of the review will introduce research into empathy, emotion recognition and self-compassion.

To identify potentially relevant studies for inclusion in this review literature searches were conducted using the following online databases: Psychinfo, Ovid, Medline, CSA Illuminia, Scopus, Informaworld, and ScienceDirect. Keywords included in the searches: a) posttraumatic stress disorder, PTSD, trauma, traumatic stress, traumatisation, vicarious/secondary traumatisation, b) emotion recognition, facial emotions, emotional expressions, fear recognition, anger recognition, c) motor vehicle accident, accident, road traffic accident, d) empathy, compassion, prosocial behaviour, e) self-compassion, f) emotional intelligence, g) emotion regulation, h) social support, coping. To narrow the resources found, terms 'b' to 'h' above were cross-referenced to the terms in 'a' above. Articles were selected if written and published in English language. In addition, articles referenced by the studies identified in the search were explored as a source of potentially relevant studies.

2. Posttraumatic Stress Disorder.

2.1. Diagnostic criteria for PTSD.

The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) (American Psychiatric Association, APA, 2000) lists PTSD as an anxiety disorder that may occur following exposure to "an extreme traumatic stressor" (p.463). The stressor may involve either actual or threatened serious injury, death, or "other threat to one's physical integrity" (p.463) or witnessing the same in another person, or discovering

the same about a family member or someone with whom one is closely associated. In adults this stressor must be met with "intense fear, helplessness, or horror" (p.463) whereas in children a disorganised or agitated behavioural component must be met in order to receive a formal diagnosis. PTSD is characterised by reexperiencing of the traumatic event, avoidance of associated stimuli, general numbing and increased arousal (APA, 2000).

2.1.1. Reexperiencing.

The individual reexperiencing the event may typically find themselves having involuntary intrusive memories or nightmares of the event, which may occur as if the traumatic event were currently happening; during the flashbacks the individual may be aware of sights, sounds, smells, images or physical sensations that they experienced during the traumatic event. Dissociative states may be experienced lasting from a few seconds to longer periods of time (minutes, hours or even days) during which the individual may behave as if the traumatic event were currently occurring (APA, 2000).

2.1.2. Avoidance and numbing.

The avoidance criterion that needs to be met for diagnostic purposes relates to the individual avoiding situations, people or events that they have associated with the trauma, and any cognitions, conversation or feelings that remind them of the traumatic event. The person may also experience feeling emotionally numb, detached from others or unable to have any loving feelings, or they may have a general decrease in their interests or activities, or a sense that their future life has been adversely affected as a result of the trauma (APA, 2000).

2.1.3. Increased arousal.

The increased arousal criterion refers to symptoms including hyperarousal and hypervigilance, which may result in an interrupted sleeping pattern, an increased startle response and difficulty concentrating (APA, 2000).

2.1.4. Duration of symptoms and type of trauma.

Symptoms experienced within the first month of a traumatic stressor may be labelled Acute Stress Disorder; however, if symptoms persist beyond that time, are present for at least one month and result in significant levels of distress or impairment in some aspect of the person's daily functioning (such as at work or in their social life and interactions) then a diagnosis of PTSD should be made (APA, 2000). The PTSD may be specified as being acute (if symptoms are present for less than three months), chronic (if three months or less) and with delayed onset (if symptoms begin six months or more after the traumatic event). In terms of the type of traumatic event to which somebody is exposed, the term Type I refers to a single traumatic stressor, for example, a motor vehicle accident, and Type II refers to longstanding and repeated stressors, such as may be the case in individuals who have experienced childhood sexual abuse.

.2.2. Lifetime incidence of PTSD.

The prevalence of PTSD following a traumatic event appears to vary depending upon the type of traumatic event to which an individual has been exposed. The lifetime incidence of exposure to a traumatic event in the U.S. has been stated to be in the region of 50-60% (Ozer, Best, Lipsey, & Weiss, 2003) and does not vary across

gender (Hapke, Schumann, Rumpf, John, & Meyer, 2006). Whilst not everybody who is exposed to a traumatic stressor will go on to develop PTSD, of the individuals who do, a number will find it persists for several years. In one study for example, three years post motor vehicle accident 11% of participants still met with DSM-IV criteria for diagnoses of PTSD (Mayou, Ehlers, & Bryant, 2002). Research has attempted to explore what may make some people more likely to develop symptoms following exposure to a traumatic event, and what may maintain the disorder. Pre-traumatic, peri-traumatic and post-traumatic predictors and risk factors have all been associated with vulnerability to symptoms of PTSD (Gil, 2005).

The lifetime incidence of PTSD (in adult population in the United States of America) has been reported in the region of 8% (APA, 2000; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995; Vieweg et al., 2006), and around 1.4% (Hapke et al., 2006). Studies have found a significantly higher lifetime incidence of PTSD in women than in men (10.4%:5% reported by Kessler et al., 1995, the 2:1 ratio also reflected by Norris, 2001, and up to four times higher in women than men, Vieweg et al., 2006).

2.3. Comorbidity.

Comorbidity of PTSD with other disorders is not uncommon. PTSD may be associated with disorders of mood, such as major depressive disorder, bipolar disorder, and with substance misuse disorders, or with anxiety disorders including agoraphobia, social and specific phobias, generalised anxiety disorder and obsessive compulsive disorder (APA, 2000) and chronic pain (Otis, Keane, & Kerns, 2003). These comorbid difficulties may have been present prior to the onset of PTSD, or may occur concurrently with or be subsequence to onset (APA, 2000).

Commonalities between some of the PTSD criterions (such as avoidance and increased arousal) and the symptoms of other disorders may partly explain the reason for comorbidity (Kessler et al., 1995).

2.4. Sub-clinical type.

Whilst individuals who do not meet the full DSM criteria cannot be diagnosed with PTSD, they may experience significant levels of distress through symptoms such as reexperiencing and hyperarousal, and their lives may be disrupted by avoidance of stimuli associated with the traumatic event. The DSM states that an individual must experience at least three symptoms from the avoidance/numbing criterion (APA, 2000); failure to fulfil this criterion is the most typical way for an individual not to receive a formal diagnosis of PTSD (Koch, 2002). This sub-clinical level of PTSD has, for research purposes, been referred to as 'subsyndromal' PTSD and has enabled study of lives adversely affected following a trauma but who do not have a full diagnosis of PTSD (Blanchard & Hickling, 2004). In order to be identified as experiencing subsyndromal PTSD, the DSM criteria A (experiencing or witnessing threat to life or physical integrity met by a fearful, helpless or horror response) and B (reexperiencing symptoms) plus either C (avoidance) or D (hyperarousal) must be fulfilled (Blanchard & Hickling, 2004).

3. Models of PTSD.

Researchers attempting to theorise what is known about the disorder have proposed varying models of PTSD. This section will look at the cognitive model of PTSD (Ehlers & Clark, 2000) and the dual representation model (Brewin et al., 1996),

together with the neurocognitive update to the dual representation model (Brewin, 2001), and outline how they propose the formation and maintenance of symptoms of PTSD.

3.1. Cognitive model of PTSD.

Ehlers and Clark's (2000) cognitive model of persistent PTSD identifies that whilst symptoms of PTSD such as reexperiencing, hyperarousal or avoidance may be common following exposure to a traumatic event, the persistence with which they ensue indicates unhelpful processing of the trauma. This processing leads to the individual's perceived sense of the trauma being a significant current threat.

In the model, the nature of the trauma memory is influenced by pre-traumatic elements such as the individual's prior experiences, peri-traumatic factors such as details and appraisals of the trauma and its sequelae, and peri- and post-traumatic components such as the individual's beliefs and coping strategies that influence their cognitive processing during the event and feed into the trauma memory post-trauma. Post-trauma, both the trauma memory and the individual's negative assessment of the traumatic event influence the current sense of threat experienced, leading to the symptoms of PTSD such as reexperiencing, physiological hyperarousal and powerful negative emotions. These in turn have a bi-directional relationship with strategies employed by the individual to try to manage the current sense of threat and unpleasant symptoms. By avoiding stimuli associated with the event, the trauma memory cannot be rewritten or elaborated upon or put into a context of time and place; the sense of current threat continues and attempts at thought-suppression may result in an increase in thoughts about the traumatic event; hyperarousal persists as

avoidance of associated stimuli does not enable the individual to challenge or disconfirm negative appraisals and generalisations made about the event, themselves, others or the world and these continue to negatively influence mood (secondary emotions).

The model offers a cognitive account of why some people develop PTSD following a traumatic event, and how PTSD is maintained. It also offers an explanation of how to address the contributing components within psychological therapy to provide effective treatment.

3.1.2. Research exploring the cognitive model of PTSD.

Support for the Ehlers and Clark (2000) cognitive model of persistent PTSD has been offered by studies such as that of Dunmore, Clark, and Ehlers (2001). A population of adults (N = 57) who had experienced either physical or sexual assault in the preceding four months were invited to complete an interview and questionnaires measuring components relating to: cognitive processing style during the assault (such as mental defeat and detachment); negative appraisals of the sequelae of the trauma (including negative appraisals of the symptoms initially experienced post-trauma, perception of the responses of others, and perception of permanent change following the trauma); trauma sensitive beliefs (both prior to and post-assault); and finally a questionnaire examining maladaptive control strategies (in the month following the traumatic event). A measure of mood (BDI: Beck, Rush, Shaw, & Emery, 1979) and symptom severity (PTSD Symptom Scale: Self-Report, PSS-SR: Foa, Riggs, Dancu, & Rothbaum, 1993) were also completed and repeated every month until nine months post-trauma. It was found that at six and nine-month follow-up, the cognitive factors

significantly related to symptom severity were peri-traumatic processing (including mental defeat, detachment and mental confusion), initial post-trauma interpretations of PTSD symptoms, coping strategies such as safety seeking and avoidance behaviour, and post-assault trauma sensitive beliefs (Dunmore et al., 2001). One limitation acknowledged in this study was the relatively small sample size (Dunmore et al., 2001).

Another study exploring the cognitive model of PTSD (Ehlers & Clark, 2000) found preliminary support for key components of the model with a population of children who developed PTSD following motor vehicle accidents (MVAs) (Stallard, 2003). Comparing children (N = 97) (aged 7–18 years, mean age 14.5 years) who met diagnostic criteria for PTSD six weeks post-MVA (assessed using the Clinician Administered PTSD Scale for Children (CAPS-C: Nader, Kriegler, Blake, & Pynoos, 1994) with those who did not, a measure assessing coping strategies (Kidcope: Spirito, Stark, & Williams, 1988) and a semi structured interview were conducted. Of these, 14 items were identified as relating to Ehlers and Clark's model and selected for analysis. Significant associations were found between the onset of PTSD and subjective trauma severity, appraisals of the trauma sequelae, some elements of behavioural avoidance, and the maintaining cognitive factors of distraction and rumination. Components of thought suppression, avoidance of accident related stimuli, and elements relating to trauma memory were found not to be significant in the development of PTSD (Stallard, 2003). It was proposed that the significant associations found offer preliminary support for the applicability of key components of the Ehlers and Clark (2000) model to children, however, as the participating children were met once six-weeks post accident, it is not possible to state whether persistence of symptoms was supported by the model beyond that time.

3.2. Dual representation model.

Another model of PTSD was that of Brewin et al. (1996) who proposed a dual representation account. They asserted that the nature of trauma memories were distinct from that of 'normal' memories and were therefore represented differently within the memory system. The two memory systems were proposed to work in parallel, one relating to Verbally Accessible Memory (VAM) and one related to Situationally Accessible Memory (SAM) each of which take priority at different times.

The VAM is a verbal memory system that can be deliberately accessed (alongside other autobiographical memories) but that contains only information that has been consciously attended to (including pre-, peri- and post-trauma components). During a traumatic event, attention is directed toward the source of threat but the amount of information that can be consciously attended to is reduced by the individual's high levels of physiological arousal, resulting in "prematurely inhibited processing" (Brewin et al., 1996, p.683). VAM are associated both with primary emotions, those experienced during the trauma, and with secondary emotions, those experienced post-trauma as a result of cognitive appraisals of the traumatic event.

SAM is proposed to be responsible for the flashbacks/reexperiencing symptoms found in those with PTSD. These memories contain nonverbal information about the traumatic event that is processed automatically, including sensory, motor and physiological components such as sights, smells, sounds, increased heart rate, temperature changes, and pain. Both encoding and retrieval of SAM is involuntary

and flashbacks can therefore be triggered by internal or external cues. Unlike VAM, which is accessed consciously, SAM results in flashbacks that are more vivid and which cannot be controlled because one cannot avoid the sensory, motor and physiological components that were experienced during the trauma. The nature of SAM (i.e. not having verbal content) results in these memories being difficult to communicate.

3.2.1. A neurocognitive account of PTSD.

Building on dual representation theory, Brewin (2001) introduced a neurocognitive perspective offering empirical support for the model. The release of stress hormones during exposure to a traumatic event is proposed to impair processing of the VAM because of their effect on the hippocampus. Of the material that is processed, memory deficits may occur during fleeting moments of "intense emotion" (Brewin, 2001, p. 380) resulting in fragmented and poorly ordered memory. It is reported that the information that is not processed at these times increases the likelihood of amygdala activation to subsequent reminders of the trauma and contribute to "a sense of current threat" (Brewin, 2001, p.381). Brewin (2001) suggests that reexperiencing shifts information from SAM (which is not processed via the hippocampus) to VAM. The sensory contents of flashbacks can be recoded through deliberate focussed attention; this gives the memory a context of place and time and reduces the sense of current threat (Brewin, 2001). Avoidance coping strategies employed by an individual in response to flashbacks would hinder the reprocessing of SAM. An impact of this may be to further exacerbate PTSD symptomatology which may be associated with negative affect and social withdrawal.

3.3. Overall limitations of the models of PTSD.

The cognitive model (Ehlers & Clark, 2000) proposes that distorted cognitions maintain the symptoms and thus the disorder as they lead to a current sense of threat. It is suggested that characteristics of the trauma, the individual's prior experiences, their beliefs and how they cope all contribute towards PTSD and are included within the overall model. However, these components fall outside of the components proposed to maintain PTSD in the model. In addition, non-psychological risk factors such as personality characteristics are excluded from the model. Negative appraisals hypothesising changes to personality as a result of the traumatic event are acknowledged to impact on mood.

The dual representation model (Brewin et al., 1996) offers an account of PTSD based on different memory systems, with trauma memories being distinct from non-trauma memories. The theory implies that following exposure to a traumatic event, the individual will experience symptoms of PTSD until they have successfully processed and integrated their memories of the trauma. Successful resolution of emotional processing within the memory system will occur for a number of people within the first month post-trauma and thus symptoms of hyperarousal and reexperiencing cease. Whilst the model incorporates an explanation of symptoms such as reexperiencing and suggests that avoidance (behavioural and cognitive) interferes with reprocessing of the trauma memories, emotional numbing receives little explanation within the model (Brewin & Holmes, 2003).

3.3.1. Empirical evidence.

Whilst both the cognitive and dual representation models offer accounts of PTSD, maintaining and contributing factors, one component that receives little or no attention is that of social or interpersonal factors. For example, Tarrier, Sommerfield, and Pilgrim (1999) investigated the effect of the quality of relationship with a close[1] relative on PTSD treatment outcome. Examining the expressed emotion of close relatives of people with PTSD, it was found that treatment gains were significantly higher in those with a relative with low expressed emotion than in those with high expressed emotion. Specifically, hostility and criticism were significant predictors of PTSD symptomatology. Tarrier et al. reported that these results indicated it was the poor quality relationship that adversely affected treatment outcomes rather than treatment gains reflecting positive relationships. They suggested that the negative relationship could maintain PTSD symptomatology; poor quality and negative interactions between the parties may lead to increased physiological arousal and activation of negative schema; the increased arousal within the home context may hinder habituation to PTSD arousal symptoms and further reduce the individual's ability to put the meaning of the trauma into a different context, thus hindering the progress of therapy (Tarrier et al., 1999).

Another study looked at the quality of the intimate relationships of Vietnam veterans (Riggs et al., 1998). It was found that the veterans with PTSD (and their partners) reported more relationship distress and more relationship problems than veterans without PTSD and their partners. Measures indicated that the veterans with PTSD and their partners had also made more moves towards separation and divorce. A

[1] Residing with or having close contact with.

correlation was found between PTSD symptom severity (especially relating to emotional numbing) and the amount of relationship distress (Riggs et al., 1998).

Whilst the direction of influence is not known, the above studies highlight a relationship between social and interpersonal factors, and PTSD symptomatology. If social components are salient to the onset or maintenance of PTSD then future researchers would need to give more importance to these in their proposed models. The following section will now explore research that has examined risk factors that have been associated with PTSD and symptom severity.

4. Risk and protective factors that influence PTSD and symptom severity.

Research examining the type of traumatic stressor experienced preceding the onset of PTSD symptoms has included populations of combat veterans, victims of sexual assault, survivors of natural disasters, adult survivors of childhood sexual and physical abuse, and those who have been involved in accidents such as motor vehicle accidents (Blanchard & Hickling, 2004). There has been a great deal of research interest in establishing the strength of influence of factors present within the individual and their life prior to the trauma, those that occur during the time of the traumatic event and its sequelae, and those occurring post-trauma that influence PTSD persistence. This review will now examine some of the research that has been conducted to explore factors that may contribute to the onset or maintenance of PTSD.

4.1. Pre-traumatic factors influencing PTSD and symptom severity.

Research into pre-traumatic predictors of PTSD has included exploration of pre-traumatic personality (Gil, 2005; Knežević, Opačić, Savić, & Priebe, 2005). One study exploring intrusion and avoidance symptoms found that personality (predominately the 'openness to new experience' trait on the NEO-PI revised (Costa & McCrae, 1992), completed one to two years prior to the traumatic event) predicted 13% of the intrusion scores found in participants (N = 54) 12 months following the traumatic event (air attacks); no predictor of subsequent avoidance was found (Knežević et al., 2005). Research utilising a different personality inventory (the Tridimensional Personality Questionnaire; Cloninger, 1987) completed two weeks prior to a terror attack and repeated six months after the attack, found that age and the personality dimension measuring avoidance of novel stimuli (harm avoidance) were positively associated with PTSD whilst the dimension measuring novelty-seeking was negatively related to PTSD (Gil, 2005). It was noted that pre- and post-trauma personality scores remained constant over time (Gil, 2005). One limitation of both studies was not to include other measures to examine coping style, intelligence or other sociodemographic factors.

Prior history of exposure to a traumatic event, prior family psychiatric history, and prior psychological maladjustment have all been found to have small yet significant effect sizes (Ozer et al., 2003; Brewin et al., 2000; Hapke et al., 2006). Factors such as gender, race and age at the time of the traumatic event have been found to be predictive of PTSD in some trauma populations but not in others (Brewin et al., 2000).

4.2. Peri-traumatic components influencing PTSD and symptom severity.

Peri-traumatic components are those relating to the traumatic event itself such as details of the event and how the individual responded to the situation (Gil, 2005). Research examining peri-traumatic components has reported that, in survivors of motor vehicle accidents, chronic pain resulting from physical injury sustained during the traumatic event can predict PTSD (Koch, 2002). It has been stated that a bi-directional relationship exists between pain and PTSD (Koch, 2002), however a discussion of this relationship is beyond the scope of this review.

Other peri-traumatic components found to be influential in PTSD were investigated in a meta-analysis by Ozer et al. (2003). They reported that factors such as perceived threat to life during the traumatic event, the individual's emotional responses during or immediately following the traumatic event (i.e. a very strong negative emotional reaction such as fear, horror, helplessness, shame or guilt) and dissociative experiences during or immediately after the event (Ozer et al., 2003; Mayou et al., 2002), are the strongest peri-traumatic predictors of PTSD. The severity of PTSD symptoms has also been predicted by ratings of fear and peri-traumatic dissociation (Mayou et al., 2002), mental defeat and mental confusion during interpersonal trauma (Dunmore et al., 2001).

4.3. Post-traumatic factors influencing PTSD and symptom severity.

Post-traumatic predictors of PTSD symptom severity have implicated anxiety sensitivity as a risk factor that may serve to maintain symptoms or even intensify them (Fedoroff, Taylor, Asmundson, & Koch, 2000). Other post-traumatic factors that may influence the development of PTSD or affect symptom severity include

chronic pain (Koch, 2002), coping strategies (Littleton, Horsley, John, & Nelson, 2007), social support (Brewin et al., 2000; Ozer et al., 2003; Vigil & Geary, 2008) and substance abuse (Sullivan & Holt, 2008).

Developing chronic pain as a result of a traumatic event can serve as a frequent reminder of the trauma resulting in increased emotional and physical arousal, one of the characteristic symptoms of PTSD (Koch, 2002). In addition, the chronic pain may remind the individual of his or her decline in physical health (resulting from the traumatic event) and lead them to become further distressed when comparing their perceived pre-trauma health or quality of life and their perceived current state (Koch, 2002).

When considering the predictive value of social support, the association between strength of the relationship and PTSD varied according to the amount of time that had passed since the traumatic event; for traumatic events occurring over three years ago, social support (or rather lack thereof) was found to be a stronger predictor of PTSD than in studies when less time had passed (Ozer et al., 2003). One explanation may be the opportunity to talk about the trauma that would assist with reprocessing of the event. Support from others may also help an individual to address some of the secondary emotions that have developed as a result of negative cognitions about the self, the world and others. For those with poor quality social support, this opportunity may not present itself and may exacerbate symptomatology, such as in the aforementioned study of Tarrier et al. (1999). These findings appear to highlight the important role of social support in helping the individual to process and move away from what has happened to them. Social support should not be considered only as a

post-trauma factor affecting PTSD, as both good and poor quality pre-trauma social support may affect the individual's sense of self and how they cope with adversities in their life.

A study exploring gender differences in social support following violent crime reported that one month post-trauma, similar levels of satisfaction with positive support were given, however, female participants described a greater number of negative responses from close acquaintances. This finding was associated with increased PTSD symptomatology, and linked with higher rates of comorbid depression (Andrews, Brewin, & Rose, 2003). In military populations, the effect size of social support relating to chronicity was found to be larger than in civilian populations (Brewin et al., 2000). In a population of adolescents exposed to a natural disaster, extra-familial social support was associated with lower levels of self-esteem and higher levels of depression and distress (Vigil & Geary, 2008).

Dysfunctional cognitions related to social support may also play a role in PTSD symptomatology. Post-trauma, close associates may steer away from discussing the event to avoid upsetting the traumatised individual, however, this may result in the individual withdrawing socially, assuming that others do not care or that they think the individual was (at least in part) to blame for the event (Ehlers & Clark, 2000). A significant association has been found between cognitive and behavioural avoidance coping strategies (including disengagement from trauma related thoughts and feelings) and distress (Littleton et al., 2007).

Experiencing some of the symptoms of PTSD (including intrusive recollections) in the immediate aftermath of a traumatic event is typical for many people (Mayou, Ehlers, & Bryant, 2002; Rachman, 1990) and these are therefore not considered to be reliable predictors of subsequent persistent PTSD (Steil & Ehlers, 2000). However, if the reexperiencing symptoms last for a number of months, this post-traumatic factor has been found to predict longer-term symptoms (Baum, Cohen, & Hall, 1993). These may be maintained by the individual's interpretation of the meaning of intrusive symptoms (Steil & Ehlers, 2000; Mayou et al., 2002) and by rumination about the traumatic event and attempts to suppress the intrusive memories (Mayou et al., 2002). This supports both Ehlers and Clark's (2000) model which predicts that negative appraisals about the self, the world and others all contribute to a sense of current threat and serve to maintain the symptoms of PTSD, and Brewin et al.'s (1996) model where SAM and VAM both contribute.

Andrews, Brewin, Rose, and Kirk (2000) reported that anger with others (as opposed to with self) contributed to symptoms of PTSD one month post-violent crime, as did shame, however only the latter appeared to be influential in the course of symptoms, with it remaining a significant predictor six months post-trauma.

4.4. Summary and limitations.

From the pre-traumatic, peri-traumatic and post-traumatic factors outlined above, it has been found that peri-traumatic and post-traumatic factors had greater effect sizes than pre-traumatic components (Brewin, Andrews, & Valentine, 2000). However, limitations of research design should be acknowledged. Self-report measures and interviews are reliant upon the individual's memory, both for elements experienced during the traumatic event and, in some research, for memory of pre-trauma

components. As highlighted by models of PTSD (Ehlers & Clark, 2000; Brewin et al., 1996), the nature of trauma memory is such that it can be fragmented, disjointed in time and difficult to retrieve, and negative cognitive biases can occur following exposure to trauma. Some studies have overcome this with longitudinal designs, engaging participants prior to their exposure to a traumatic event and repeating measures at certain time points following exposure to the traumatic stressor (Gil, 2005; Knežević et al., 2005). This design lends itself well to populations involved in military combat but not to the investigation of populations exposed to unpredictable traumatic events such as accidents and natural disasters (Vigil & Geary, 2008).

Brewin et al. (2000) concluded their meta-analysis of risk factors associated with the onset of PTSD by reporting that any attempt to create a 'general vulnerability model' would be ill advised. This is reflected in a number of the studies outlined above which have attempted to explore potential risk factors with homogenous PTSD populations and emphasised the misguidance of generalising findings to other PTSD populations.

5. PTSD and social factors.

Thus far this review has outlined the diagnostic criteria for PTSD, introduced models of PTSD and reviewed research which has examined factors thought to influence either the onset of symptoms following a traumatic event, or serve to maintain the disorder once it has arisen. Whilst the influence of social factors has been acknowledged, their influence either in the onset or maintenance of PTSD is less well understood.

The ability to form stable healthy social relationships may depend on some intrapersonal dispositions such as perspective taking skills and compassion for self and others. These may enable the individual to interact successfully within a social environment and develop a network of social support. A benefit of having strong social support is highlighted when an individual is exposed to a potentially traumatic event. The cognitive model (Ehlers & Clark, 2000) asserts that symptoms of PTSD decline when trauma memories are reprocessed and stored alongside autobiographical memories. Being supported to talk about the event and its impact allows those trauma memories to be processed and integrated within the memory system.

A history of shame following sexual abuse has reportedly been associated with PTSD (Tangney, Stuewig, & Mashek, 2007). Adult survivors of childhood abuse with PTSD have been reported as typically having difficulties with emotion regulation and social skills, which can adversely affect engagement with exposure therapy. One study offered two phases of treatment to traumatized survivors of childhood abuse, the first comprising skills training in emotion and social regulation, the second consisting of prolonged exposure therapy (Cloitre, Koenen, Cohen, & Han, 2002). It was reported that PTSD symptom reduction, regulation of affect and improvement in social skills all followed therapy (which still held at nine month follow up), and phase one skill acquisition predicted symptom reduction in phase two. This highlights that there is a relationship between interpersonal factors and improvement in symptoms of PTSD.

The remainder of the review will turn to examine empathy and its constituent components, and explore the literature related to emotion recognition and self-compassion.

6. Empathy.

Empathy can be described as the capacity an individual has to understand, relate and respond to the thoughts, feelings or experiences of another (Lamm, Batson, & Decety, 2007). It is constructed from both cognitive and emotional components (Davis, 1983) and is distinguishable from sympathy by the vicarious experiencing of the other person's emotions (Tangney, Stuewig, & Mashek, 2007) but also involves self-monitoring processes to regulate ones inner states (Decety & Moriguchi, 2007). The field of neuroscience has recently become interested in identifying the neurocognitive mechanisms that underlie the process of empathy, as one key function is to enable the shared representations experienced in empathy, that is, to understand the experience of another by experiencing it in oneself (Decety & Jackson, 2006).

This section will look at why empathy is important and examine a scale that has attempted to measure the construct, before moving on to consider neurocognitive research and the 'mirror neurone system' which is said to allow shared representations, before finally examining the possible relationship between empathy of PTSD.

6.1. Why is empathy important?

Empathy is considered important in a social context as it shapes our reactions to others and our subsequent behaviour (Davis, 1980). To be empathic towards another person is useful for social communication and interactions and may be of evolutionary benefit as it would confer some survival value to be able to identify with the thoughts and feelings of another and regulate these in oneself in response. With this social context in mind, empathy has been associated with pro-social behaviour (Eisenberg, 2000), moral development (Chlopan et al., 1985; Hogan, 1969) and social competence (Lawrence, Shaw, Baker, Baron-Cohen, & David, 2004).

Measures of empathy have tended to assess particular components of the construct, such as a measure of emotional aspects (Questionnaire Measure of Emotional Empathy: Mehrabian & Epstein, 1972; Balanced Emotional Empathy Scale: Mehrabian, 2000) or cognitive elements (Empathy Scale: Hogan, 1969) (Baron-Cohen & Wheelwright, 2004; Choplan, McCain, Carbonell, & Hagen, 1985), or combined both components (Baron-Cohen & Wheelwright, 2004). One criticism of these scales is that their resulting total 'empathy' score fails to take into account the components from which empathy is constructed and do not allow measurement for variation on these components within an individual.

6.2. The Interpersonal Reactivity Index (IRI).

The Interpersonal Reactivity Index (IRI) (Davis, 1980) was designed to take into account the multidimensionality of empathy. Initial construction involved pooling a number of items (including adapted items from existing scales[2], but predominantly introducing new items) to tap cognitive and emotional elements of empathy. Factor

[2] Such as the Emotional Empathy Scale of Mehrabian and Epstein (1972)

analyses revealed four common factors arising for both the male and female respondents (male: 201, female: 251). These were fantasy related items (such as strongly identifying with a character in a book), those relating to perspective taking, items relating to empathic concern, and those relating to personal distress (measuring one's emotional responses to the negative experiences of another person). Further revision and analysis resulted in the inclusion only of items loading heavily onto factors for both male and female respondents, together with the exclusion of items loading heavily onto more than one factor. The finalised version of the IRI consists of 28 items, equally divided into each of the four subscales, two concerned with cognitive factors (perspective taking and fantasy) and two relating to emotional components (empathic concern and personal distress) (Davis, 1980). The scale does not have a composite score and instead indicates individual differences in components on the subscales. Further detail can be found in Appendix B.

6.3. Association between empathy and PTSD.

Whilst having a higher empathic ability may benefit social interaction, with the difficulties associated with populations who have lower empathic ability previously outlined, one may question whether somebody could ever be too empathic. Given that one important component of empathy is to vicariously experience another person's emotions (Tangney et al., 2007), it follows that if one is highly empathic towards somebody who is describing their traumatic experience, then they too will experience the trauma vicariously and place themselves at risk of secondary traumatisation. A recent literature review (Sinclair & Hamill, 2007) documents that professionals such as therapists and carers working closely with clients who experience symptoms of PTSD may themselves be susceptible to secondary

traumatisation through hearing the accounts of their clients. Pearlman and Saakvitne (1995) identified that empathy is the highest risk factor for vicarious traumatisation. Vicarious or secondary traumatisation is evidenced in the DSM-IV-TR (APA, 2000) criterion A which states that a person may become traumatised through either having witnessed a traumatic event or hearing about a family member/close associate experiencing the same. From this, a link between empathy and PTSD in the general population is suggested.

6.4. Neuro-cognitive mechanisms.

The precise mechanism by which people become traumatised by exposure to the trauma accounts of others is not yet known, however, one potential mechanism might be via the mirror neuron system, a network of brain areas in the frontal cortex (Rizzolatti, Fogassi, & Gallese, 2006) that has been associated with empathy or the lack thereof in recent neuroscience theories (Ramachandran & Oberman, 2007). More specifically, the right somatosensory cortex (Adophs et al., 2000), the insula, anterior cingulate cortex and the right temporo-parietal region have all been reported as consisting the neurocognitive mechanisms underlying empathy (Decety & Jackson, 2006). In order to recognise the emotional experience of another person from visual presentations, it is necessary to generate in oneself the somatosensory representations of how that person might feel given the emotion displayed on their face (Adolphs, Damasio, Tranel, Cooper, & Damasio, 2000). However, the 'viewer' is also able to separate him or herself from the person they are viewing, allowing the viewer to differentiate between their empathic response and their own personal distress (Jackson, Brunet, Meltzoff, & Decety, 2006; Decety & Jackson, 2006). Blair (2005)

has reported that empathy is constructed from "a variety of dissociable neurocognitive processes" (p. 699).

A study examining empathy and neural activity monitored the brain activity of female participants while their romantic partner was in the room (Singer et al., 2004). Indications were given of whether painful stimuli would be given to themselves or their partner. It was found that the participants' bilateral anterior insula, rostral anterior cingulate cortex, brainstem and cerebellum (i.e. a neural circuitry underlying pain processing) were activated not only when receiving the painful stimuli themselves but also when it was indicated that their partner received the painful stimuli. Other brain regions were activated solely when experiencing pain themselves (posterior insula/secondary somatosensory cortex, caudal anterior cingulate cortex and the sensorimotor cortex). It was reported that the higher participants scored on the IRI subscale of empathic concern, the higher the activity in their anterior cingulate cortex and anterior insula cortex, areas particularly involved in the affective processing of the pain experience. From this it was suggested that neural activity for empathy of pain involves affective components but not the sensory components of the pain matrix (Singer et al., 2004).

Having introduced empathy this review will now turn to explore the emotion recognition literature, given the close association between the two. One aim of studies of emotion recognition has been to explore whether general deficits are present across emotions when viewed by certain populations, or if specific basis are evident either towards or away from certain emotions.

7. Emotion Recognition.

In the context of this literature review, emotion recognition refers to recognising human facial emotional expressions. In order to empathise with another person one must be able to accurately identify their emotions. Emotion recognition is considered important for social communication and interaction; detecting social cues such as the emotion in another's face allows one to regulate one's own emotions and behaviour and to gain a sense of other people's perspectives (Niedenthal, Halberstadt, Margolin, & Innes-Ker, 2000); in evolutionary terms this may confer some survival value (Darwin, 1872/1998). Cross culturally, it has been documented that facial emotional expressions are universally recognised (Ekman & Friesen, 1971; Ekman, Friesen, O'Sullivan et al., 1987), or least recognised at better-than-chance levels (Elfenbein & Ambady, 2002).

Alexithymia is a disturbance in identifying and describing the emotional feelings of oneself and others (Frewen, Dozois, Neufeld, & Lanius, 2008; Kessler, Schwarze, Filipic, Traue, & von Wietersheim, 2006). It is, however, considered to fall outside of the range of the current discussion of emotion recognition and thus will be excluded from this review and discussion of emotion recognition.

7.1. Populations studied using emotion recognition tasks.

Research incorporating emotion recognition tasks have been conducted with a number of clinical and non-clinical populations. These have included participants with anxiety disorders such as social phobia (e.g. Joormann & Gotlib, 2006), mood disorders including major depressive disorder (e.g. Joormann & Gotlib, 2006),

neuroimaging studies in PTSD (e.g. Felmingham, Bryant, & Gordon, 2003; Houlihan et al., 2006), psychopathy (e.g. Blair et al., 2004), schizophrenia (Brüne, 2005; Tsoi et al., 2007), Asperger Syndrome (Ashwin, Wheelwright, & Baron-Cohen, 2006), borderline personality disorder (Lynch et al., 2006), as well as non-clinical populations exploring high and low-trait social anxiety (Richards et al., 2002).

7.2. Research designs.

The paradigms utilised by researchers have varied both in design and complexity. Showing images of facial emotional expressions including anger, happiness, fear, sadness, disgust and surprise, participants have been presented with images such as photographs (Cooper, Rowe, & Penton-Voak, in press; Surguladze et al., 2004), images of schematic faces (Ashwin, Wheelwright, & Baron-Cohen, 2006), images of different emotions morphed together (Richards et al., 2002). Criticism that the designs were too big a departure from the 'real life' experience of emotional expressions led to the introduction of morphed emotional expression sequences, either beginning with a fully emotional facial expression and morphing into a neutral expression (Niedenthal, Halberstadt, Margolin, & Innes-Ker, 2000) or starting with a neutral expression and morphing into a fully emotional expression (Blair, Colledge, Murray, & Mitchell, 2001; Blair et al., 2004; Joormann & Gotlib, 2006), the latter design said to enable better prediction of "interpersonal functioning" (Joormann & Gotlib, 2006, p.710).

Research tasks have involved emotion and label matching, making valence ratings (Kohler, Bilker, Hagendoorn, Gur, & Gur, 2000), target matching (Tsoi et al., 2007), interpreting emotionally ambiguous facial expressions (Richards et al., 2002),

identifying emotional expressions as quickly as possible, either via presentations of images varying in intensity of emotional expression (50%, 100%) (Surguladze et al., 2004) or by looking at presentation length, or a combination of varying emotional intensity and presentation time (such as 100ms and 2,000ms durations) (Surguladze et al., 2004).

7.3. Empirical evidence.

Studies that have explored elements of empathy or emotion recognition have tended to look at both components together due to their close relationship; one needs to be able to recognise emotional expressions in order to identify with them and subsequently adapt one's behaviour. For example, it has been found that individuals who recognised fearful facial expressions more accurately also tended to behave more prosocially (Marsh, Kozak, & Ambady, 2007).

7.3.1. Gender differences in emotion recognition.

Given the previously reported increased incidence of PTSD in women, an exploration of any gender difference in emotion recognition was considered pertinent. Gender differences have been found in some of the research exploring emotion recognition. Women have been reported as being more accurate in their detection of emotional facial expressions (Hall, 1984). Using an emotion recognition paradigm in which a series of coloured pictures of neutral facial expressions were morphed to show a fully emotional expression, it was found in a non-clinical population that women were more accurate than men in detecting the emotions shown and were able to detect the emotion earlier in the sequence intensity than were men (Montagne, Kessels, Frigerio, de Haan, & Perrett, 2005). This difference was significantly marked on

accuracy for the emotional expressions of sadness and surprise, and for the intensity of expression required in order for men to identify anger and disgust (Montagne et al., 2005). From these findings it was concluded that a general effect of gender on emotion recognition was present (Montagne et al., 2005).

Another study exploring the effect of gender and sexual orientation on performance in a task of emotion recognition reported that the gender of the face being viewed affected response accuracy (Rahman, Wilson, & Abraham, 2004). Women were biased towards more accurate identification of the expressions of male faces than female faces regardless of the emotion, male participants did not show any such bias but had comparable levels of correct responses overall. Women were quicker at identifying happy, sad and neutral expressions (both genders). Exploration of sexual orientation did not yield any significant findings (Rahman et al., 2004).

7.3.2. Deficits in emotion recognition.

Certain populations have demonstrated difficulties in accurately identifying the emotional expressions of others. People who have been found to exhibit low levels of empathy also perform badly on tasks of emotion recognition (such as the participants with autism spectrum disorder in the study of Hall, Szechtman, and Mahmias, 2003). In a population of incarcerated men, those with high levels of psychopathy[3] were found to be far poorer at recognising fearful emotional expressions than the comparison group with low levels of psychopathy when performing a task looking at morphed images of facial expressions of varying intensities (Blair et al., 2004). This finding was also present in a population of children scoring highly on a measure of

[3] "characterized... by... callousness, a diminished capacity for remorse, superficial charm as well as impulsivity and poor behavioral controls" (Blair et al., 2004, p.1112)

psychopathy, as when the emotional expressions were presented in their fullest intensity, the fearful expression was likely to be mislabelled as another emotion, and the boys also required a greater intensity of emotional expression in order to accurately identify the sad facial expression (Blair et al., 2001). The poor identification of the fearful emotional expression found in studies such as these has been posited as related to emotional dysfunction and poor socialisation. In this context the antisocial behaviour remains because "the victim's distress is not aversive" (Blair et al., 2004, p.1112). Neurologically this finding has been related to dysfunction of the amygdala (Blair et al., 2004).

The presentation length and the intensity of the emotional expression has been found to influence whether or not people with clinical diagnoses of depression can accurately discriminate between different emotional expressions. Compared to an age and gender-matched group without depression, it was found that participants were less accurate at labelling emotions, specifically when judging between sad and happy expressions, when the expressions were shown at either 50% or 100% intensity for 100ms. However, when the length of presentation time was increased to 2000ms no significant difference was found between participant groups (Surguladze et al., 2004).

7.3.3. Bias in emotion recognition.

One study sought to explore whether the impairments found in social interactions in people diagnosed with major depressive disorder and social phobia might be related to biased interpretation of emotional cues in the social context (Joormann & Gotlib, 2006). Participants were presented with morphed images of facial emotional

expressions (morphed in 2% increments until the full emotional expression was shown) and asked to identify and label the emotional expression appearing on the face as quickly and accurately as they could. It was found that the group with major depressive disorder were more likely to detect sad emotional expressions earlier, and detect the happy and angry expressions later in the sequence than those with social phobia and another matched group with no clinical diagnosis. The individuals with social phobia were more likely to detect angry faces earlier in the sequence than the other two groups (Joormann & Gotlib, 2006). In contrast to research where deficits in processing emotional faces have been found, this study suggests that specific biases to certain (varying) emotions may be present in different clinical populations (Joormann & Gotlib, 2006).

An overall bias towards recognising different facial emotional expressions earlier in morphing sequences was found in a population of individuals with borderline personality disorder (BPD, Lynch et al., 2006). Compared to an age and gender matched comparison group (n = 20), the group with BPD (n = 20) required less emotional intensity in the expression to accurately identify the emotion appearing on the face (anger, disgust, sadness, fear, surprise, happiness). This heightened sensitivity to the emotions of others may lead to some of the interpersonal difficulties found in this population, for example, a mild facial expression of anger may be mistakenly perceived as a threat and negatively influence the subsequent interaction (Lynch et al., 2006).

George et al. (1998) used an emotion recognition paradigm in a single case study of a man with bipolar disorder. They found that the emotion recognition was related to

his current state. When depressed he had a negative bias, demonstrated by his tendency to label neutral faces as sad, and sad faces as very sad.

7.3.4. Effect of mood and anxiety.

A study involving mood induction (sad, happy or neutral) utilised an emotion recognition paradigm to explore whether the perceiver's mood affected their recognition of congruent and incongruent emotions (Niedenthal et al., 2000). Non-clinical participants were required to indicate when the emotion was no longer present on the face they were viewing as it morphed towards a neutral expression. Facial expressions congruent with the mood induced in the viewer were rated as lasting longer than incongruent emotions (Niedenthal et al., 2000).

The effect of level of trait anxiety on emotion recognition has been explored in a non-clinical population of high and low anxious adults. When presented with static facial images it was found that there was no significant difference in accuracy of recognition across the emotions presented (anger, disgust, fear, sadness and surprise). Response times did not differ for the disgust, sadness and surprised emotional expressions, but they were all recognised more quickly than were fearful and angry expressions (Cooper et al., in press). It was stated that this contradicted previous research that had found that perception of fear was influenced by high anxiety (Cooper et al., in press).

7.4. Neuroimaging studies.

As with the neurological components discussed in relation to empathy, there have been numerous neuroimaging studies exploring the neural substrates mediating

responses to various emotional expressions. To identify with the emotional experience of others, representations of how that person feels must be generated (using cues from their facial expressions) (Adolphs et al., 2000). Indeed, people with lesions to regions of their right somatosensory cortex[4], have been found to have impairments in their ability to recognise the emotional expressions of others (Adolphs et al., 2000).

With a non-clinical population, using photographs of facial images (Ekman & Friesen, 1978) morphed into 20% increments, Positron Emission Tomography (PET) scans have revealed that different emotional expressions elicited differing (and even dissociable) neural activity (Blair, Morris, Frith, Perrett, & Dolan, 1999). This included increased activation within the amygdala and right temporal pole in response to the increasing intensity of sad facial expressions, and increased orbitofrontal and anterior cingulate cortical activity in response to increasing intensity of angry expressions (Blair et al., 1999). Again, these regions have been associated with the mirror neurone system (Decety & Jackson, 2006).

In an Electroencephalography (EEG) study involving participants with PTSD symptomatology, it was found that participants (N = 11) with higher symptom levels (from unspecified traumatic stressors) had higher N170[5] amplitudes to angry expressions than to faces with neutral, sad, surprised or happy expressions, or non-facial images (Houlihan et al., 2006). This was reported to be a hyperarousal

[4] one of the aforementioned regions associated with the mirror neurone system

[5] The N170 is a component of the event-related potential of the EEG occurring around 170 ms after facial stimulus onset and has been associated with facial recognition. Individuals with prosopagnosia (i.e. the inability to recognise faces) have no such components.

response to anger and was associated with the hypervigilance symptoms of PTSD, with the angry face presenting as a generalised threat. However, the high amplitude to angry faces in the PTSD group did not match the amplitude levels (for any of the emotional faces) of the non-PTSD group. This overall decreased responsiveness was attributed to emotional blunting and numbing symptoms found in PTSD (Houlihan et al., 2006).

A functional magnetic resonance imaging (fMRI) study by Wicker et al. (2003) involving non-clinical participants (N = 14) reported that when images were viewed of someone looking disgusted, the neural representations of disgust in the viewer were activated. Similarly, other studies have reported the automatic activation of the neural representations of a behaviour in participants viewing the same behaviour, including pain in the study of Jackson, Meltzoff, and Decety (2005). A link between emotion recognition, empathy and the mirror neuron system was further highlighted in the fMRI study of Saarela et al. (2007). It was found that the IRI empathy subscale of personal distress correlated positively with higher activation in the left anterior insula and left inferior frontal gyrus when viewing facial images displaying provoked pain.

7.5. Emotion recognition, empathy and prosocial behaviour.

Bringing together the constructs of emotion recognition and empathy, the association between these components has been explored in different populations. Blair et al. (2004) reported that fearful faces were poorly recognised by those with psychopathy (and thus were non-aversive), and therefore did not lead to moderation of antisocial behaviour. A study that associated accurate emotion recognition with prosocial

behaviour was that of Marsh, Kozak, and Ambady (2007). They found that individuals who recognised fearful and sad facial expressions more accurately also tended to behave empathically by demonstrating prosocial behaviour, such as rating the attractiveness of a person in a photograph more highly when they knew that the result would be shared with the model.

An association has been found between social dysfunction in depression and poor recognition of a range of emotional expressions in others (Surguladze et al, 2004). Finally, a study of emotion recognition and empathy in youth offenders (Carr, Lujemeier, & John, 2005) reported that there was a positive relationship between emotion recognition (particularly of fearful faces) and empathy. It also found a negative correlation between recognition of fearful faces and self-reported acts of delinquency and physical violence. The above studies have illustrated the links between emotion recognition, empathy and social interaction.

8. Self-compassion.

8.1. Definition of self-compassion.

Self-compassion has been defined as being kind to oneself in times of adversity, "perceiving one's experiences as part of the larger human experience; and holding painful thoughts and feelings in balanced awareness" (Neff, Rude, & Kirkpatrick, 2007, p.908). It has been said that self-compassion is "directly related to feelings of compassion and concern for others" (Neff, 2003, p.224). Self-compassion is distinguishable from self-esteem as the latter is related to positive self-feelings as well as feeling valued by others, whereas self-compassion is related to caring for

oneself (Leary, Tate, Adams, Batts Allen, & Hancock, 2007). Self-compassion is important for psychological wellbeing because of the value in acknowledging distressing thoughts or feelings without over-identifying with them (Neff, 2003), and it may serve as a protective factor against PTSD (Slater, Holowka, Schorr, & Roemer, 2005).

8.2. Self-compassion and PTSD.

In relation to PTSD and to models of PTSD (Ehlers & Clark, 2000; Brewin et al., 1996), levels or skills of self-compassion may influence some of the secondary emotions experienced. For example, self-blaming appraisals following a trauma may result in a drop in mood, and if this were met with low self-compassion then symptoms may be further exacerbated. High levels of anger prior to treatment have also been reported to hinder effective exposure treatment (Foa, Riggs, Massie, & Yarczower, 1995), as has fear of anger (Forbes et al., 2008). Developing skills of self-compassion may also help the individual to tolerate the distress they are experiencing, which might alter avoidance symptoms.

Mindfulness is one of the constituent parts of self-compassion (Neff, 2003) in which a balanced view of one's own thoughts and feelings is adopted. This component appears to be one that is contrary to rumination, which is found PTSD. Rumination about the traumatic event has already been cited as a component that maintains symptomatology (Mayou et al., 2002), and it may be that people with symptoms of PTSD have lower levels of self-compassion.

As self-compassion is defined as being kind to oneself in times of adversity, research has explored whether self-compassion may serve as a protective factor during such times. Slater, Holowka, Schorr, and Roemer (2005) hypothesised that in a population of individuals who had developed symptoms of PTSD following exposure to a traumatic event, those with higher levels of self-compassion and experiential acceptance would have lower PTSD symptom levels, whilst those who ruminated and dissociated would have increased symptomatology. It was reported that higher levels of self-compassion and acceptance would enable individuals to hold in balanced awareness their thoughts and feelings when experiencing fearful memories associated with the traumatic event. This would enable new information to be introduced and less fragmented processing of the event. Slater et al. (2005) screened a non-clinical population for prior exposure to traumatic events (N = 238); participants were invited to complete measures of self-compassion, acceptance, rumination and dissociation. A significant negative correlation was found between measures of self-compassion and acceptance and symptoms of PTSD, and a significant positive correlation was found between rumination and dissociation and increased PTSD symptomatology. From this it was concluded that self-compassion and acceptance may assist the recovery process following a traumatic event (Slater et al., 2005).

8.3. Self-compassion and psychological therapy.

Elements of self-compassion may be encouraged during psychological therapy (Neff et al., 2007) with the rationale within treatment of PTSD being that this enables the individual to process the event and its corresponding emotions successfully (Slater et al., 2005). Compassionate mind training has been incorporated within cognitive behavioural interventions to aid working with problems around internal shame and

self-critical thinking (Gilbert & Irons, 2005) which may play a role in PTSD (such as for those exposed to interpersonal violence, Andrews et al., 2000, and childhood sexual abuse, Tangney et al., 2007).

The previously mentioned study of Tarrier et al. (1999) reported that poor-quality interpersonal relationships between traumatised participants and their relative negatively influenced treatment outcomes. Whilst self-compassion was not examined in the study, it may be that encouraging, within psychological therapy, components of self-compassion such as the skills of mindfulness, would enable the individual to hold in mind negative cognitions (both related to the trauma and the difficult relationship), acknowledging distress (such as flashbacks or intrusive thoughts) rather than attempting to avoid it. This type of adaptation to therapy may be supplemented by incorporation of social and emotional regulation skills such as in the aforementioned study of Cloitre et al. (2002).

9. Discussion.

Whilst there has been little by the way of research investigating empathy in relation to PTSD, it has been highlighted that social factors have a part to play in the onset and maintenance of its symptomatology. With the link between empathy and emotion recognition previously explored (Carr et al., 2005; Marsh et al., 2007), what is not clear is the nature of the relationship between empathy and PTSD. Is there a link between low levels of empathy and high symptom severity, or conversely, is there an association between high levels of empathy and higher symptom severity?

To support the case that there may be a link between low levels of empathy and high symptom severity, EEG studies have found that traumatised individuals have lower amplitudes to facial stimuli than non-traumatised participants (e.g. Houlihan et al., 2006), and of these facial stimuli, angry facial expressions received the highest amplitudes (Houlihan et al., 2006). The overall reduced amplitudes within the traumatised participant groups could be associated with depression; however, the study of Joormann and Gotlib (2006) reported increased sensitivity to recognition of sad faces within a depressed population, which was not the case within the study of Houlihan et al. (2006). One plausible explanation for the reduced sensitivity to the emotional expressions of others is the PTSD symptom of emotional numbing, which is associated with feeling detached from others or unable to have any loving feelings. Perhaps emotional numbing would lead to lower emotion recognition or poor emotion recognition lead the individual to feel detached from others and emotionally numb.

Another idea to support a possible inverse relationship between empathy and symptom severity would be that those with higher levels of empathy have been reported as having higher social competence (Lawrence et al., 2004), specifically with higher perspective taking being associated with increased social functioning and higher self-esteem (Davis, 1983). If people have superior social skills then their social interactions will be more successful; this may increase social support available to the individual. During times of adversity, social support has been shown to influence treatment outcomes (Tarrier et al., 1999). Increased quality of social support offers the individual the opportunity to talk about their traumatic experience and to reprocess trauma memories, integrating them into autobiographical memory.

Supporting the alternative notion that high empathy and emotion recognition skills are associated with higher PTSD symptom severity, individuals with higher levels of empathy are typically more accurate in their recognition of social stimuli. This could be associated with hyperarousal symptoms in PTSD, in which an individual will be hypervigilant to cues of potential threat within the social environment, including angry or fearful facial expressions. Higher empathy scores on the IRI fantasy scale have also been associated with increased predisposition to being more fearful (Davis, 1983).

To further support the idea that high empathy and emotion recognition are associated with increased symptom severity, it has been reported that women are more susceptible to developing PTSD following exposure to a traumatic stressor (Kessler et al., 1995; Norris, 2001; Vieweg et al., 2006). Studies have also reported superior performance of women on tasks of emotion recognition (Hall, 1984; Montagne et al., 2005). Finally, women have been reported to have lower levels of self-compassion (Neff, 2003), a factor that may be protective against symptoms of PTSD (Slater et al., 2005).

In final support of the relationship between high levels of empathy and PTSD is the concept of vicarious traumatisation, wherein healthcare professionals may become traumatised through hearing the accounts of their clients or patients (Pearlman & Saakvitne, 1995; Sinclair & Hamill, 2007). The mirror neurone system has been shown to activate in response to disgust and pain expressions in another person's face (Saarela et al., 2007; Singer et al., 2004; Wicker et al., 2003). Empathy is defined as comprising systems which allow differentiation between ones own and others

distress. It could be questioned whether too great a level of empathy may indicate some kind of difficulty in the mirror neurone system, which reduces the ability to be able to differentiate between ones own and others distress.

9.1. Clinical implications.

A common theme within both ideas above is the potentially higher sensitivity within PTSD populations to threatening social cues such as anger. Within a clinical context, it has also been reported that experiencing anger, and fear of anger can adversely affect treatment outcome (Foa et al., 1995; Forbes et al., 2008).

For adult survivors of childhood abuse, troubled relationships together with internalised shame may hinder the development of social skills and emotion regulation, which in turn may impede the development of a social network, which in turn limits the opportunity for the individual to rehearse and reprocess trauma memories. Cloitre et al. (2002) found introducing social and emotion regulation training, as a precursor to exposure therapy, was associated with reduction in PTSD symptoms.

Compassionate mind training has also been used within the therapeutic environment to work on issues around internal shame and self-critical thinking within populations who have been exposed to childhood sexual abuse and interpersonal violence as these influence PTSD symptoms (Gilbert & Irons, 2005; Andrews et al., 2000).

9.2. Future research.

The overall goal of research into PTSD is to provide explanations as to either why some individuals develop the symptoms and others do not, or why symptoms are maintained, or why symptoms are resistant to psychological treatment. It also provides the therapist with tools to more effectively treat the disorder and improve the psychological well-being of the client. Given the large number of people affected by the disorder (the lifetime incidence in the U.S. is estimated at between two and a half and seven million people, Blanchard & Hickling, 2004) providing a more effective treatment would be of great benefit to the mental health of the population.

PTSD and potential risk factors have been explored for a number of years and what has been found is the wide-ranging contributory factors. However, research thus far has not gone as far as to test the relationship between empathy and PTSD. Whilst a relationship has been implied within this review, the precise nature is as yet unknown. Future research should therefore attempt to understand the role empathy plays in the onset of PTSD. If higher levels of empathy leave a person vulnerable to developing symptoms of trauma then screening for this in an individual after exposure to a traumatic stressor could highlight those at risk and enable preventative action. Similarly, if lower levels of empathy leave a person vulnerable to developing PTSD then appropriate screening and preventative or early intervention could lower symptom severity.

Future research should explore the influence of factors that have not previously received satisfactory investigation, such as empathy and emotion recognition, to help further the understanding of potential risk factors for PTSD. If found to be predictive

of PTSD symptomatology, this would enable the development of appropriate screening tools and further therapeutic interventions. Self-compassion, whilst being incorporated more recently into psychological therapy, has received little exploration as an individual protective factor that might help buffer the negative impact of exposure to a traumatic stressor. It would be beneficial to understand this further.

9.3. Overall summary.

This paper has outlined models of PTSD and discussed risk factors associated with its onset and maintenance. It has shown that there are possible links between empathy, emotion recognition and PTSD. In order to empathise one needs to be able to read social stimuli such as the emotion in another's face. High levels of empathy could be associated with increased social competence, providing support to enable the individual to process the event post-trauma, suggesting that empathy could be a protective factor against symptoms. However, better recognition of the emotional expressions in others and the higher incidence of PTSD in women, suggests that empathy could be a risk factor for developing PTSD. Interestingly, levels of self-compassion are also reportedly lower in women, and self-compassion has been found to be a protective factor against symptomatology. Given the clinical advantages of better understanding the role played by empathy in PTSD, it is a relationship worthy of further investigation.

10. References.

Adolphs, R., Damasio, H., Tranel, D., Cooper, G., & Damasio, A.R. (2000). A role for somatosensory cortices in the visual recognition of emotion as revealed by three-dimensional lesion mapping. *The Journal of Neuroscience*, 20, 2683-2690.

American Psychiatric Association (APA). (2000). *Diagnostic and Statistical Manual of Mental Disorders (4th ed., text revision)*. Washington DC: American Psychiatric Association.

Andrews, A., Brewin, C.R., & Rose, S. (2003). Gender, social support, and PTSD in victims of violent crime. *Journal of Traumatic Stress,* 16, 421-427.

Andrews, B., Brewin, C.R., Rose, S., & Kirk, M. (2000). Predicting PTSD symptom in victims of violent crime: the role of shame, anger, and childhood abuse. *Journal of Abnormal Psychology,* 109, 69-73.

Ashwin, C., Wheelwright, S., & Baron-Cohen, S. (2006). Finding a face in the crowd: testing the anger superiority effect. *Brain and Cognition,* 61, 78-95.

Baron-Cohen, S., & Wheelwright, S. (2004). The empathy quotient: an investigation of adults with Asperger Syndrome or high functioning Autism, and normal sex differences. *Journal of Autism and Developmental Disorders,* 34, 163-175.

Baum, A., Cohen, L., & Hall, M. (1993). Control and intrusive memories as possible determinants of chronic stress. *Psychosomatic Medicine*. 55, 274-286.

Beck, A. T., Rush, A. J., Shaw, B. F., & Emery, G. (1979). *Cognitive therapy for depression.* New York: The Guildford Press.

Blair, R.J.R. (2005). Responding to the emotions of others: dissociating forms of empathy through the study of typical and psychiatric populations. *Consciousness and Cognition,* 14, 698-718.

Blair, R.J.R., Colledge, E., Murray, L., & Mitchell, D.G.V. (2001). A Selective Impairment in the Processing of Sad and Fearful Expressions in Children With Psychopathic Tendencies. *Journal of Abnormal Child Psychology,* 29, 491–498.

Blair, R.J.R., Mitchell, D.G.V., Peschardt, K.S., Colledge, E., Leonard, R.A., Shine, J.H., et al. (2004). Reduced sensitivity to others' fearful expressions in psychopathic individuals. *Personality and Individual Differences,* 37, 1111-1122.

Blair, R.J.R., Morris, J.S., Frith, C.D., Perrett, D.I., & Dolan, R.J. (1999). Dissociable neural responses to facial expressions of sadness and anger. *Brain,* 122, 883-893.

Blanchard, E.B., & Hickling, E.J. (2004). *After the crash: psychological assessment and treatment of survivors of motor vehicle accidents (2nd ed.).* Washington DC: American Psychological Association.

Brewin, C.R. (2001). A cognitive neuroscience account of posttraumatic stress disorder and its treatment. *Behaviour Research and Therapy,* 39, 373–393.

Brewin, C.R., Andrews, B., & Valentine, J.D. (2000). Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. *Journal of Consulting and Clinical Psychology,* 68, 748-766.

Brewin, C.R., Dalgleish, T., & Joseph, S. (1996). A dual representation theory of posttraumatic stress disorder. *Psychological Review,* 103, 670-686.

Brewin, C.R., & Holmes, E.A. (2003). Psychological theories of posttraumatic stress disorder. *Clinical Psychology Review,* 23, 339-376.

Brüne, M. (2005). Emotion recognition, 'theory of mind', and social behavior in schizophrenia. *Psychiatry Research,* 133, 135-147.

Carr, M.B., & Lutjemeier, J.A. (2005, September 22). The relation of facial affect recognition and empathy to delinquency in youth offenders. *Adolescence,* 40, 601-619.

Choplan, B., McCain, J., Carbonell, J., & Hagen, R. (1985). Empathy: a review of available measures. *Journal of Personality and Social Psychology,* 48, 635-653.

Cloitre, M., Koenen, K.C., Cohen, L.R., & Han, H. (2002). Skills training in affective and interpersonal regulation followed by exposure: a phase-based treatment for PTSD related to childhood abuse. *Journal of Consulting and Clinical Psychology,* 70, 1067-1074.

Cloninger, C. R. (1987). A systemic method for clinical description and classification of personality variants. *Archives of General Psychiatry,* 44, 573–587.

Cooper, R.M., Rowe, A.C., & Penton-Voak, I.S. (in press). The role of trait anxiety in the recognition of emotional facial expressions. *Journal of Anxiety Disorders,* doi:10.1016/j.janxdis.2007.11.010.

Costa, P. T., & McCrae, R. R. (1992). *The Revised NEO Personality Inventory Manual.* Odessa, FL: Psychological Assessment Resources.

Darwin, C. (1998). *The expression of the emotions in man and animals* (3rd ed.). Oxford, UK: Oxford University Press. (Original work published in 1872).

Davis, M.H. (1980). A Multidimensional Approach to Individual Differences in Empathy. *Journal Supplement Abstract Service (JSAS) Catalog of Selected Documents in Psychology.* 10, 85.

Davis, M.H. (1983). Measuring individual differences in empathy: evidence for a multidimensional approach. *Journal of Personality and Social Psychology,* 44, 113-126.

Decety, J., & Jackson, P.L. (2006). A social-neuroscience perspective on empathy. *Current Directions in Psychological Science,* 15, 54-58.

Decety, J., & Moriguchi, Y. (2007). The empathic brain and its dysfunction in psychiatric populations: implications for intervention across different clinical conditions. *BioPsychoSocial Medicine,* 1:22.

Dunmore, E., Clark, D.M., & Ehlers, A. (2001). A prospective investigation of the role of cognitive factors in persistent Posttraumatic Stress Disorder (PTSD) after physical or sexual assault. *Behaviour Research and Therapy,* 39, 1063–1084.

Ehlers, A., & Clark, D.M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy,* 38, 319-345.

Eisenberg, N. (2000). Empathy-related responding and prosocial behaviour. In Novartis Foundation Symposium 278. *Empathy and Fairness* (pp.71-88). Chichester, UK: John Wiley & Sons Ltd.

Ekman, P., & Friesen, W.V. (1978). *Facial action coding system.* Consulting Psychologists Press: Palo Alto (CA).

Ekman, P., & Friesen, W.V. (1971). Constants across cultures in the face and emotion. *Journal of Personality and Social Psychology,* 17, 124-129.

Ekman, P., Friesen, W.V., O'Sullivan, M., Chan, A., Diacoyanni-Tarlatzis, I., Heider, K., et al. (1987). Universals and Cultural Differences in the Judgments of Facial Expressions of Emotion. *Journal of Personality and Social Psychology,* 53, 712-717.

Elfenbein, H.A., & Ambady, N. (2002). On the universality and cultural specificity of emotion recognition: a meta-analysis. *Psychological Bulletin,* 128, 203–235.

Fedoroff, I.C., Taylor, S., Asmundson, G.J.G., & Koch, W.J. (2000). Cognitive factors in traumatic stress reactions: predicting PTSD symptoms from anxiety sensitivity and beliefs about harmful events. *Behavioural and Cognitive Psychotherapy,* 28, 5-15.

Felmingham, K.L., Bryant, R.A., & Gordon, E. (2003). Processing angry and neutral faces in posttraumatic stress disorder: an event-related potentials study. *NeuroReport,* 14, 777-780.

Foa, E. B., Riggs, D. S., Dancu, C. V., & Rothbaum, B. O. (1993). Reliability and validity of a brief instrument for assessing post-traumatic stress disorder. *Journal of Traumatic Stress,* 6, 459–473.

Foa, E.B., Riggs, D.S., Massie, E.D., & Yarczower, M. (1995). The impact of fear activation and anger on the efficacy of exposure treatment for posttraumatic stress disorder. *Behavior Therapy,* 26, 487-499.

Forbes, D., Parslow, R., Creamer, M., Allen, N., McHugh, T., & Hopwood, M. (2008). Mechanisms of anger and treatment outcome in combat veterans with posttraumatic stress disorder. *Journal of Traumatic Stress,* 21, 142-149.

Frewen, P.A., Dozois, D.J.A., Neufeld, R.W.J., & Lanius, R.A. (2008). Meta-analysis of Alexithymia in posttraumatic stress disorder. *Journal of Traumatic Stress,* 21, 243-246.

George, M.S., Huggins, T., McDermut, W., Parekh, P.I., Rubinow, D., & Post, R.M. (1998). Abnormal facial emotion recognition in depression: serial testing in an ultra-rapid-cycling patient. *Behavior Modification,* 22, 192-204.

Gil, S. (2005). Pre-traumatic personality as a predictor of post-traumatic stress disorder among undergraduate students exposed to a terrorist attack: a prospective study in Israel. *Personality and Individual Differences,* 39, 819-827.

Gilbert, P., & Irons, C. Focused therapies and compassionate mind training for shame and self-attacking. In P. Gilbert (Ed.). (2005). *Compassion: conceptualisations, research and use in psychotherapy* (pp.263-325). Routledge: Hove, England.

Hall, J.A. (1984). *Nonverbal sex differences: communication accuracy and expressive style.* Baltimore, MD: John Hopkins University Press.

Hall, G.B.C., Szechtman, H., & Mahmias, C. (2003). Enhanced salience and emotion recognition in autism: a PET study. *American Journal of Psychiatry,* 160, 1439-1441.

Hapke, U., Schumann, A., Rumpf, H.-J., John, U., & Meyer, C. (2006). Post-traumatic stress disorder: the role of trauma, pre-existing psychiatric disorders, and gender. *European Archives of Psychiatry and Clinical Neuroscience,* 256, 299–306.

Hogan, R. (1969). Development of an empathy scale. *Journal of Consulting and Clinical Psychology,* 33, 307-316.

Houlihan, M., Fraser, I., Donahue, M., Sharma, M., Bourque, W. & MacLean, M. (2006). Processing emotional face expressions in post-traumatic stress disorder, Presentation at the Forty-Sixth Annual Meeting of the Society for Psychophysiological Research. *Psychophysiology*, 43(Suppl. 1), S47.

Jackson, P.L., Brunet, E., Meltzoff, A.N., & Decety, J. (2006). Empathy examined through the neural mechanisms involved in imagining how I feel versus how you feel pain. *Neuropsychologia,* 44, 752–761.

Jackson, P.L., Meltzoff, A.N., & Decety, J. (2005). How do we perceive the pain of others? A window into the neural processes involved in empathy. *Neuroimage,* 24, 771-779.

Joormann, J., & Gotlib, I.H. (2006). Is this happiness I see? Biases in the identification of emotional facial expressions in depression and social phobia. *Journal of Abnormal Psychology,* 115, 705-714.

Kessler, H., Schwarze, M., Filipic, S., Traue, H.C., & von Wietersheim, J. (2006). Alexithymia and facial emotion recognition in patients with eating disorders. *International Journal of Eating Disorders,* 39, 245-251.

Kessler, R.C., Sonnega, A., Bromet, E., Hughes, M., & Nelson, C. (1995). Posttraumatic stress disorder in the national comorbidity survey. *Archives of General Psychiatry,* 52, 1048-1060.

Knežević, G., Opačić, G., Savić, D., & Priebe, S. (2005). Do personality traits predict post-traumatic stress?: a prospective study in civilians experiencing air attacks. *Psychological Medicine*, 35, 659-663.

Koch, W.J. (2002). Post-traumatic stress disorder and pain following motor vehicle collisions. *BC Medical Journal,* 44, 298-302.

Kohler, C.G., Bilker, W., Hagendoorn, M., Gur, R.E., & Gur, R.C. (2000). Emotion recognition deficit in schizophrenia: association with symptomatology and cognition. *Biological Psychiatry,* 48, 127-136.

Lamm, C., Batson, C.D., & Decety, J. (2007). The neural basis of human empathy - effects of perspective-taking and cognitive appraisal: An event-related fMRI study. *Journal of Cognitive Neuroscience,* 19, 42-58.

Lawrence, E.J., Shaw, P., Baker, D., Baron-Cohen, S., & David, A.S. (2004). Measuring empathy: reliability and validity of the empathy quotient. *Psychological Medicine,* 34, 911-924.

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, 887–904.

Littleton, H., Horsley, S., John, S., & Nelson, D.V. (2007). Trauma coping strategies and psychological distress: a meta-analysis. *Journal of Traumatic Stress,* 20, 977-988.

Lynch, T.R., Rosenthal, M.Z., Kosson, D.S., Cheavens, J.S., Lejuez, C.W., & Blair, R.J.R. (2006). Heightened sensitivity to facial expressions of emotion in borderline personality disorder. *Emotion,* 6, 647-655.

Marsh, A.A., Kozak, M.N., & Ambady, N. (2007). Accurate identification of fear facial expressions predicts prosocial behavior. *Emotion,* 7, 239-251.

Mayou, R.A., Ehlers, A., & Bryant, B. (2002). Posttraumatic stress disorder after motor vehicle accidents: 3-year follow-up of a prospective longitudinal study. *Behaviour Research and Therapy,* 40, 665-675.

Mehrabian, A., & Epstein, N. (1972). A measure of emotional empathy. *Journal of Personality,* 40, 525-543.

Montagne, B., Kessels, R.P.C., Frigerio, E., de Haan, E.H.F., & Perrett, D.I. (2005). Sex differences in the perception of affective facial expressions: do men really lack emotional sensitivity? *Cognitive Processing,* 6, 136-141.

Nader, K.O., Kriegler, J.A., Blake, D.D., & Pynoos, R.S. (1994). *Clinician Administered PTSD Scale for Children (CAPS-C).* Boston: National Centre for PTSD.

Neff, K.D. (2003). The development and validation of a scale to measure self-compassion. *Self and Identity,* 2, 223-250.

Neff, K.D., Rude, S.S., & Kirkpatrick, K.L. (2007). An examination of self-compassion in relation to positive psychological functioning and personality traits. *Journal of Research in Personality,* 41, 908-916.

Niedenthal, P.M., Halberstadt, J.B., Margolin, J., & Innes-Ker, A.H. (2000). Emotional state and the detection of change in facial expression of emotion. *European Journal of Social Psychology,* 30, 211-222.

Norris, F.H., Byrne, C., Diaz, E., & Kaniasty, K. (2001). 50,000 Disaster Victims Speak: An Empirical Review of the Empirical Literature, 1981 – 2001.

Otis, J.D., Keane, T.M., & Kerns, R.D. (2003). An examination of the relationship between chronic pain and post-traumatic stress disorder. *Journal of Rehabilitation Research and Development,* 40, 397-406.

Ozer, E., Best, S., Lipsey, T., & Weiss, D. (2003). Predictors of posttraumatic stress disorder and symptoms in adults: a meta-analysis. *Psychological Bulletin,* 129, 52-73.

Pearlman, L.A., & Saakvitne, K.W. (1995). *Trauma and the Therapist: countertransference and vicarious traumatisation in psychotherapy with incest survivors.* W.W. Norton & Company: London, UK.

Rachman, S. J. (1990). *Fear and courage (2nd ed.)*. New York: Freeman

Rahman, Q., Wilson, G.D., & Abrahams, S. (2004). Sex, sexual orientation, and identification of positive and negative facial affect. *Brain and Cognition,* 54, 179-185.

Ramachandran, V.S., & Oberman, L.M. (2006, November). Broken mirrors: a theory of autism. *Scientific American,* 39-45.

Richards, A., French, C.C., Calder, A.J., Webb, B., Fox, R., & Young, A.W. (2002). Anxiety-related bias in the classification of emotionally ambiguous facial expressions. *Emotion,* 2, 273-287.

Riggs, D.S., Byrne, C.A., Weathers, F.W., & Litz, B.T. (1998). The quality of the intimate relationships of male Vietnam veterans: problems associated with posttraumatic stress disorder. *Journal of Traumatic Stress,* 11, 87-101.

Rizzolatti, G., Fogassi, L., & Gallese, V. (2006, November). Mirrors in the mind. *Scientific American,* 30-37.

Saarela, M.V., Hlushchuk, Y., de C. Williams, A.C., Schürmann, Kalso, E., & Hari, R. (2007). The compassionate brain: humans detect intensity of pain from another's face. *Cerebral Cortex,* 17, 2380-237.

Sinclair, H.A.H., & Hamill, C. (2007). Does vicarious traumatisation affect oncology nurses? A literature review. *European Journal of Oncology Nursing,* 11, 348-356.

Singer, T., Seymour, B., O'Doherty, J., Kaube, H., Dolan, R.J., & Frith, C.D. (2004). Empathy for pain involves the affective but not sensory components of pain. *Science,* 303, 1157-1162.

Slater, R., Holowka, D.W., Schorr, Y., & Roemer, L. (2005, November). Rumination, dissociation, self-compassion, and acceptance as correlates of posttraumatic stress symptoms. Poster session presented at the annual convention of the Association for Advancement of Behavior Therapy, Washington, DC.

Spirito, A., Stark, L.J., & Williams, C. (1988). Development of a brief coping checklist for use with pediatric populations. *Journal of Pediatric Psychology,* 13, 555-574.

Stallard, P. (2003). A retrospective analysis to explore the applicability of the Ehlers and Clark (2000) cognitive model to explain PTSD in children. *Behavioural and Cognitive Psychotherapy,* 31, 337–345.

Steil, R., & Ehlers, A. (2000). Dysfunctional meaning of posttraumatic intrusions in chronic PTSD. *Behaviour Research and Therapy,* 38, 537-558.

Sullivan, T.P., & Holt, L.J. (2008). PTSD symptom clusters are differentially related to substance use among community women exposed to intimate partner violence. *Journal of Traumatic Stress,* 21, 173-180.

Surguladze, S., Young, A., Senior, C., Brébion, G., Travis, M., & Phillips, M. (2004). Recognition accuracy and response bias to happy and sad facial expressions in patients with major depression. *Neuropsychology,* 18, 212-218.

Tangney, J.P., Stuewig, J., & Mashek, D.J. (2007). Moral emotions and moral behavior. *Annual Review of Psychology,* 58, 345-372.

Tarrier, N., Sommerfield, C., & Pilgrim, H. (1999). Relatives' expressed emotion (EE) and PTSD treatment outcome. *Psychological Medicine,* 29, 801-811.

Tsoi, D.T., Lee, K., Khokhar, W.A., Mir, N.U., Swalli, J.S., Gee, K.A., et al. (2007). Is facial emotion recognition impairment in schizophrenia identical for different emotions? A signal detection analysis. *Schizophrenia Research,* 99, 263-269.

Vieweg, W.V.R., Julius, D.A., Fernandez, A., Beatty-Brooks, M., Hettema, J.M., & Pandurangi, A.K. (2006). Posttraumatic stress disorder: clinical features, pathophysiology, and treatment. *The American Journal of Medicine,* 119, 383-390.

Vigil, J.M., & Geary, D.C. (2008). A preliminary investigation of family coping styles and psychological well-being among adolescent survivors of Hurricane Katrina. *Journal of Family Psychology,* 22, 176–180.

Wicker, B., Keysers, C., Plailly, J., Royet, J.P., Gallese, V., & Rizzolatti, G. (2003). Both of us disgusted in *my* insula: the common neural basis of seeing and feeling disgust. *Neuron,* 40, 655-664.

An exploration of empathy, emotion recognition and self-compassion in posttraumatic stress disorder following a motor vehicle accident.

Victoria Rose

Doctoral Programme in Clinical Psychology

School of Psychology

University of Southampton

(Prepared for submission to Behaviour Research & Therapy

see Appendix C for instructions to authors).

An exploration of empathy, emotion recognition and self-compassion in posttraumatic stress disorder following a motor vehicle accident.

Abstract.

The present exploratory study was designed to examine the role of empathy, emotion recognition and self-compassion within symptoms of posttraumatic stress disorder (PTSD) following a motor vehicle accident. It was predicted that accident exposed individuals with PTSD (n = 7) would have higher levels of empathy and lower levels of self-compassion than accident exposed individuals without symptoms of PTSD (n = 10), or individuals never exposed to a motor vehicle accident (n = 18). It was further predicted that participants with PTSD would require less intensity of expression to recognise the emotion in another's face when completing an emotion recognition computer task. Results revealed that whilst participants with symptoms of PTSD were more accurate in their identification of angry faces, they required no less intensity of expression in order to label the emotion. Self-reported empathy levels were not higher in the PTSD group, nor were self-compassion levels lower. However, symptom severity was significantly correlated with some of the empathy subscales and with self-reported ratings indicating feelings of unpleasantness in response to negative facial stimuli. Implications of these findings and future research are discussed.

An exploration of empathy, emotion recognition and self-compassion in posttraumatic stress disorder following a motor vehicle accident.

1. Introduction.

1.1. Posttraumatic Stress Disorder.

Whilst exposure to a traumatic stressor is an essential prerequisite for a diagnosis of posttraumatic stress disorder (PTSD, American Psychiatric Association, APA, 2000), not everybody who experiences such an event develops the disorder. It has been reported that between 15-45% of people who have experienced a serious[6] motor vehicle accident (MVA) subsequently develop PTSD (including symptoms of intrusion, numbing and arousal) within the following 12 months (Blanchard & Hickling, 2004). One study found that three years post-accident, 11% of participants still met the Diagnostic and Statistical Manual of mental disorders (DSM-IV-TR, APA, 2000) criteria for a diagnosis of PTSD (Mayou, Ehlers, & Bryant, 2002). In the United States, a lifetime incidence of PTSD following MVA has been reported at one to three percent of the population (equating to between two and a half and seven million people) (Blanchard & Hickling, 2004).

In light of the sizable number of people affected by symptoms of PTSD following exposure to a traumatic stressor, researchers have attempted to find risk factors that may make some people more vulnerable to the disorder or influence symptom severity. These have included pre-, peri- and post-trauma factors, for example, prior

[6] Blanchard and Hickling (2004) included as 'serious' only those accidents resulting in physical injury requiring hospital treatment, however, this is not a necessary requirement for clinical diagnosis of PTSD.

exposure to traumatic stressors, age, gender, personality characteristics, anxiety sensitivity, coping strategies, dissociative experiences during/after the trauma, social support and substance abuse, which have all been reported as being influential to varying degrees (Brewin, Andrews, & Valentine, 2000; Fedoroff, Taylor, Asmundson, & Koch, 2000; Gil, 2005; Littleton, Horsley, John, & Nelson, 2007; Mayou, Ehlers, & Bryant, 2002; Ozer, Best, Lipsey, & Weiss, 2003; Sullivan & Holt, 2008; Vigil & Geary, 2008) and begin to assist explanations as to why not everybody exposed to a traumatic event goes on to develop diagnosable levels of PTSD symptomatology.

1.2. Empathy.

The term empathy refers to the capacity an individual has to understand, relate and respond to the thoughts, feelings or experiences of another (Lamm, Batson, & Decety, 2007). Constructed from both cognitive and emotional components (Davis, 1983) empathy can be distinguished from sympathy by the vicarious experiencing of the other person's emotions (Tangney, Stuewig, & Mashek, 2007). More recently, neurological studies have discussed a self-monitoring component to empathy that allows regulation of one's inner states (Decety & Moriguchi, 2007) and enables one to differentiate between an empathic response and one's own personal distress (Jackson, Brunet, Meltzoff, & Decety, 2006; Decety & Jackson, 2006).

Being empathic is of benefit in the social environment as it aids social interaction and communication. It may offer some evolutionary benefit, as it would confer some survival value to be able to identify with the thoughts and feelings of another person. However, as one important component of empathy is to vicariously experience the

emotions of another (Tangney et al., 2007) there may be situations in which being highly empathic is not beneficial to the individual. It has been documented that professionals such as therapists and carers who work closely with people who experience symptoms of PTSD may themselves be susceptible to secondary traumatisation through hearing the accounts of their clients or patients (Sinclair & Hamill, 2007). The capacity for this within the general population is evidenced by the DSM-IV-TR (APA, 2000) in which PTSD Criterion A states that a person may become traumatised not only by exposure to actual or threatened serious injury, death or threat to physical integrity, but also through either having witnessed a traumatic event or hearing about a family member/close associate experiencing the same. It has been reported that empathy is a strong risk factor for vicarious traumatisation (Sinclair & Hamill, 2007). An association between empathy and PTSD is therefore suggested, however research examining this link is sparse.

1.3. Emotion Recognition.

The ability to recognise the emotion in another's face is closely connected with the ability to empathise. In order to empathise and interact successfully one must be able to recognise and accurately identify the emotions others express. Studies that have explored elements of empathy or emotion recognition have often looked at both components together due to their close relationship. Marsh, Kozak, and Ambady (2007) found that individuals who recognised fearful and sad facial expressions more accurately also tended to behave empathically by demonstrating prosocial behaviour. In one study, when asked to rate the attractiveness of a person in a photograph, participants who rated the person as more attractive (when told that the person in the

image would be informed of their rating) also demonstrated more accurate identification of fearful and sad expressions (Marsh et al., 2007).

People who present with low levels of empathy have been found to perform badly on tasks of emotion recognition, such as participants with autism spectrum disorder (Hall, Szechtman, & Mahmias, 2003). Deficits specific to the recognition of fearful facial expressions have been found in participants with psychopathy (Blair, Colledge, Murray, & Mitchell, 2001; Blair et al., 2004) and have been associated with antisocial behaviour.

It has been questioned whether the impairments in social interaction found in people with major depressive disorder and social phobia may be due to biased interpretation of emotional cues within the social environment (Joormann & Gotlib, 2006). An emotion recognition study presented morphed images of increasing emotional intensity to participants with major depressive disorder (n = 21) and found biases towards detecting sad emotional expressions earlier in the sequence, and happy and angry expressions later in the sequence than the participants with social phobia (n = 26) and another non-clinical matched group (n = 25). The participants in the social phobia group were more likely to detect angry faces earlier in the sequence than the other two groups. This research suggested that specific biases to certain emotions are evident in different clinical populations, as opposed to more general deficits in overall recognition of emotions (Joormann & Gotlib, 2006).

In anxiety disorders such as social phobia, the bias towards early recognition of the presence of angry facial expressions appears to relate to biases towards detecting

socially threatening cues. In mood disorders such as depression, the bias towards sad faces may reflect the negative cognitive bias. The detection of mood-congruent facial emotional expressions has been reported in the literature (e.g. Niedenthal, Halberstadt, Margolin, & Innes-Ker, 2000), as has the negative bias in interpretation of neutral emotional expressions (George et al., 1998).

The current pilot study seeks to explore whether any 'trauma' specific biases in participants with PTSD impact upon their identification and labelling of different facial emotional expressions.

1.4. Self-Compassion.

Not only have researchers examined factors that may increase vulnerability to PTSD, but attention has also explored possible protective factors, including that of self-compassion (Slater, Holowka, Schorr, & Roemer, 2005). Self-compassion is defined as being kind to and caring for oneself in times of adversity (Leary, Tate, Adams, Batts Allen, & Hancock, 2007) and "perceiving one's experiences as part of the larger human experience; and holding painful thoughts and feelings in balanced awareness" (Neff, Rude, & Kirkpatrick, 2007, p.908). Self-compassion is reportedly important for psychological wellbeing because of the value in acknowledging distressing thoughts or feelings without over-identifying with them (Neff, 2003).

The little mention that self-compassion has received in the field of trauma has been concerned with psychological therapy. However, the study of Slater et al. (2005) included an exploration of whether self-compassion might act as a protective factor against symptoms of PTSD. They hypothesised that higher levels of self-compassion

would allow traumatised individuals to hold in balanced awareness their thoughts and feelings when experiencing fearful memories associated with the traumatic event. This in turn would enable integration of new information and less fragmented processing of the trauma and its sequelae. Slater et al. (2005) found a significant relationship between higher levels of self-compassion and lower levels of PTSD symptomatology. From this it was concluded that self-compassion might assist the recovery process following a traumatic event.

Neff et al. (2007) suggests that elements of self-compassion may be encouraged during therapy. The rationale for this as discussed by Slater et al. (2005), is that in trauma work self-compassion may allow the client to process the trauma and its sequelae successfully. Self-compassion may also be beneficial to clients who are working through and addressing some of the secondary emotions experienced in PTSD. Self-compassion would allow a more balanced perspective in response to rumination (including self-blame statements) that can adversely affect mood.

The current pilot study seeks to replicate the finding of Slater et al. (2005) by exploring the role of self-compassion within a group of people who have been exposed to a serious MVA to find out if self-compassion is associated with lower PTSD symptomatology.

1.5. Current study.

The purpose of this exploratory study is to investigate the relationship between facial emotion recognition, empathy and self-compassion in a traumatised population. Prior research has advised against generalising findings across different trauma populations

due to the heterogeneity of the disorder (Brewin et al., 2000). This study will explore primary PTSD in a group of adults who have been exposed to a serious MVA. It is questioned whether individuals who are predisposed to higher levels of empathy might be more vulnerable (than those with lower levels) to symptoms of PTSD and whether self-compassion might act as a protective factor against symptoms.

Joormann and Gotlib (2006) found specific biases in recognition of different emotions across the participant groups in their study. Replication of their emotion recognition paradigm with a population of individuals with PTSD will provide the opportunity to explore if specific biases are operating in response to social cues (i.e. emotional faces) within a traumatised population. For example, will there be a greater bias towards recognising fearful expressions more quickly in the sequence than in those who have not been exposed to a traumatic event? It would be anticipated that individuals found to possess higher levels of empathy would require a lesser degree of intensity of emotional expression in order to accurately identify the emotion depicted in the facial images presented than individuals with lower empathy.

Attempting to explore empathy experimentally poses difficulties including perceived pressure to give socially desirable responses and the artificial environment within which the experiment may fall. To address these difficulties the current study will present participants with i) a measure of empathy (together with a measure that screens for social desirability), ii) an emotion recognition task (based on Joormann & Gotlib, 2006), and iii) a task to rate how aroused and how pleasant the participant felt when viewing the full intensity emotional expressions.

Given the association between empathy and emotion recognition (Marsh et al., 2007), presenting sequences of facial images that morph from a neutral to a full intensity emotional expression may be a useful way to experimentally measure a facet or prerequisite of empathy, negating the influence of social desirability in responses. One strength of the current study is the replication of the paradigm utilised by Joormann and Gotlib (2006), as it will allow recording of subtle changes in recognition performance by participants across the emotions. Participants will be required to identify which emotion they think is appearing on the face as quickly as possible in the gradually changing sequence. As emotional expressions in a social context are rarely static, moving facial expressions offer a more realistic presentation of these social stimuli.

Additional ratings of mirrored valence (pleasantness) and arousal (based on Lang, Bradley, & Cuthbert, 1997) will give an indication of how much participants are affected by the emotions of others, and will enable further exploration of emotion recognition and empathy.

In summary, the current pilot study aims to explore the components of empathy, emotion recognition and self-compassion in a traumatised population.

1.6. Hypotheses.

1. Do individuals who have symptoms of Posttraumatic Stress Disorder (PTSD) resulting from a severe motor vehicle accident (MVA) have higher levels of empathy as measured on the Interpersonal Reactivity Index (IRI) than

individuals who have not developed PTSD following their MVA or a group who have never been exposed to a serious MVA?

2. Do individuals with symptoms of PTSD require a lower intensity of facial emotion in order to accurately identify and label the emotion expressed (as measured on a computer task) than individuals who do not have symptoms of PTSD?
3. Do individuals who present with symptoms of PTSD have lower levels of self-compassion than those who do not have symptoms of PTSD?
4. Is there an association between higher levels of PTSD symptoms and higher levels of self-reported empathy and higher ratings of unpleasantness when viewing negative facial emotions?
5. Is there an association between higher levels of PTSD symptoms and lower levels of self-compassion?

2. Method.

2.1. Design.

The study has a cross-sectional design with an opportunistic sample of participants assigned to one of the following groups (i) MVA PTSD/subsyndromal PTSD (MVA PTSD), ii) MVA no-PTSD group (MVA no PTSD), iii) no-MVA comparison group (No MVA Comparison). PTSD was identified by current trauma symptoms indicated on the Posttraumatic Diagnostic Scale (PDS) (Foa, 1995)[7]. Subsyndromal PTSD was

[7] The current study formed part of another wider investigation of the psychological consequences of motor vehicle accident in which the PDS was administered to participants (further details of which can be found in section 2.4. Materials and Procedure).

identified when participants satisfied the DSM-IV (APA, 2000) criteria A, B and either C or D (Blanchard & Hickling, 2004).

2.2. Ethics.

Ethics Committee approval was obtained from the University of Southampton, School of Psychology Committee (see Appendix D). All participants were asked to give written informed consent (see Appendix E) and informed of their right to withdraw consent at any time. The British Psychological Society guidelines concerning the ethical principles for conducting research with human participants were followed (The Code of Conduct, Ethical Principles and Guidelines, pp.8-12).

2.3. Participants.

Seventeen adults aged between 18-65 years (mean age 38 years, SD 11.61, 5:12 male/female), who had been exposed to a motor vehicle accident, were recruited from a non-clinical community population. Participants were recruited via advertisements in the local press and media, and flyers placed around the campuses of the University of Southampton and within local libraries. A comparison group of 18 adults aged between 18-65 years (mean age 35.11 years, SD 11.29, 5:13 male/female) who had not been involved in a serious motor vehicle accident were also recruited for the study and matched with the MVA exposed participants on age and gender.

For the purposes of data analysis, the MVA participants were allocated to one of two groups based on their responses on the Posttraumatic Diagnostic Scale (PDS) (Foa, 1995). The PDS is a 49 item self-report scale used to assess which of the DSM-IV

PTSD criteria have been met and allows a symptom severity score to be calculated[8] (range 0 – 51). Participants meeting the PTSD/subsyndromal PTSD diagnostic criteria (i.e. meeting criteria A, B, C and D, or A, B and either C or D as indicated on the PDS) were allocated to the MVA PTSD group (symptom severity scores ranged from 4 – 21). This group consisted of seven participants (2:5 male/female), with a mean age of 39 years (SD 14.96). Participants who did not fulfil the diagnostic criteria were allocated to the MVA no-PTSD group (symptom severity scores ranged from 0 – 23); this equated to 10 participants (3:7 male/female) with a mean age of 38 years (SD 9.48 years).

Participants interested in further information about the study were invited to contact the researcher by telephone or email. A telephone interview was conducted to screen potential participants, to establish that all participants were native English speakers and to exclude participants who had suffered a brain injury or whose accident was less than six months ago. Appointments were made with those individuals who, having received the information sheet (see Appendix F) wished to participate in the study. Questionnaires for completion were included with the appointment letter (see Materials Section 2.4.3 to 2.4.7).

An a priori power calculation based on the study of Joormann and Gotlib (2006) upon which the current study is based, indicated that with a sample size of 25 people in each of the three groups and a medium effect size, the power would be 0.77.

[8] No cut off point for symptom severity is indicated in the manual. Symptom severity ratings are classified as follows: 1-10 = mild, 11-20 = moderate, 11-20 = moderate, 21-35 = moderate to severe, 36-51 = severe (Foa, 1995).

2.4. Materials and Procedure.

This study formed part of another wider investigation of the psychological consequences of motor vehicle accidents. After a telephone screening, participants were invited to attend a three hour session at the University of Southampton. During the appointment written informed consent was obtained, and an accident interview conducted, followed by completion of questionnaires including the PDS (Foa, 1995). Participants then completed an emotional stroop computer task while their brain activity was measured (using an EEG). In the second part of the session, participants completed an emotion recognition task and a task of empathy ratings on the computer. The current study focussed only on the second part of the session, looking at the emotion recognition task and the empathy ratings task. These components took 45 minutes to complete in total including task instructions and a practice session. The no-MVA comparison group were invited to attend a 45 minute session at the University of Southampton. They had previously been screened for prior exposure to traumatic events[9].

2.4.1.1. Emotion Recognition Task: Materials.

This task employed the paradigm of Joormann and Gotlib (2006), in which the images from the Facial Expressions of Emotions-Stimuli and Tests series set (Young, Perrett, Calder, Sprengelmeyer, & Ekman, 2002) were presented. Photographs of the faces of one male and one female actor were presented throughout the task, depicting

[9] Any disclosure of prior (non-MVA) trauma required completion of the Posttraumatic Diagnostic Scale (PDS) (Foa, 1995) to ensure that participating individuals did not currently experience symptoms of PTSD.

anger, sadness, happiness and fear (disgust was utilised only for the practice session). The black and white morphed facial images were prepared using Morph Studio: Morph Editor software Version 1.0 Ulead, 2000) software. Stimuli were 10.3 cm high and 7.2 cm wide, presented on a black background using Presentation Version 10.2 software, displayed on a 40 cm computer screen. Participants indicated their responses by using the labelled keys on the computer keyboard.

2.4.1.2. Emotion Recognition Task: Procedure.

Individually, participants were asked to sit in front of a computer screen whilst the researcher gave task instructions verbally (Appendix G) supplemented with a visual aid (Appendix H). Instructions were also presented on the computer screen.

Participants were advised that a face with a neutral expression would appear on the screen and slowly morph into a fully emotion expression. As soon as the participant recognised the emotional expression appearing (angry, sad, disgusted, happy or fearful) they were to press the spacebar on the computer keyboard to stop the sequence and select their chosen emotion. The facial sequence would then continue to morph until the full expression had been shown. The next neutral face would then appear, and so on.

The practice session consisted of morphed presentations of the disgust emotional expression, with both male and female facial images. Once the practice session was complete a screen on the computer informed participants that the sequences they had viewed had all related to the disgust emotional expression and it would not appear throughout the remainder of the task. Participants were instructed to press the

spacebar on the keyboard to begin the task, which took approximately 25 minutes to complete.

2.4.2.1. Valence and Arousal Rating Computer Task: Materials.

In order to assess the participants' empathic responses to the emotional expressions of others, mirrored ratings of valence and arousal were taken. This task incorporates the full emotional expression images from the morphed facial images in the former task (from the Facial Expressions of Emotions-Stimuli and Tests series set [Young et al., 2002]). Valence[10] and arousal ratings (Lang et al., 1997) were recorded to indicate how participants thought the person in the image felt and how they themselves felt viewing the image (the latter referred to as mirrored pleasantness and mirrored arousal). The valence scale was scored from –4 (very unpleasant) to +4 (very pleasant), the higher the score, the more pleasant the rating. Stimuli were 10.3 cm high and 7.2 cm wide, presented on a black background using Presentation Version 10.2 software on a computer with a 40 cm screen monitor. Participants indicated their responses by clicking with the cursor of the mouse along the numbered on-screen response scale (see Appendix I).

2.4.2.2. Valence and Arousal Rating Computer Task: Procedure.

Task instructions were given verbally and supplemented with a visual aid (see Appendix I) and on-screen instructions. Participants were informed that they were about to view the full intensity emotional expression images they had seen in task 1.

[10] To aid clarity, valence will be referred to as pleasantness within the results and discussion of this paper.

They were instructed that they would be asked to give four ratings for each of the emotional expressions.

A question appeared on screen asking how pleasant or unpleasant the person in the image felt and then the image would appear on the screen, followed by a response screen on which they should click using the cursor of the mouse on one of the numbers along the scale, from –4 (very unpleasant) to +4 (very pleasant). The second question asked for an indication of how pleasant or unpleasant the participant felt when viewing the image; the image would appear again (3 seconds) before the rating scale appeared on the screen. The third question asked participants to rate how aroused the person in the image felt, on a response scale ranging from 0 (not at all aroused) to 8 (extremely aroused). The final question asked participants to rate how aroused they had felt when viewing the image. Participants were advised that there were no incorrect answers and not to agonise over responses and the meanings given to the words, but to go with his or her initial response.

Once all of the ratings had been completed a final screen appeared informing the participant that the study had finished and asking them to inform the researcher. The task took approximately 6 minute to complete.

2.4.3. Interpersonal Reactivity Index (IRI) (Davis, 1980).

This is a self-report measure of cognitive and affective components of empathy. It consists of 7 items on each of the four subscales: perspective-taking (PT), empathic concern (EC), fantasy scale (FS) and personal distress (PD). For example, "I try to look at everybody's side of a disagreement before I make a decision" (PT), "I am

quite often touched by the things I see happen" (EC), "I really get involved with the feelings of the characters in a novel" (FS) and "When I see someone who badly needs help in an emergency, I go to pieces" (PD). Responses are given on a 5-point scale, ranging from 'does not describe me well' to 'describes me very well' and nine items across the subscales are reverse-scored. Each subscale yields its own total score and no overall total empathy score is calculated. Test-retest and internal reliabilities of all four subscales have been reported as being substantial (test-retest: male = .61 - .79, female = .72 -.81) (internal reliabilities: FS: male = .78, female =. 75; PT: male = .75, female = .78; EC: male = .72, female = .70; PD: male = .78, female = .78) (Davis, 1980). Further details of the subscales can be found in Appendix B.

2.4.4. Self-Compassion Scale (SCS) (Neff, 2003).

This self-report measure of self-compassion contains 26 statements, with subscale items relating to Self-Kindness, Self-Judgment (reverse scored), Common Humanity, Isolation (reverse scored), Mindfulness, and Over-identified Items (reverse scored). For example, "I try to be loving towards myself when I'm feeling emotional pain" (self-kindness), "I'm disapproving and judgmental about my own flaws and inadequacies" (self-judgment), "When things are going badly for me, I see the difficulties as part of life that everyone goes through" (common humanity), "When I think about my inadequacies, it tends to make me feel more separate and cut off from the rest of the world" (isolation), "When something upsets me I try to keep my emotions in balance" (mindfulness) and "When I'm feeling down I tend to obsess and fixate on everything that's wrong" (over-identified items). Responses are given on a 5-point scale, from 'almost never' to 'almost always'. A total of 5 points is possible on each subscale, with the maximum total self-compassion score of 30.

Good test-retest reliability was found on each subscale and overall (Kindness: .88; Self-Judgment: .88; Common Humanity: .80; Isolation: .85; Mindfulness: .85; Over-Identification: .88; Self-Compassion Scale (total): .93) and good construct validity was reported.

2.4.5. Social Phobia Inventory (SPIN) (Connor et al., 2000).

This self-report measure of social phobia consists of 17 statements, made up of five factors which relate to: talking to strangers and in social gatherings, criticism and embarrassment, people in authority, and avoiding being the centre of attention and of public speaking. For example, "I am afraid of doing things when people might be watching". Responses are given on a 5-point scale ranging from 'not at all' to 'extremely'. A SPIN score of 19 reportedly distinguished between a population with social phobia and those without. Good test-retest reliability, internal consistency, convergent and divergent validity have been reported (Connor et al., 2000).

2.4.6. Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983).

This is a 14-item self-report measure of anxiety and depression. Items include statements such as "I feel tense or 'wound up'" (anxiety), and "I feel as if I am slowed down" (depression). Responses are scored from 0-3 for each item, with varying wording on each response scale, for example, 'nearly all of the time' (3), 'very often' (2), 'sometimes' (1), 'not at all' (0). Item number 1, 3, 5, 7, 9, 11 and 13 relate to anxiety and the remaining items relate to depression. The anxiety and depression subscales yield individual subscale scores; a score on either subscale of less than 8 is considered to be within the range of the general population, between 8-10 is considered 'borderline', and scores of 11+ are said to indicate clinical 'caseness'

in that domain. The two-factor structure, the discriminant validity and the internal consistency of the HADS and subscales have been supported in a review of the literature (see Bjelland, Dahl, Haug, & Neckelmann, 2000). The mean internal consistency for anxiety was reported as .83, and for the depression subscale .82 (Bjelland et al., 2000).

2.4.7. Marlowe-Crowne Social Desirability (Crowne & Marlowe, 1960).

This self-report scale measures whether participants have a tendency to respond to questionnaire items with socially desirable answers. The scale contains 33 statements such as 'I like to gossip at times' and each item is answered on a true/false response scale as it applies to the respondent. Items 1, 2, 4, 7, 8, 13, 16, 17, 18, 20, 21, 24, 25, 26, 27, 29, 31 and 33 score 1 when answered true and 0 when answered false. Items 3, 5 6, 9, 10, 11, 12, 14, 15, 19,22, 23, 28, 30 and 32 score 1 for a false answer and 0 when answered as true. The total score is the sum of all items and therefore ranges between 0 - 33. The mean score for 120 students was 13.72 (SD 5.78) (Crowne & Marlow, 1960) and 15.00 (SD 5.91) for 608 undergraduates. The authors reported internal consistency of 0.88 and test–retest reliability of .89 at one month. This scale is recommended for use in the current study as it is quick to complete and will give an indication of whether respondents tend to complete the Interpersonal Reactivity Index (Davis, 1980) by giving socially desirable answers and thus identify the potential confounding effects of response bias.

2.4.8. Procedure for the session.

Mutually convenient appointment times were arranged for participants to visit the University of Southampton to participate in the research. The procedure for the

session was explained to participants upon their arrival, they were then asked to read and provide their signed consent for participation in the study (Appendix E). After completion of the first part of the session[11], participants were invited into a room and asked to sit in front of a computer screen. Following the procedure of Joormann and Gotlib (2006) a facial expression recognition task was presented on the computer lasting approximately 30 minutes including a practice session. Participants were then asked to complete a second computer task in which they would give four rating relating to each of the emotional expressions they had seen (anger, sadness, happiness and fear), for both the male and female images. The task took approximately 6 minutes. Once completed, participants were thanked for their time, debriefed and given a debriefing statement (Appendix J).

Participants were reminded that if they were experiencing any distress as a result of their MVA to speak to their G.P.; they were also reminded of the helpline telephone numbers on the information sheet.

[11] Details of the components completed as part of the wider investigation of the psychological consequences of MVAs can be found in Section 2.4. Materials and Procedure.

3. Results.

3.1. Social desirability.

In order to ascertain whether the participant groups differed in their responses on the Marlowe-Crowne social desirability scale, a one way analysis of variance (ANOVA) was conducted, with group as the between subjects variable and social desirability as the within group factor. No significant differences were found across the participant groups [$F(2, 34) = .468, p = .631$], indicating that participants in one group were no more influenced by perceived need to give socially desirable responses on the measures and rating scales than participants within the other groups.

3.2. PTSD and Emotion Recognition.

3.2.1. PTSD and emotion identification accuracy.

As the data were not normally distributed, a Kruskal-Wallis test was conducted to check that any potential group differences in intensity of emotion were not due to differences in accuracy. Results revealed a significant main effect of group for accuracy of angry expressions [$\chi^2 (2, N = 35) = 6.06, p = .048$], with participants in the MVA PTSD group being more accurate in identification of angry expressions than the MVA no-PTSD group and the no-MVA comparison group. No other significant group differences were found (See Table 1 in Appendix K, page 122 for means and standard deviations).

3.2.2. PTSD and emotion expression intensity.

In order to investigate whether individuals with symptoms of PTSD require lower intensity of expression to accurately identify an emotional expression than those

without symptoms of PTSD a repeated measures analysis of variance (ANOVA) was conducted, with group as the between subjects variable and emotional expression intensity as the within group factor. A main effect for emotion type was found between the mean intensity of expression across the emotions [$F(3, 96) = 95.70, p < .001, \eta^2 = .749$]. The interaction of emotion and group was not significant, although approaching significance [$F(6, 96) = 2.126, p = .057, \eta^2 = .117$]. An analysis of covariance (ANCOVA) revealed that the interaction was no longer approaching significance when accounting for the influence of current anxiety, depression and social phobia (as measured by HADS and SPIN respectively) ($p = .114$).

Tests of within subjects contrasts (Helmert) revealed a significant difference between the intensity required to accurately identify the emotions happiness versus anger, sadness, fearfulness [$F(1, 32) = 327.603, p < .001$], between anger and sadness, fearfulness [$F(1, 32) = 4.50, p = .042$] but no significant difference between sadness and fear [$F(1, 32) = 3.52, p = .07$]. Levene's test indicated the assumption of equality of variance had been violated for happiness ($p = .017$), however, using the more conservative alpha of .01 (Pallant, 2001) the significant results held.

There was no significant main effect of group [$F(2, 32) = 2.967, p = .066, \eta^2 = .156$]. As the means in Table 1 (Appendix K, page 122) indicate, the MVA no-PTSD group tended to require the highest intensity across the groups to identify each of the emotions.

3.3. PTSD and Empathy.

3.3.1. PTSD and the Interpersonal Reactivity Index.

To investigate whether serious MVA exposed participants with symptoms of PTSD/subsyndromal PTSD (MVA PTSD group) had higher levels of empathy on the different subscales than those without PTSD/subsyndromal PTSD (MVA no-PTSD group) or those never exposed to a serious MVA (comparison group), a repeated measures ANOVA was conducted. Group was the between subjects variable and empathy subscales the within subjects factors. Empathy subscales on the Interpersonal Reactivity Index (IRI): Fantasy Scale (FS), Perspective Taking (PT), Empathic Concern (EC) and Personal Distress (PD).

A significant main effect for empathy domain was found [$F(3, 96) = 35.61, p = < .001, \eta^2 = .527$]. As can be seen in Table 2 (Appendix L, page 124), the highest scores were found for EC and the lowest in PD. No significant interaction effect of IRI and group was found [$F(6, 96) = 1.437, p = .208, \eta^2 = .082$].

Test of between subjects factors revealed a significant main effect for participant group [$F(2, 32) = 3.467, p = .043, \eta^2 = .178$]. However, Bonferroni-corrected pairwise comparisons revealed no significant difference between the groups.

3.3.2. PTSD and ratings of mirrored pleasantness[12] *and mirrored arousal.*

To investigate whether serious motor vehicle accident exposed participants with symptoms of PTSD/subsyndromal PTSD (MVA PTSD group) had higher ratings of unpleasantness and arousal when viewing facial emotional expressions than those without PTSD/subsyndromal PTSD (MVA no-PTSD group) or those never exposed

[12] See section 2.4.2.1 for an explanation of pleasantness (valence) ratings

to a serious MVA (comparison group), two repeated measures ANOVAs were conducted, with group as the between subjects variable and mirrored pleasantness and mirrored arousal ratings the within subjects factors (see Table 1, Appendix K, page 123 for means and standard deviations).

3.3.2.1. Mirrored Pleasantness Ratings.

As the test of sphericity was violated, Greenhouse-Geisser corrections were utilised. A significant main effect of emotion was found across the mirrored pleasantness ratings [$F(1.98, 63.31) = 89.396$, $p < .001$, $\varepsilon = .659$, $\eta^2 = .736$]. Simple contrasts revealed significant differences between the mirrored pleasantness ratings in response to happy and fearful faces [$p < .001$], between sad and fearful faces [$p = .02$], but no significant difference between ratings in response to angry and fearful faces [$p = .109$]. No significant effect of group was found [$F(2, 32) = .983$, $p = .385$, $\eta^2 = .058$] and no significant interaction of group and emotion was found [$F(3.96, 63.31) = .392$, $p = .812$, $\eta^2 = .024$].

3.3.2.2. Mirrored Arousal Ratings.

Greenhouse-Geisser corrections were used as sphericity had been violated. A significant main effect of emotion was found across the mirrored pleasantness ratings [$F(2.46, 78.60) = 11.986$, $p < .001$, $\varepsilon = .819$, $\eta^2 = .272$]. Levene's test indicated that the assumption of equality of variance for sadness had been violated, however, using the more conservative alpha of .01 (Pallant, 2001) the significant results held. Tests of within subjects contrasts (repeated) revealed significant differences between the mirrored arousal ratings in response to angry and sad faces ($p < .001$) and between sad and fearful faces ($p < .001$). No significant interaction of group and arousal to

emotion was found [$F(4.91, 78.60) = .278, p = .922, \eta^2 = .017$]. Tests of between subjects effects revealed no significant effect of group [$F(2, 32) = .029, p = .972, \eta^2 = .002$].

3.4. PTSD and self-compassion.

To investigate whether those with symptoms of PTSD/subsyndromal PTSD following exposure to a serious MVA have lower levels of self-compassion than those who do not have symptoms of PTSD, a repeated measures ANOVA was conducted with group as the between variable and self-compassion subscales as the within group factor.

As the assumption of sphericity had been violated, Greenhouse-Geisser corrections were used. Tests of between-subjects effects demonstrated no group differences [$F(2, 32) = .171, p = .843, \eta^2 = .011$], and no significant interaction was found between the groups and IRI subscales [$F(2.78, 44.49) = .351, p = .774, \eta^2 = .021$]. See Table 2 (Appendix L, pages 124 - 125) for means and standard deviations.

3.5. Association: PTSD, emotion recognition, empathy and self-compassion.

3.5.1. PTSD, emotion recognition and empathy.

In order to investigate if there is a relationship between higher symptom severity in those with PTSD/subsyndromal PTSD, higher levels of empathy and higher ratings of unpleasantness when viewing negative facial emotions, a Pearson's product-moment correlation coefficient was calculated (and can be found in Table 3, Appendix M, page 126).

Significant positive correlations were found between the PTSD symptom severity and two empathy subscales: the higher the PTSD symptom severity the higher was the self-reported IRI-EC and IRI-PD. In addition, PTSD severity was correlated with ratings of mirrored pleasantness: the higher the PTSD severity, the lower the rating of mirrored pleasantness to expressions of fear. Symptom severity was also positively correlated with intensity required to identify happy facial expressions. There were no significant correlations between PTSD symptom severity and mirrored arousal ratings.

Significant correlations between IRI subscales and ratings may indicate that they both measure aspects of empathy. Specifically, significant correlations were found between IRI-FS and mirrored arousal to fearful expressions; between IRI-FS and mirrored pleasantness ratings to sad expressions (the higher the fantasy score, the less pleasant participants felt when viewing sad expressions and the more aroused they felt when viewing fearful expressions) (all one tailed tests, see Table 3, Appendix M, page 126). Significant negative correlations were found between IRI-PT and ratings of mirrored pleasantness to fearful and sad expressions; IRI-PT and emotion intensity required to identify angry and fearful facial expressions. The higher the perspective taking empathy score, the less pleasant the response to fearful and sad faces, and the greater the intensity required to identify angry and fearful facial expressions.

When including within the analysis only participants who met the criteria for PTSD/subsyndromal PTSD (n = 7) significant negative correlations were found between PTSD symptom severity and mirrored pleasantness ratings to fearful

expressions (r = -.670, p = .05), and between IRI-FS and mirrored pleasantness ratings to sad expressions (r = -.677, p = .047) (all one tailed tests).

3.5.2. PTSD and self-compassion.

To investigate if there is a relationship between higher levels of PTSD symptom severity and lower levels of self-compassion a Pearson's product-moment correlation coefficient was calculated on the data from all MVA participants (n = 17). The only significant relationship found was a positive correlation between symptom severity and SCS Mindfulness (r = .486, p = .048) indicating that higher PTSD severity was associated with higher self-reports in the mindfulness subscale (see Table 4, Appendix N, page 127).

When conducting correlations on the data obtained from participants fulfilling criteria for PTSD/subsyndromal PTSD (n = 7), no significant correlations were found between symptom severity and the subscales of the SCS.

4. Discussion.

The present pilot study was designed to explore the role of empathy, emotion recognition and self-compassion in a traumatised population. It was hypothesised that individuals with PTSD would have higher levels of empathy and would require a lower intensity of emotional expression in order to accurately identify the emotion appearing on another's face. It was further hypothesised that individuals with PTSD would have lower levels of self-compassion. Associations were predicted between higher PTSD symptom severity, higher levels of empathy and higher ratings of

unpleasantness when viewing negative facial emotions. Finally, it was hypothesised that there would be an association between higher symptom severity and lower levels of self-compassion.

4.1. Summary of the findings[13].

The PTSD group did not have higher empathy levels than the other groups; therefore Hypothesis 1 was not supported. However, a significant difference was found between participant groups on empathy subscale ratings; the accident exposed no-PTSD group had lower levels of personal distress, although the group difference did not remain significant when conducting further comparisons[14].

Whilst participants with PTSD were more accurate in their identification of angry expressions, no significant differences were found between the participant groups in the level of emotional intensity needed to label the emotion expressed. As the PTSD did not require less intensity in order to identify the emotional expression Hypothesis 2 was not supported.

No significant group differences were found on the self-compassion subscale scores; as the PTSD group did not have lower levels of self-compassion, Hypothesis 3 was not supported.

---

[13] The findings should be treated with caution due to the small number of participants in the study.

[14] Possibly due to the sample size (see 4.3.1. Statistical power calculations).

Significant correlations were found between symptom severity, some of the empathy subscales and the ratings of mirrored pleasantness when viewing negative facial emotions, offering partial support for Hypothesis 4.

PTSD symptom severity was also significantly positively correlated with the mindfulness subscale of self-compassion. As higher severity of symptoms was not associated with lower self-compassion scores Hypothesis 5 was not supported.

4.2. Interpretation of the findings.

Within the limits of the small sample size in the current pilot study, results should be treated cautiously. Participants with symptoms of PTSD were more accurate in their identification of angry emotional expressions than the other participant groups, but did not differ in intensity. This offers some support to previous findings of a processing bias for threat-related information (i.e. angry faces) in people with PTSD. For example, an EEG study reported higher amplitude responses to angry faces than to other expressions in a study involving participants with symptoms of PTSD (Houlihan et al., 2006). One explanation for the finding in the current study may relate to symptoms of hyperarousal, where an individual is hypervigilant to cues of potential threat within their environment. This would support Ehlers and Clark's (2000) model of persistent PTSD where the world is perceived as a threatening place. However, participants with PTSD did not differ from the other groups in their ratings of mirrored arousal in response to angry faces.

Interestingly, the accident-exposed participants without PTSD had significantly lower self-reported empathy on the personal distress subscale, and a general (but non-

significant) trend towards lower scores on each of the empathy subscales. It would have been anticipated that this group would have had comparable levels to participants within the non-accident exposed comparison group. If this finding were replicated within a larger participant sample in future studies, it could indicate that having lower levels of aspects of empathy serves as a protective factor during times of trauma. More specifically, personal distress is a subscale exploring emotional empathy, so it may be that having lower emotional empathy is a protective factor. Future studies could explore this further, and examine whether cognitive and emotional empathy are differentially related to PTSD symptoms. In the current study, both of the subscales examining emotional empathy (empathic concern and personal distress) were associated with increased PTSD symptomatology, whilst no significant results were found for the measure of cognitive empathy (perspective taking and fantasy scale). The design of the study was not longitudinal, so it cannot be ascertained whether the difference in scores would have been found in participants prior to their MVA. The participants with PTSD demonstrated empathy levels equivalent to the non-exposed comparison group, again it cannot be known whether this would have been the case prior to the accident, however it may be indicative of symptoms of emotional numbing, or depressed affect, and future studies should examine this.

As there are no standard experimental measures of empathy, one aim of this pilot study was to explore whether emotion recognition and subsequent mirrored ratings would relate to a self-report measure of empathy. Marsh et al. (2007) reported that participants recognising sad and fearful faces were more likely to show empathy (measured by prosocial behaviour). In the current study, the significant correlations

between the subscales measuring cognitive empathy and ratings of mirrored pleasantness (e.g. the perspective taking scale and responses to sad and fearful faces) may indicate that they also measure aspects of empathy. The correlation between the fantasy scale and mirrored arousal to fearful faces could be associated with the finding of Davis (1983), in which higher scores on the fantasy scale were associated with an increased predisposition to being more fearful. Replication with a larger population sample would be necessary in order to ascertain whether these results hold, to explore the relationships between the cognitive and emotional empathy subscales and mirrored ratings, and to explore the influence of mood.

4.3. Limitations and strengths of the study.

To reiterate, a significant limitation of the current study was the small sample size. Another limitation of the study was the female gender bias within the sample, although gender distribution was equal across the groups. Blanchard and Hickling (2004) reported that there should be a balance of males and females within participant groups of MVA survivors so as not to bias the PTSD rates within the population sample. Future replication would aim to recruit a larger participant sample with a more balanced gender mix.

Another limitation was reliance upon self-reported symptoms on Posttraumatic Diagnostic Scale (Foa, 1995) to establish PTSD diagnosis. Whilst this measure is well accepted in the literature, the Clinician-Administered PTSD Scale (CAPS, Blake et al., 1995) is considered the "gold standard" for establishing clinical diagnoses.

A strength of the study was the use of a morphed image presentation (replicating Joormann & Gotlib, 2006). The presentation of facial images in this study allowed participants to view emotional expressions as gradually increasing in intensity, a step closer to how they would be experienced in the social world, where facial stimuli would tend not to be static. Unlike the emotion recognition tasks of other researchers (e.g. Montagne et al., 2005), the current paradigm benefited by recording both accuracy and intensity within the same presentation, reducing task length for participants.

In an attempt to address the criticism that studies exploring risk factors for PTSD do so by comparing participants with PTSD with "a control group" (Brewin et al., 2000, p.749), the current pilot study recruited participants exposed to a traumatic stressor and then allocated individuals to groups based on PTSD symptoms, and also included a comparison group of non-accident exposed participants. Whilst it may be preferable to conduct longitudinal research when exploring risk or protective factors, this design does not lend itself easily to investigation of trauma.

4.3.1. Statistical power calculations.

An a priori power calculation[15] indicated that a sample size of 25 people in each group would be required. There is a possibility that the non-significant group differences in this study are due to insufficient power as a result of the small sample size recruited, rather than there being no difference between the participant groups, thus increasing the chance of a Type II error (Pallant, 2001).

[15] For further detail see section 2.3. Participants.

For the ANOVAs testing hypotheses predicting group differences, power was calculated to range between .08 (group for self-compassion) to .7 (group for empathy). Sample size calculations with an alpha of .05 and .8 power revealed that a sample of between 11 and 56 participants in total would have been needed in order to find significant group differences across the variables.

Power calculations for the correlations in this study revealed power of between .6 (emotional intensity and symptom severity) and .9 (symptom severity and the empathy personal distress scale) with a sample size of 17.

4.4. Clinical implications.

The results of this pilot study suggest that the empathy ratings of empathic concern and personal distress were positively related to PTSD symptom severity. Individuals who did not have symptoms of PTSD following their MVA were also found to have lower levels of personal distress. If these findings are confirmed in future research with a larger sample size, then a potential vulnerability factor to symptoms of PTSD following MVA may have been identified. An implication for healthcare professionals may be to provide early screening following exposure to MVA to identify individuals who score highly on these empathy traits, as they may be susceptible to developing trauma symptoms. If individuals can be identified at an earlier stage, before the symptoms of PTSD become chronic, then early treatment may prevent the maintenance of PTSD and continued distress for the individual. Similarly, if future research confirms the finding that mindfulness components of self-compassion are positively related PTSD symptom severity, this too may warrant early screening.

4.5. Future directions.

The exploration of group differences within this pilot study yielded largely non-significant results. As previously mentioned, this may have been a result of the small number of participants within the study. Replication of the study with a larger sample would be required in order to effectively examine empathy, emotion recognition and self-compassion in a population of MVA survivors. Examination of possible differential relationships between cognitive and emotional aspects of empathy, and PTSD symptomatology and mirrored ratings would clarify the relationship.

Comorbidity of PTSD with depression and anxiety is not uncommon, however with a larger sample size it may be possible to control for the effect of these, together with social phobia, as they have all be found to influence performance on the emotion recognition paradigm used in this study (Joormann & Gotlib, 2006), and may influence pleasantness and arousal ratings. When exploring the resulting data, it may also be interesting to examine gender differences both in the self-report measures and on the emotion recognition task to explore whether these can offer any explanation towards the higher incidence of PTSD found in women.

If future replication of the current exploratory study yields the same results within a larger participant population, the findings would need to be explored within other trauma populations, as the heterogeneity of the disorder does not allow researchers to propose "a general vulnerability model" (Brewin et al., 2000, p.756).

5. References.

American Psychiatric Association (APA). (2000). *Diagnostic and Statistical Manual of Mental Disorders (4th edn, text revision)*. Washington DC: American Psychiatric Association.

Bjelland, I, Dahl, A.A., Haug, T.T., & Neckelmann, D. (2002). The validity of the Hospital Anxiety and Depression Scale: an updated literature review. *Journal of Psychosomatic Research,* 52, 69-77.

Blair, R.J.R., Colledge, E., Murray, L., & Mitchell, D.G.V. (2001). A selective impairment in the processing of sad and fearful expressions in children with psychopathic tendencies. *Journal of Abnormal Child Psychology,* 29, 491–498.

Blair, R.J.R., Mitchell, D.G.V., Peschardt, K.S., Colledge, E., Leonard, R.A., Shine, J.H., et al. (2004). Reduced sensitivity to others' fearful expressions in psychopathic individuals. *Personality and Individual Differences,* 37, 1111-1122.

Blake, D.D., Weathers, F.W., Nagy, I.M., Kaloupek, D.G., Gusman, F.D., Charney, D.S., et al. (1995). The development of a clinician-administered PTSD scale. *Journal of Traumatic Stress,* 8, 75-90.

Blanchard, E.B., & Hickling, E.J. (2004). *After the crash: psychological assessment and treatment of survivors of motor vehicle accidents (2nd edition).* Washington DC: American Psychological Association.

Brewin, C.R., Andrews, B., & Valentine, J.D. (2000). Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. *Journal of Consulting and Clinical Psychology,* 68, 748-766.

Connor, K.M., Davidson, J.R.T., Churchill, E., Sherwood, A., Foa, E., & Weisler, R.H. (2000). Psychometric properties of the social phobia inventory (SPIN). *Journal of Psychiatry,* 176, 379-386.

Crowne, D.P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology,* 24, 349-354.

Davis, M.H. (1980). A multidimensional approach to individual differences in empathy. *Catalog of Selected Documents in Psychology*, 10, MS. 2124, p85

Davis, M.H. (1983). Measuring individual differences in empathy: evidence for a multidimensional approach. *Journal of Personality and Social Psychology,* 44, 113-126.

Decety, J., & Jackson, P.L. (2006). A social-neuroscience perspective on empathy. *Current Directions in Psychological Science,* 15, 54-58

Decety, J., & Moriguchi, Y. (2007). The empathic brain and its dysfunction in psychiatric populations: implications for intervention across different clinical conditions. *BioPsychoSocial Medicine,* 1:22.

Ehlers, A., & Clark, D.M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy,* 38, 319-345.

Fedoroff, I.C., Taylor, S., Asmundson, G.J.G., & Koch, W.J. (2000). Cognitive factors in traumatic stress reactions: predicting PTSD symptoms from anxiety sensitivity and beliefs about harmful events. *Behavioural and Cognitive Psychotherapy,* 28, 5-15.

Foa. E. B. (1995). *Posttraumatic Stress Diagnostic Scale Manual.* United States of America: National Computer Systems, Inc.

George, M.S., Huggins, T., McDermut, W., Parekh, P.I., Rubinow, D., & Post, R.M. (1998). Abnormal facial emotion recognition in depression: serial testing in an ultra-rapid-cycling patient. *Behavior Modification,* 22, 192-204.

Gil, S. (2005). Pre-traumatic personality as a predictor of post-traumatic stress disorder among undergraduate students exposed to a terrorist attack: a prospective study in Israel. *Personality and Individual Differences,* 39, 819-827.

Hall, G.B.C., Szechtman, H., & Mahmias, C. (2003). Enhanced salience and emotion recognition in autism: a PET study. *American Journal of Psychiatry,* 160, 1439-1441.

Houlihan, M., Fraser, I., Donahue, M., Sharma, M., Bourque, W., & MacLean, M. (2006). Processing emotional face expressions in post-traumatic stress disorder, presentation at the forty-sixth annual meeting for the Society for Psychophysiological Research. *Psychophysiology,* 43(Suppl. 1), S47.

Jackson, P.L., Brunet, E., Meltzoff, A.N., & Decety, J. (2006). Empathy examined through the neural mechanisms involved in imagining how I feel versus how you feel pain. *Neuropsychologia,* 44, 752–761.

Joormann, J., & Gotlib, I.H. (2006). Is this happiness I see? Biases in the identification of emotional facial expressions in depression and social phobia. *Journal of Abnormal Psychology,* 115, 705-714.

Lamm, C., Batson, C.D., & Decety, J. (2007). The neural basis of human empathy - effects of perspective-taking and cognitive appraisal: An event-related fMRI study. *Journal of Cognitive Neuroscience,* 19, 42-58.

Lang, P.J., Bradley, M.M., & Cuthbert, B.N. (1997). International affective picture system (IAPS): Technical manual and affective ratings.

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, 887–904.

Littleton, H., Horsley, S., John, S., & Nelson, D.V. (2007). Trauma coping strategies and psychological distress: a meta-analysis. *Journal of Traumatic Stress,* 20, 977-988.

Marsh, A.A., Kozak, M.N., & Ambady, N. (2007). Accurate identification of fear facial expressions predicts prosocial behavior. *Emotion,* 7, 239-251.

Mayou, R.A., Ehlers, A., & Bryant, B. (2002). Posttraumatic stress disorder after motor vehicle accidents: 3-year follow-up of a prospective longitudinal study. *Behaviour Research and Therapy,* 40, 665-675.

Montagne, B., Kessels, R.P.C., Frigerio, E., de Haan, E.H.F., & Perrett, D.I. (2005). Sex differences in the perception of affective facial expressions: do men really lack emotional sensitivity? *Cognitive Processing,* 6, 136-141.

Neff, K.D. (2003). The development and validation of a scale to measure self-compassion. *Self and Identity,* 2, 223-250.

Neff, K.D., Rude, S.S., & Kirkpatrick, K.L. (2007). An examination of self-compassion in relation to positive psychological functioning and personality traits. *Journal of Research in Personality,* 41, 908-916.

Niedenthal, P.M., Halberstadt, J.B., Margolin, J., & Innes-Ker, A.H. (2000). Emotional state and the detection of change in facial expression of emotion. *European Journal of Social Psychology,* 30, 211-222.

Ozer, E., Best, S., Lipsey, T., & Weiss, D. (2003). Predictors of posttraumatic stress disorder and symptoms in adults: a meta-analysis. *Psychological Bulletin,* 129, 52-73.

Pallant, J. (2001). *SPSS survival manual.* Buckingham, England: Open University Press.

Sinclair, H.A.H., & Hamill, C. (2007). Does vicarious traumatisation affect oncology nurses? A literature review. *European Journal of Oncology Nursing,* 11, 348-356.

Slater, R., Holowka, D.W., Schorr, Y., & Roemer, L. (2005, November). Rumination, dissociation, self-compassion, and acceptance as correlates of posttraumatic stress symptoms. Poster session presented at the annual convention of the Association for Advancement of Behavior Therapy, Washington DC.

Sullivan, T.P., & Holt, L.J. (2008). PTSD symptom clusters are differentially related to substance use among community women exposed to intimate partner violence. *Journal of Traumatic Stress,* 21, 173-180.

Tangney, J.P., Stuewig, J., & Mashek, D.J. (2007). Moral emotions and moral behavior. *Annual Review of Psychology,* 58, 345-372.

Vigil, J.M., & Geary, D.C. (2008). A preliminary investigation of family coping styles and psychological well-being among adolescent survivors of Hurricane Katrina. *Journal of Family Psychology,* 22, 176–180.

Young, A., Perett, D., Calder, A., Sprengelmeyer, R., & Ekman, P. (2002). Facial Expressions of Emotion – Stimuli and Tests (FEEST). Bury St. Edmunds, England: Thames Valley Test.

Zigmond, A.S., & Snaith, R.P. (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica, 67, 361-370.*

List of the Appendices.

Appendix A	Information for authors: Clinical Psychology Review.
Appendix B	Interpersonal Reactivity Index – Further Information
Appendix C	Information for authors: Behaviour Research & Therapy.
Appendix D	Note of Ethical Approval.
Appendix E	Participant Consent Form.
Appendix F	Information Sheet.
Appendix G	Verbal Instructions for Emotion Recognition Task.
Appendix H	Visual Aid for Emotion Recognition Task Instructions.
Appendix I	Visual Aid for Pleasantness and Arousal Ratings.
Appendix J	Participant Debriefing Statement.
Appendix K	Results Table 1 – Emotion Recognition Task and Mirrored Ratings.
Appendix L	Results Table 2 – Empathy and Self-Compassion.
Appendix M	Results Table 3 – PTSD Symptom Severity, Empathy, Mirrored Ratings and Intensity of Expression
Appendix N	Results Table 4 – PTSD Symptom Severity and Self-Compassion

Appendix A - Information for authors: Clinical Psychology Review.

ELSEVIER

http://www.elsevier.com

CLINICAL PSYCHOLOGY REVIEW

Guide for Authors

SUBMISSION REQUIREMENTS: Authors should submit their articles electronically via the Elsevier Editorial System (EES) page of this journal (http://ees.elsevier.com/cpr). The system automatically converts source files to a single Adobe Acrobat PDF version of the article, which is used in the peer-review process. Please note that even though manuscript source files are converted to PDF at submission for the review process, these source files are needed for further processing after acceptance. All correspondence, including notification of the Editor's decision and requests for revision, takes place by e-mail and via the Author's homepage, removing the need for a hard-copy paper trail. Questions about the appropriateness of a manuscript should be directed (prior to submission) to the Editorial Office, details at URL above. Papers should not exceed 50 pages (including references).

Submission of an article implies that the work described has not been published previously (except in the form of an abstract or as part of a published lecture or academic thesis), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, without the written consent of the Publisher.

FORMAT: We accept most wordprocessing formats, but Word, WordPerfect or LaTeX are preferred. Always keep a backup copy of the electronic file for reference and safety. Save your files using the default extension of the program used.

Please provide the following data on the title page (in the order given).

Title. Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible.

Author names and affiliations. Where the family name may be ambiguous (e.g., a double name), please indicate this clearly. Present the authors' affiliation addresses (where the actual work

was done) below the names. Indicate all affiliations with a lower-case superscript letter immediately after the author's name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name, and, if available, the e-mail address of each author.

Corresponding author. Clearly indicate who is willing to handle correspondence at all stages of refereeing and publication, also post-publication. **Ensure that telephone and fax numbers (with country and area code) are provided in addition to the e-mail address and the complete postal address.**

Present/permanent address. If an author has moved since the work described in the article was done, or was visiting at the time, a 'Present address' (or 'Permanent address') may be indicated as a footnote to that author's name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript Arabic numerals are used for such footnotes.

Abstract. A concise and factual abstract is required (not exceeding 200 words). This should be typed on a separate page following the title page. The abstract should state briefly the purpose of the research, the principal results and major conclusions. An abstract is often presented separate from the article, so it must be able to stand alone. References should therefore be avoided, but if essential, they must be cited in full, without reference to the reference list.

STYLE AND REFERENCES: Manuscripts should be carefully prepared using the Publication Manual of the American Psychological Association, 5th ed., 1994, for style. The reference section must be double spaced, and all works cited must be listed. Please note that journal names are not to be abbreviated.

Reference Style for Journals: Cook, J. M., Orvaschel, H., Simco, E., Hersen, M., and Joiner, Jr., T. E. (2004). A test of the tripartite model of depression and anxiety in older adult psychiatric outpatients, *Psychology and Aging*, 19, 444-45.

For Books: Hersen, M. (Ed.). (2005). Comprehensive handbook of behavioral assessment (2 Volumes). New York: Academic Press (Elsevier Scientific).

TABLES AND FIGURES: Present these, in order, at the end of the article. High-resolution graphics files must always be provided separate from the main text file (see http://ees.elsevier.com/cpr for full instructions, including other supplementary files such as high-resolution images, movies, animation sequences, background datasets, sound clips and more).

PAGE PROOFS AND OFFPRINTS: When your manuscript is received by the Publisher it is considered to be in its final form. Proofs are not to be regarded as 'drafts'. One set of page proofs will be sent to the corresponding author, to be checked for typesetting/editing. No changes in, or additions to, the accepted (and subsequently edited) manuscript will be allowed at this stage. Proofreading is solely the authors' responsibility.

The Publisher reserves the right to proceed with publication if corrections are not communicated. Please return corrections within 3 days of receipt of the proofs. Should there be no corrections, please confirm this.

COPYRIGHT: Upon acceptance of an article, authors will be asked to transfer copyright (for more information on copyright, see ⇨ http://www.elsevier.com). This transfer will ensure the widest possible dissemination of information. A letter will be sent to the corresponding author confirming receipt of the manuscript. A form facilitating transfer of copyright will be provided.

If excerpts from other copyrighted works are included, the author(s) must obtain written permission from the copyright owners and credit the source(s) in the article. Elsevier has forms for use by authors in these cases available at ⇨www.elsevier.com/locate/permissions phone: (+44) 1865 843830, fax: (+44) 1865 853333, e-mail: permissions@elsevier.com

NIH voluntary posting policy US National Institutes of Health (NIH) voluntary posting (" Public Access") policy Elsevier facilitates author response to the NIH voluntary posting request (referred to as the NIH "Public Access Policy", see http://www.nih.gov/about/publicaccess/index.htm) by posting the peer-reviewed author's manuscript directly to PubMed Central on request from the author, 12 months after formal publication. Upon notification from Elsevier of acceptance, we will ask you to confirm via e-mail (by e-mailing us at NIHauthorrequest@elsevier.com) that your work has received NIH funding and that you intend to respond to the NIH policy request, along with your NIH award number to facilitate processing. Upon such confirmation, Elsevier will submit to PubMed Central on your behalf a version of your manuscript that will include peer-review comments, for posting 12 months after formal publication. This will ensure that you will have responded fully to the NIH request policy. There will be no need for you to post your manuscript directly with PubMed Central, and any such posting is prohibited.

Appendix B - Interpersonal Reactivity Index – Further Information

The four subscales of the Interpersonal Reactivity Index (Davis, 1980) are as follows:

i) Perspective Taking (PT).

The perspective taking subscale represents the general predisposition to take the point of view of another person. Davis (1983) reported that higher perspective taking scores were correlated with higher levels of social functioning (using measures of interpersonal functioning) and higher self-esteem. There was a negative correlation with fearfulness (subscale from the Emotionality, Activity, Sociability, and Impulsivity [EASI] temperament measure of Buss and Plomin, 1975) (Davis, 1983) and no relationship was found with measures of intellectual ability (Verbal and Quantitative Scholastic Aptitude Tests [SATs] and the vocabulary component of the Wechsler Adult Intelligence Scale [WAIS] Wechsler, 1955) (Davis, 1983).

ii) Fantasy Scale (FS).

The fantasy scale measures the propensity to relate to fictional characters in books, films and so forth; it was found to be positively related to measures of intellectual ability, with significant findings for verbal intelligence. Measures of emotional vulnerability were positively related to higher scores on the fantasy scale and amongst these a small correlation was found with scores on the fearfulness subscale. It was proposed that this suggested a predisposition towards being more fearful for those who were high fantasisers (Davis, 1983). The FS was not related to measures of social functioning or to self-esteem (Davis, 1983).

iii) Empathic Concern (EC).

The empathic concern scale looks at the tendency for one to have compassion, concern and warmth towards someone experiencing negative episode (Davis, 1980). Results relating to components of interpersonal functioning were inconsistent. Overall those who were more concerned and sympathetic towards others were also more likely to be anxious and uneasy when around others but less likely to feel lonely (Davis, 1980).

iv) Personal Distress (PD).

The personal distress scale examines the feelings (such as fear or apprehension) that one has in response to the negative experiences of others (Davis, 1980). Those who scored more highly on the PD scale indicated lower social competence (i.e. increased levels of social anxiety and shyness). High scorers were also more likely to have lower levels of self-esteem. Measures on the scale were unrelated to intelligence (Davis, 1980).

Appendix C - Information for authors: Behaviour Research & Therapy.

ELSEVIER

http://www.elsevier.com

BEHAVIOUR RESEARCH AND THERAPY

An International Multi-Disciplinary Journal

Guide for Authors

For full instructions, please visit http://ees.elsevier.com/brat

Aims and Scope

Behaviour Research and Therapy encompasses all of what is commonly referred to as cognitive behaviour therapy (CBT). The major focus is on the following: experimental analyses of psychopathological processes linked to prevention and treatment; the development and evaluation of empirically-supported interventions; predictors, moderators and mechanisms of behaviour change; and dissemination of evidence-based treatments to general clinical practice. In addition to traditional clinical disorders, the scope of the journal also includes behavioural medicine. The journal will not consider manuscripts dealing primarily with measurement, psychometric analyses, and personality assessment.

The Editor and Associate Editors will make an initial determination of whether or not submissions fall within the scope of the journal and are of sufficient merit and importance to warrant full review.

Submission to the journal prior to acceptance Authors can submit their articles electronically via the Elsevier Editorial System (EES) page of this journal http://ees.elsevier.com/brat. The system automatically converts source files to a single Adobe Acrobat PDF version of the article, which is used in the peer-review process. Please note that even though manuscript source files are converted to PDF at submission for the review process, these source files are needed for further processing after acceptance. All correspondence, including notification of the Editor's decision and requests for revision, takes place by e-mail and via the Author's homepage, removing the need for a hard-copy paper trail.

Online submission is strongly preferred but authors can, in special cases, also submit via mail. Four copies of the manuscript, including one set of high-quality original illustrations, suitable for direct reproduction, should be submitted to **Professor G. T. Wilson, Psychological Clinic at Gordon Road, Rutgers, The State University of New Jersey, 41C Gordon Road, Piscataway, New Jersey, 08854-8067, USA.** Email: brat@rci.rutgers.edu. (Copies of the illustrations are acceptable for the other sets of manuscripts, as long as the quality permits refereeing.)

Submission of an article implies that the work described has not been published previously (except in the form of an abstract or as part of a published lecture or academic thesis), that it is not under consideration for publication elsewhere, that its

publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, without the written consent of the Publisher.

Presentation of manuscript Please write your text in good English (American or British usage is accepted, but not a mixture of these). Italics are not to be used for expressions of Latin origin, for example, in vivo, et al., per se. Use decimal points (not commas); use a space for thousands (10 000 and above). Print the entire manuscript on one side of the paper only, using double spacing and wide (3 cm) margins. (Avoid full justification, i.e., do not use a constant right-hand margin.) Ensure that each new paragraph is clearly indicated. Present tables and figure legends on separate pages at the end of the manuscript. If possible, consult a recent issue of the journal to become familiar with layout and conventions. Number all pages consecutively.

Provide the following data on the title page (in the order given).

Title. Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible.

Author names and affiliations. Where the family name may be ambiguous (e.g., a double name), please indicate this clearly. Present the authors' affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lower-case superscript letter immediately after the author's name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name, and, if available, the e-mail address of each author.

Corresponding author. Clearly indicate who is willing to handle correspondence at all stages of refereeing and publication, also post-publication. **Ensure that telephone and fax numbers (with country and area code) are provided in addition to the e-mail address and the complete postal address.**

Present/permanent address. If an author has moved since the work described in the article was done, or was visiting at the time, a 'Present address' (or 'Permanent address') may be indicated as a footnote to that author's name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript Arabic numerals are used for such footnotes.

Abstract. A concise and factual abstract is required (maximum length 200 words). The abstract should state briefly the purpose of the research, the principal results and major conclusions. An abstract is often presented separate from the article, so it must be able to stand alone. References should therefore be avoided, but if essential, they must be cited in full, without reference to the reference list.

Keywords. Immediately after the abstract, provide a maximum of 6 keywords, to be chosen from the APA list of index descriptors. These keywords will be used for indexing purposes.

Abbreviations. Define abbreviations that are not standard in this field at their first occurrence in the article: in the abstract but also in the main text after it. Ensure consistency of abbreviations throughout the article.

N.B. Acknowledgements. Collate acknowledgements in a separate section at the end of the article and do **not**, therefore, include them on the title page, as a footnote to the

title or otherwise.

Shorter Communications This option is designed to allow publication of research reports that are not suitable for publication as regular articles. Shorter Communications are appropriate for articles with a specialized focus or of particular didactic value. Manuscripts should be between 3000 - 5000 words, and must not exceed the upper word limit. This limit includes the abstract, text, and references, but not the title pages, tables and figures.

Arrangement of the article Subdivision of the article. Divide your article into clearly defined and numbered sections. Subsections should be numbered 1.1 (then 1.1.1, 1.1.2), 1.2, etc. (the abstract is not included in section numbering). Use this numbering also for internal cross-referencing: do not just refer to 'the text.' Any subsection may be given a brief heading. Each heading should appear on its own separate line.

Appendices. If there is more than one appendix, they should be identified as A, B, etc. Formulae and equations in appendices should be given separate numbering: (Eq. A.1), (Eq. A.2), etc.; in a subsequent appendix, (Eq. B.1) and so forth.

Acknowledgements. Place acknowledgements, including information on grants received, before the references, in a separate section, and not as a footnote on the title page.

Figure legends, tables, figures, schemes. Present these, in this order, at the end of the article. They are described in more detail below. High-resolution graphics files must always be provided separate from the main text file (see Preparation of illustrations).

Specific remarks Tables. Number tables consecutively in accordance with their appearance in the text. Place footnotes to tables below the table body and indicate them with superscript lowercase letters. Avoid vertical rules. Be sparing in the use of tables and ensure that the data presented in tables do not duplicate results described elsewhere in the article.

Preparation of supplementary data. Elsevier accepts supplementary material to support and enhance your scientific research. Supplementary files offer the author additional possibilities to publish supporting applications, movies, animation sequences, high-resolution images, background datasets, sound clips and more. Supplementary files supplied will be published online alongside the electronic version of your article in Elsevier Web products, including ScienceDirect: ⇨ http://www.sciencedirect.com. In order to ensure that your submitted material is directly usable, please ensure that data is provided in one of our recommended file formats. Authors should submit the material in electronic format together with the article and supply a concise and descriptive caption for each file. For more detailed instructions please visit our artwork instruction pages at ⇨ http://www.elsevier.com/artworkinstructions.

References Responsibility for the accuracy of bibliographic citations lies entirely with the authors

Citations in the text: Please ensure that every reference cited in the text is also present in the reference list (and vice versa). Any references cited in the abstract must be given in full. Unpublished results and personal communications should not be in the reference list, but may be mentioned in the text. Citation of a reference as 'in press' implies that the item has been accepted for publication.

Citing and listing of web references. As a minimum, the full URL should be given. Any further information, if known (author names, dates, reference to a source publication, etc.), should also be given. Web references can be listed separately (e.g., after the reference list) under a different heading if desired, or can be included in the reference list.

Text: Citations in the text should follow the referencing style used by the American Psychological Association. You are referred to the Publication Manual of the American Psychological Association, Fifth Edition, ISBN 1-55798-790-4, copies of which may be ordered from http://www.apa.org/books/4200061.html or APA Order Dept., P.O.B. 2710, Hyattsville, MD 20784, USA or APA, 3 Henrietta Street, London, WC3E 8LU, UK. Details concerning this referencing style can also be found at http://humanities.byu.edu/linguistics/Henrichsen/APA/APA01.html.

List: References should be arranged first alphabetically and then further sorted chronologically if necessary. More than one reference from the same author(s) in the same year must be identified by the letters "a", "b", "c", etc., placed after the year of publication.

Examples: Reference to a journal publication: Van der Geer, J., Hanraads, J. A. J., & Lupton R. A. (2000). The art of writing a scientific article. Journal of Scientific Communications, 163, 51-59.

Reference to a book: Strunk, W., Jr., & White, E. B. (1979). The elements of style. (3rd ed.). New York: Macmillan, (Chapter 4).

Reference to a chapter in an edited book: Mettam, G. R., & Adams, L. B. (1994). How to prepare an electronic version of your article. In B. S. Jones, & R. Z. Smith (Eds.), Introduction to the electronic age (pp. 281-304). New York: E-Publishing Inc.

Note that journal names are not to be abbreviated.

Preparation of illustrations

Submitting your artwork in an electronic format helps us to produce your work to the best possible standards, ensuring accuracy, clarity and a high level of detail.

General points

- Always supply high-quality printouts of your artwork, in case conversion of the electronic artwork is problematic.
- Make sure you use uniform lettering and sizing of your original artwork.
- Save text in illustrations as "graphics" or enclose the font.
- Only use the following fonts in your illustrations: Arial, Courier, Helvetica, Times, Symbol.
- Number the illustrations according to their sequence in the text.
- Use a logical naming convention for your artwork files, and supply a separate listing of the files and the software used.
- Provide all illustrations as separate files and as hardcopy printouts on separate sheets.
- Provide captions to illustrations separately.
- Produce images near to the desired size of the printed version.

For more detailed instructions please visit our artwork instruction pages at ⇨ http://www.elsevier.com/artworkinstructions. You are urged to visit this site; some excerpts from the detailed information are given here.

Formats Regardless of the application used, when your electronic artwork is finalised, please "save as" or convert the images to one of the following formats (Note the resolution requirements for line drawings, halftones, and line/halftone combinations given below.):
EPS: Vector drawings. Embed the font or save the text as "graphics".
TIFF: Colour or greyscale photographs (halftones): always use a minimum of 300 dpi.
TIFF: Bitmapped line drawings: use a minimum of 1000 dpi.
TIFF: Combinations bitmapped line/half-tone (colour or greyscale): a minimum of 500 dpi is required.
DOC, XLS or PPT: If your electronic artwork is created in any of these Microsoft Office applications please supply "as is".

Line drawings Supply high-quality printouts on white paper produced with black ink. The lettering and symbols, as well as other details, should have proportionate dimensions, so as not to become illegible or unclear after possible reduction; in general, the figures should be designed for a reduction factor of two to three. The degree of reduction will be determined by the Publisher. Illustrations will not be enlarged. Consider the page format of the journal when designing the illustrations. Photocopies are not suitable for reproduction. Do not use any type of shading on computer-generated illustrations.

Photographs (halftones) Please supply original photographs for reproduction, printed on glossy paper, very sharp and with good contrast. Remove non-essential areas of a photograph. Do not mount photographs unless they form part of a composite figure. Where necessary, insert a scale bar in the illustration (not below it), as opposed to giving a magnification factor in the legend. Note that photocopies of photographs are not acceptable.

Copyright Upon acceptance of an article, authors will be asked to sign a ?Journal Publishing Agreement?? (for more information on this and copyright see ⊟→ http://www.elsevier.com/copyright). Acceptance of the agreement will ensure the widest possible dissemination of information. An e-mail (or letter) will be sent to the corresponding author confirming receipt of the manuscript together with a `Journal Publishing Agreement? form or a link to the online version of this agreement.
If excerpts from other copyrighted works are included, the author(s) must obtain written permission from the copyright owners and credit the source(s) in the article. Elsevier has preprinted forms for use by authors in these cases: contact Elsevier?s Rights Department, Oxford, UK: phone (+44) 1865 843830, fax (+44) 1865 853333, e-mail permissions@elsevier.com. Requests may also be completed online via the Elsevier homepage (⊟→ http://www.elsevier.com/locate/permissions).

Proofs When your manuscript is received by the Publisher it is considered to be in its final form. Proofs are not to be regarded as 'drafts'. One set of page proofs will be sent to the corresponding author, to be checked for typesetting/editing. No changes in, or additions to, the accepted (and subsequently edited) manuscript will be allowed at this stage. Proofreading is solely your responsibility. The Publisher reserves the right to proceed with publication if corrections are not communicated. Return corrections within 3 days of receipt of the proofs. Should there be no corrections, please confirm this.

Offprints Twenty-five offprints will be supplied free of charge. Additional offprints and copies of the issue can be ordered at a specially reduced rate using the order form sent to the corresponding author after the manuscript has been accepted. Orders for reprints (produced after publication of an article) will incur a 50% surcharge.

NIH voluntary posting policy
US National Institutes of Health (NIH) voluntary posting (" Public Access") policy Elsevier facilitates author response to the NIH voluntary posting request (referred to as the NIH "Public Access Policy", see ⇨ http://www.nih.gov/about/publicaccess/index.htm) by posting the peer-reviewed author's manuscript directly to PubMed Central on request from the author, 12 months after formal publication. Upon notification from Elsevier of acceptance, we will ask you to confirm via e-mail (by e-mailing us at NIHauthorrequest@elsevier.com) that your work has received NIH funding and that you intend to respond to the NIH policy request, along with your NIH award number to facilitate processing. Upon such confirmation, Elsevier will submit to PubMed Central on your behalf a version of your manuscript that will include peer-review comments, for posting 12 months after formal publication. This will ensure that you will have responded fully to the NIH request policy. There will be no need for you to post your manuscript directly with PubMed Central, and any such posting is prohibited.

Appendix D - Note of Ethical Approval.

Ethics Committee Approval was given for this study by the Southampton University Ethics Committee, under ethics approval code ST/03/98.

Appendix E - Participant Consent Form.

University of Southampton

School of Psychology

University of Southampton
Highfield Southampton
SO17 1BJ

Tel +44 (0)23 8059 2633
Fax +44 (0)23 8059 4597
Email karl@soton.ac.uk

Statement of Consent
Study Number:
Participant Identification Number for this trial:

CONSENT FORM

Title of Project: Psychological Consequences of Motor Vehicle Accidents.

Name of Researcher: Dr. Anke Karl

	Please initial box
1. I confirm that I have read and understand the information sheet dated 15/10/2007 for the above study. 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, without my medical care or legal rights being affected.	☐
3. I understand that relevant sections of the data collected during the study, may be looked at by individuals from the MVA research team headed by Dr. Anke Karl 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 agree to my GP being informed of my participation in the study	☐
5. I agree to take part in the above study.	☐

Name of Participant	Date	Signature
Name of Person taking consent	Date	Signature

When completed, 1 for patient; 1 for researcher site file; 1 (original) to be kept in medical notes

Appendix F - Information Sheet.

University of Southampton

School of Psychology

University of Southampton
Highfield Southampton
SO17 1BJ

Tel +44 (0)23 8059 2633
Fax +44 (0)23 8059 4597
Email karl@soton.ac.uk

Psychological Consequences of Motor Vehicle Accidents.

Information Sheet

You are being invited to take part in a research study. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Thank you for reading this information sheet.

What is the purpose of the study?

The aim of the study is to investigate psychological consequences of an MVA. Especially, we are interested in behavioural and brain activity during the processing of different emotional words and pictures. For this, we are investigating brain activity while you will be asked to carry out different tasks which are described in more detail below. The brain activity will be measured using leads that are attached to the scalp. We will also ask you to answer some questionnaires. The study will involve one appointment lasting approximately three hours.

Why have I been chosen?

We are writing to a number of potential participants who may be interested in participating in the study. We are seeking both healthy volunteers and motor-vehicle accident survivors.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason.

What will happen to me if I take part?

The study will involve one appointment which will take place at the University of Southampton and which will last approximately three hours. Prior to your appointment we will arrange a convenient time to speak to you on the phone and ask you some questions about the accident which you were in. During the first part of your visit to the University we will ask you to complete some questionnaires and to answer some questions describing your accident, your personality and your general mood.

During the second part of your visit we will ask you to carry out some different tasks: (a) to read words on a computer screen and identify how often they are on the screen by pressing some buttons (b) classify some pictures with different faces, and (c) to look at some images and listen to some music. You will be given detailed instructions for each task before you are asked to carry it out.

While you carry out the tasks we will measure your brain activity using the method of electroencephalography (EEG). In order to measure the brain activity a number of leads will be attached to your scalp and face. The leads on your head will be mounted on a cap. All leads will be filled with a watery gel. The leads transmit the electrical activity to the computer where it is recorded.

There is no risk involved; it is not possible for the leads to send electrical activity back to the brain. The leads can be removed in less than a minute if you decide you want to stop. Once the leads have been placed, you will be asked to complete the above-mentioned tasks on the computer.

We will endeavour to remove as much of the gel as possible at the end of the visit, but you may also wish to wash your hair when you get home.

What do I have to do?

There are no special requirements of you. Each task will be clearly explained before you are asked to carry it out.

What are the possible disadvantages and risks of taking part?

There are no significant disadvantages or risks involved in taking part in this study. Many people find the tasks fun if a little tiring. Some of the words and faces which are used may temporarily arouse strong feelings or memories or you may not find that you react at all.

The gel is salt based. It is harmless. However, to be certain, we will conduct a skin test to check that you do not react to it. This involves putting a tiny amount of gel on your hand to look for redness or itching.

What are the possible benefits of taking part?

There are no direct benefits to you, however the information that we get from this study may help to learn more about psychological consequences of MVAs and to improve treatment for people who may suffer from symptoms of stress and/or pain after an MVA.

What if there is a problem?

It is very unlikely that any part of this study will cause you harm. In the unlikely event that you feel upset after the investigation you can call one of the helpline numbers provided below. Also, if you feel distress as a consequence of the accident you may want to discuss this with your GP. The study is entirely non invasive. However, if any aspect of the way you have been approached or treated in the course of the study causes you concern, please write to the project supervisor Dr. Anke Karl at the School of Psychology, University of Southampton, Highfield, Southampton SO17 1BJ. If you remain unhappy and wish to complain formally, you can do this through the Chair of the Ethics Committee, Department of Psychology, University of Southampton, Southampton SO17 1BJ. Phone: (023) 8059 3995.

Will my taking part in this study be kept confidential?

Yes. All information collected about you during the course of the research will be kept strictly confidential. Personal information will not be released to or viewed by anyone other than researchers involved in this project. All of the data collected will be coded so that it is anonymous and will be stored securely. Results of this study will not include your name or any other identifying characteristics.

What will happen to the results of the research study?

The results from the study will provide us with data that we intend to present within the School of Psychology, University of Southampton and an article will be submitted for publication. You will not be identified in any presentation of the data. A copy of the study findings can be provided by Dr. Anke Karl, on request.

Involvement of the General Practitioner/Family Doctor

If you wish we can send the results of your questionnaires to your GP. We will only do this at your request.

What will happen if I do not want to carry on with the study?

Nothing will happen. If you no longer wish to participate you can do so whenever you wish without any negative consequences.

What will happen to the results of the research study?

The results from the study will provide us with data that we intend to present within the School of Psychology, University of Southampton and an article will be submitted for publication. You will not be identified in any presentation of the data. A copy of the study findings can be provided by Dr. Anke Karl, on request.

Who is organising and funding the research?

The study is funded and managed by the University of Southampton.

Who has reviewed the study?

The study has been reviewed and approved by the University of Southampton School of Psychology Ethics Committee. If you have questions about your rights as a participant in this research, or if you feel that you have been placed at risk, you may contact the Chair of the Ethics Committee, Department of Psychology, University of Southampton, Southampton, SO17 1BJ.
Phone: (023) 8059 3995.

Contact for Further Information:

Dr. Anke Karl
Lecturer in Clinical Psychology
School of Psychology,
University of Southampton,
Highfield, Southampton SO17 1BJ

Office number: 023 8059 2633
Email: karl@soton.ac.uk

Helplines:

ASSIST (Assistance Support and Self-help In Surviving Trauma)
www.traumatic-stress.freeserve.co.uk
01788 560800

Samaritans (24 hours a day)
www.samaritans.org
08457 909090

Appendix G - Verbal Instructions for Emotion Recognition Task.

Verbal Instructions for Emotion Recognition Task.

You are about to view a series of black and white facial images on the screen. A face will appear on the screen with a neutral expression and over the course of 35-40 seconds it will change into a fully emotional expression. The emotional expression could be angry, sad, disgusted, happy or fearful.

Your job is to identify the emotional expression on the face as quickly and accurately as you can. As soon as you think you recognise the emotional expression, press the space bar on the keyboard, this will stop the facial sequence and a response screen will appear.

The screen will say, if you think the emotional expression is angry press A, if you think it's sad press S, if you think it's disgusted press D, if you think it's happy press H and if you think it's fearful press F. [point to labelled buttons on keyboard].

As soon as you have made your selection the facial sequence will return to the screen and continue to change until the full emotional expression is shown. After a gap of a couple of seconds the next facial sequence will begin.

If you select an answer and then change your mind as the sequence progresses, you can just press the space bar again at any time and choose a different answer, as the computer will record all responses.

There are some on-screen instructions, then a short practice session before the task begins. Do you have any questions?

Appendix H - Visual Aid for Emotion Recognition Task Instructions.

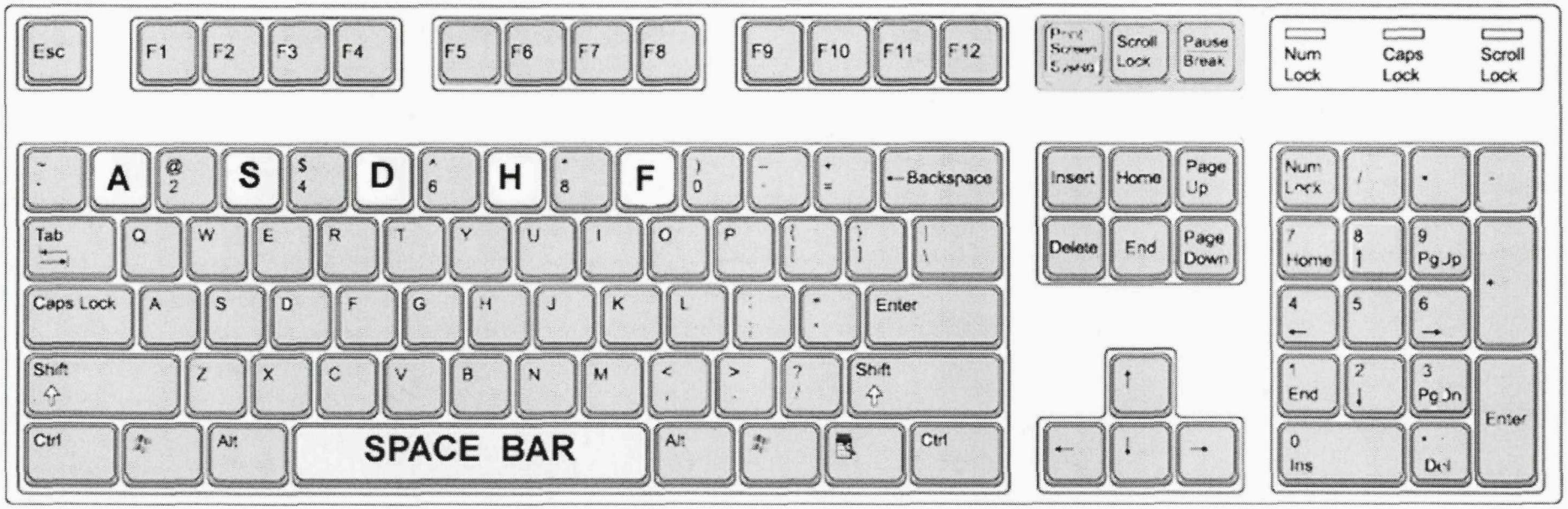
INSTRUCTIONS FOR TASK 1

During this task you will be shown images of several faces, merging from a neutral expression to an emotional expression.

You will be asked to identify the emotion displayed on the face as quickly as possible.

When you are ready to name the expression, press the SPACE BAR and select your answer from the following options:

ANGRY = Press A **SAD = Press S** **DISGUSTED= Press D** **HAPPY= Press H** **FEARFUL = Press F**



Appendix I - Visual Aid for Pleasantness and Arousal Ratings.

During this task you will be shown some of the faces you have just seen. You will be asked to make 4 ratings of each picture:

1) How pleasant or unpleasant the person in the image feels
2) How pleasant or unpleasant you feel viewing the image
3) How aroused the person in the image feels
4) How aroused you feel viewing the image

On each scale you can select your response by clicking the cursor of the mouse on one of the numbers on the scale to indicate your answer.

On the first scale, the word *pleasant* on the right-hand side refers to feeling *happy, pleased, satisfied, contented,* or *hopeful.* On the left-hand side the word *unpleasant* refers to feeling *unhappy, annoyed, unsatisfied, melancholy, despairing* or *bored.* If you feel completely *neutral*, you should place the arrow in the centre of the scale to indicate you feel neither *pleasant* nor *unpleasant*.

-4 ----- -3 ----- -2 ----- -1 ----- 0 ----- +1 ----- +2 ----- +3 ----- +4

Very Unpleasant | **Slightly Unpleasant** | **Neutral** | **Slightly Pleasant** | **Very Pleasant**

Using the mouse cursor, please click on the number above to indicate how pleasant or unpleasant the PERSON IN THE IMAGE feels

On the second scale, the words '*extremely aroused*' refer to feeling *stimulated, excited, frenzied, jittery, wide awake* or *aroused.* At the left hand side of the scale the words '*not at all aroused*' refer to feeling *relaxed, calm, sluggish, dull, sleepy, and un-aroused.* Again, you can click on any number along the scale to indicate your answer.

0 ----- +1 ----- +2 ----- +3 ----- +4 ----- +5 ----- +6 ----- +7 ----- +8

Not at all Aroused | **Slightly Aroused** | **Moderately Aroused** | **Very Aroused** | **Extremely Aroused**

Using the mouse cursor, please click on the number above to indicate how aroused the PERSON IN THE IMAGE feels

Appendix J - Participant Debriefing Statement.

University of Southampton

School of Psychology

University of Southampton
Highfield Southampton
SO17 1BJ

Tel +44 (0)23 8059 2633
Fax +44 (0)23 8059 4597
Email karl@soton.ac.uk

Psychological Consequences of Motor Vehicle Accidents.

Debriefing Statement

The aim of this study was to investigate behavioural and brain activity differences in emotional processing in MVA survivors. Based on the interview and questionnaire responses we allocated you to one of five groups: participants with both chronic pain and post-traumatic stress disorder, participants with post-traumatic stress disorder only, participants with chronic pain only, MVA survivors without chronic pain or PTSD and participants who never had an accident and have no chronic pain and PTSD.

During the experiment you were presented with four types of words; pain-related, accident-related, neutral and positive. It has been predicted that participants in different groups will react differently to these words. More specifically, we expect to find differences in brain activity and in the length of time that it took to name the number of the words on the screen.

In addition we asked you to classify pictures of faces with respect to the emotion you could detect in their face. We also asked you to rate how unpleasant and aroused that person felt and how unpleasant and aroused you felt when you saw this emotion. It has been hypothesized that people with a tendency to anxiety may be faster at classifying certain emotions in others.

Individual feedback on performance is not provided as the individual data collected do not have scientific utility. Information about brain activity are produced by averaging sections of the EEG across participants; individual recordings do not provide any useful information.

The results of this study will not include your name or any other identifying characteristics. The research did not use deception. You may have a copy of this summary if you wish.

I would like to take this opportunity to thank you for your assistance. I would appreciate any comments you have about your experiences of the study. If you have any further questions or comments, please contact me on 023 8059 2633 (office number) or via email karl@soton.ac.uk.

If you have questions about your rights as a participant in this research, or if you feel that you have been placed at risk, you may contact the Chair of the Ethics Committee, School of Psychology, University of Southampton, Southampton, SO17 1BJ. Phone: (023) 8059 3995.

Appendix K-Results Table 1 – Emotion Recognition Task and Mirrored Ratings.

Table 1. Results of emotion recognition task and ratings of mirrored pleasantness and arousal (MVA PTSD, n = 7; MVA no-PTSD, n = 10; No MVA no-PTSD n = 18).

	Measure	Group	Mean	SD
Accuracy of Emotion Recognition (0-10)				
	Angry	MVA PTSD	9.14	.89
		MVA no-PTSD	7.40	1.50
		Comparison Group	7.77	1.55
	Sad	MVA PTSD	8.71	1.38
		MVA no-PTSD	8.40	1.17
		Comparison Group	8.66	1.32
	Fearful	MVA PTSD	9.71	.48
		MVA no-PTSD	9.10	.99
		Comparison Group	9.50	.70
	Happy	MVA PTSD	10.00	0
		MVA no-PTSD	10.00	0
		Comparison Group	10.00	0
Intensity of Emotional Expression (%)				
	Angry	MVA PTSD	51.96	10.11
		MVA no-PTSD	63.27	13.18
		Comparison Group	50.49	8.69
	Sad	MVA PTSD	52.27	11.26
		MVA no-PTSD	54.35	11.69
		Comparison Group	46.49	7.23
	Fearful	MVA PTSD	51.68	9.45
		MVA no-PTSD	58.28	9.47
		Comparison Group	51.75	8.80
	Happy	MVA PTSD	34.85	10.19
		MVA no-PTSD	35.10	14.23
		Comparison Group	30.47	4.89

Table 1. *(continued).*

	Measure	Group	Mean	SD
Ratings of Mirrored Pleasantness (%)				
	Angry	MVA PTSD	22.85	15.33
		MVA no-PTSD	27.95	13.45
		Comparison Group	28.50	10.07
	Sad	MVA PTSD	34.42	13.24
		MVA no-PTSD	38.20	18.47
		Comparison Group	36.69	12.12
	Fearful	MVA PTSD	27.42	20.50
		MVA no-PTSD	32.95	15.69
		Comparison Group	30.22	12.94
	Happy	MVA PTSD	74.74	15.93
		MVA no-PTSD	74.85	11.63
		Comparison Group	71.55	11.47
Ratings of Mirrored Arousal (%)				
	Angry	MVA PTSD	39.07	32.77
		MVA no-PTSD	39.60	23.56
		Comparison Group	40.69	22.25
	Sad	MVA PTSD	22.00	35.25
		MVA no-PTSD	16.60	16.70
		Comparison Group	21.16	15.75
	Fearful	MVA PTSD	44.64	34.28
		MVA no-PTSD	37.75	22.82
		Comparison Group	40.52	21.74
	Happy	MVA PTSD	36.28	30.13
		MVA no-PTSD	39.10	21.24
		Comparison Group	35.05	19.47

Note: Ratings of mirrored pleasantness: the higher the score, the more pleasant the rating, Ratings of mirrored arousal: the higher the score, the more aroused the rating

Appendix L - Results Table 2 – Empathy and Self-Compassion.

Table 2. Group differences: empathy and self-compassion self-report scales (MVA PTSD group, n = 7, MVA no-PTSD group, n = 10, non-MVA comparison group, n = 18).

Measure	Group	Mean	SD
Empathy: Interpersonal Reactivity Index			
Fantasy Scale	MVA PTSD	15.28	6.92
	MVA no-PTSD	13.20	6.03
	Comparison Group	15.88	6.21
Perspective Taking	MVA PTSD	20.14	4.63
	MVA no-PTSD	18.40	3.83
	Comparison Group	19.11	4.10
Empathic Concern	MVA PTSD	22.42	3.95
	MVA no-PTSD	19.30	3.88
	Comparison Group	20.94	5.24
Personal Distress	MVA PTSD	13.28	5.28
	MVA no-PTSD	5.50	2.46
	Comparison Group	12.22	5.15
Self-Compassion: Self-Compassion Scale			
Self-Kindness	MVA PTSD	2.91	.82
	MVA no-PTSD	2.76	.57
	Comparison Group	2.80	.85
Common Humanity	MVA PTSD	2.78	.72
	MVA no-PTSD	3.22	.97
	Comparison Group	3.06	.73
Mindfulness	MVA PTSD	3.96	.54
	MVA no-PTSD	3.72	.74
	Comparison Group	3.54	.77
Self-Judgement	MVA PTSD	3.57	1.02
	MVA no-PTSD	3.22	.81
	Comparison Group	3.25	.98

Table 2. Group differences: self-compassion scale *(continued)*

Isolation	MVA PTSD	3.21	.99
	MVA no-PTSD	3.60	.81
	Comparison Group	3.55	.98
Over-identified	MVA PTSD	3.28	.98
	MVA no-PTSD	3.75	1.00
	Comparison Group	3.13	.92
Total Self-Compassion	MVA PTSD	19.73	4.21
	MVA no-PTSD	20.28	3.40
	Comparison Group	19.36	4.18

Appendix M -Results Table 3 – PTSD Symptom Severity, Empathy, Mirrored Ratings and Intensity of Expression

Table 3. Correlation coefficients between PTSD symptom severity, empathy subscales and ratings of mirrored pleasantness and arousal in response to negative facial emotions, and intensity required for accurate identification of emotions (n = 17),

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Symptom Severity	1														
Interpersonal Reactivity Index																
2	Fantasy Scale	.041	1													
3	Perspective Taking	.231	.463*	1												
4	Empathic Concern	.499*	.003	.308	1											
5	Personal Distress	.607**	.259	.071	.182	1										
Mirrored Pleasantness Ratings																
6	Angry	-.404	-.290	-.407	.131	-.331	1									
7	Sad	.055	-.641**	-.497*	-.045	-.028	.369	1								
8	Fearful	-.512*	-.208	-.454*	-.138	-.228	.676**	.559**	1							
Mirrored Arousal Ratings																
9	Angry	.283	.404	.237	-.244	.178	-.848**	-.381	-.527*	1						
10	Sad	.160	.266	.059	-.050	.104	-.371	-.201	-.343	.571**	1					
11	Fearful	.407	.419*	.330	-.079	.206	-.851**	-.536*	-.710**	.942**	.573**	1				
Emotional Intensity																
12	Angry	.215	.031	-.422*	.010	-.204	.191	.219	.148	.083	.044	.034	1			
13	Sad	.259	.181	-.137	.275	-.180	.030	-.040	-.122	.221	.358	.290	.753**	1		
14	Fearful	.201	.052	-.467*	-.083	-.139	.026	.035	-.055	.229	.223	.215	.867**	.748**	1	
15	Happy	.431*	.289	-.104	.302	.070	-.151	-.057	-.099	.372	.448*	.381	.727**	.830**	.810**	1

*Correlation is significant at the 0.05 level, **Correlation is significant at the 0.01 level (both 1-tailed).

Appendix N - Results Table 4 – PTSD Symptom Severity and Self-Compassion

Table 4. Correlation coefficients between PTSD symptom severity and self-compassion (n = 17)

		1	2	3	4	5	6	7	8
1	Symptom Severity	1							
Self-Compassion Scale									
2	Self-Kindness	.209	1						
3	Common Humanity	-.399	.093	1					
4	Mindfulness	.486*	.443*	.496*	1				
5	Self-Judgement	-.105	.244	.333	.502*	1			
6	Isolation	-.362	-.151	.776**	.435*	.450*	1		
7	Over-identified	.068	.334	.532*	.686**	.567**	.556*	1	
8	Total Self-Compassion	-.066	.401	.766**	.800**	.727**	.746**	.862**	1

*Correlation is significant at the 0.05 level, **Correlation is significant at the 0.01 level (both 1-tailed).

References for Appendices.

Buss, A. H., & Plomin, R. (1975). *A temperament theory of personality development.* New York: Wiley.

Davis, M.H. (1980). A Multidimensional Approach to Individual Differences in Empathy. *Journal Supplement Abstract Service (JSAS) Catalog of Selected Documents in Psychology.* 10, 85.

Davis, M.H. (1983). Measuring individual differences in empathy: evidence for a multidimensional approach. *Journal of Personality and Social Psychology,* 44, 113-126.

Wechsler, D. (1955). *Manual for the Wechsler Adult Intelligence Scale.* New York: The Psychological Corporation.