SOCIAL COGNITION PERFORMANCE IN POST TRAUMATIC STRESS DISORDER

SOCIAL COGNITION PERFORMANCE

IN

INDIVIDUALS WITH POST TRAUMATIC STRESS DISORDER

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Abstract

Social cognition, the ability to understand the thoughts and feelings of oneself and others, is central to optimal navigation of the social world. Accumulating evidence suggests disruptions in social cognition may underlie the interpersonal dysfunction commonly experienced by individuals with several psychiatric disorders such as schizophrenia, bipolar disorder, major depressive disorder, and post-traumatic stress disorder (PTSD). Exposure to psychological trauma can have lasting and debilitating effects on an individual, with a subset developing PTSD as a result, marked by symptoms of re-experiencing, mood disturbances, arousal changes, emotional dysregulation, and in turn, poor interpersonal and general functioning. Here, we investigated the effects of psychological trauma exposure on sociocognitive performance across the domains of emotion comprehension in prosody, theory of mind (ToM), and moral reasoning. This thesis contributes unique findings to the PTSD literature by demonstrating that individuals diagnosed with PTSD stemming from chronic childhood trauma experience alterations in emotional comprehension of prosody, ToM performance, and moral reasoning. Furthermore, we have integrated and summarized literature on the interaction of morality, moral transgressions, the experience of shame and guilt, and the emergence of associated adverse mental health outcomes experienced in a military context. In summary, we have demonstrated that sociocognitive skills are disrupted in individuals exposed chronic psychological trauma and that moral emotions such as guilt and shame play an important role in the emergence of PTSD and its resistance to treatment. These

disruptions may represent a central therapeutic focus in the pursuit to ameliorate the interpersonal difficulties experienced in trauma and stress-related disorders.

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I would like to dedicate this work to my parents and family, who have sacrificed so much in their own lives in order for me to be able to focus on pursuits I am extremely passionate about. You are truly an inspiration for me.

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List of Abbreviations

ACC	Anterior cingulate cortex
ANCOVA	Analysis of covariance
ANOVA	Analysis of variance
BDI	Beck Depression Inventory
CAPS	Clinician-Administered PTSD Scale
CES	Combat Exposure Scale
CF	Canadian Forces
CGS	Combat Guilt Scale
CINAHL	Cumulative Index to Nursing and Allied Health Literature
CSTQ	Child Soldiers Trauma Questionnaire
CTQ	Childhood Trauma Questionnaire
DLPFC	Dorsolateral prefrontal cortex
DMN	Default mode network
DND	Canada's Department of National Defense
DoD	US Department of Defense
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders (4^{th} Edition)
EC	Emotion comprehension
EMBASE	Excerpta Medica Database
fMRI	Functional magnetic resonance imaging
FTD	Frontotemporal dementia
fvFTD	Frontal-variant frontotemporal dementia

HAM-D	Hamilton Rating for Depression
HC	Healthy control
IPT-15	Interpersonal Perception Task-15
IQ	Intelligence quotient
LHSC	London Health Sciences Centre
MDD	Major Depressive Disorder
MDI	Multiscale Dissociation Inventory
MEDLINE	Medical Literature Analysis and Retrieval System Online
MIES	Moral Injury Evaluation Scale
MINI-KID	Mini International Neuropsychiatric Interview for Children and Adolescents
MPFC	Medial prefrontal cortex
M-PTSD	Mississippi Scale for Combat-Related PTSD
MST	Military sexual trauma
NVVRS	National Vietnam Veterans Readjustment Study
OEF/OIF	Operation Enduring Freedom/Operation Iraqi Freedom
OFC	Orbitofrontal cortex
OSI	Operational stress injuries
PBI	Parental Bonding Instrument
PCL	PTSD Checklist
PSS-I	Posttraumatic Symptom Scale, Interview Version
PsycINFO	Psychological Information Database

PTCI	Posttraumatic Cognitions Inventory
PTGI	Posttraumatic Growth Inventory
PTSD	Post-traumatic Stress Disorder
RT	Reaction time
RMET	Reading the Mind in the Eyes Test – Revised
SCID	Structured Clinical Interview for DSM Disorders
SN	Salience network
STRGS-WZ	Sources of Trauma-Related Guilt Survey – War-Zone Version
sx	Symptoms
ToM	Theory of mind
TRGI	Trauma-Related Guilt Inventory
US	The United States of America
VA	US Veteran Affairs
VAC	Veteran Affairs Canada
VLPFC	Ventrolateral prefrontal cortex
VREQ	Vietnam Related Experiences Questionnaire

Declaration of Academic Achievement

Chapter 2

Manuscript: Nazarov, A., Frewen, P., Oremus, C., Schellenberg, G., McKinnon, M.C., & Lanius, R. (2015). Comprehension of affective prosody in women with posttraumatic stress disorder related to childhood abuse. *Acta Psychiatrica Scandinavica*, 131, 342-349.

Contribution: A. Nazarov managed the day-to-day execution of the project, conducted interviews with study participants, analyzed data, interpreted results, and wrote the manuscript. P. Frewen assisted with interpretation of results and revised the manuscript. C. Oremus conducted interviews with study participants. G. Schellenberg designed the paradigm and assisted in data analysis, data interpretation, and manuscript revision. Drs. McKinnon and Lanius conceived and designed the study, interpreted results, and revised the manuscript. Dr. McKinnon provided direct guidance and project oversight. This paper was submitted to *Acta Psychiatrica Scandinavica* on May 5th, 2014 and accepted for publication on October 14th, 2014.

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Contribution: A. Nazarov managed the day-to-day execution of the project, conducted interviews with study participants, analyzed data, interpreted results, and wrote the manuscript. V. Walaszczyk assisted with qualitative scoring and manuscript revisions. P. Frewen assisted with interpretation of results and revised the manuscript. C. Oremus conducted interviews with study participants. G. Drs. McKinnon and Lanius conceived and designed the study, interpreted results, and revised the manuscript. Dr. McKinnon provided direct guidance and project oversight. This paper is in final stages of preparation for submission to *Acta Psychiatrica Scandinavica.*

CHAPTER 1:

GENERAL INTRODUCTION

General Introduction

It is estimated that at least half of the general population will experience psychological trauma at some point in their life. Between 10-25% of individuals exposed to trauma subsequently develop post-traumatic stress disorder (PTSD), an illness marked by disrupted interpersonal function, heightened arousal, intrusive memories, and diminished concentration and memory performance, reflecting dysregulation in both affective and information processing resources among patients with this disorder (Association, 2013; Herman, 1992; Litz, Orsillo, Kaloupek, & Weathers, 2000; Moore, 2009). PTSD can have debilitating effects on social and emotional functioning, with associated loss of productivity.

Literature has shown that individuals with PTSD report diminished cohesion and disrupted functioning of the family unit (Evans, McHugh, Hopwood, & Watt, 2003), lower life satisfaction (Jordan et al., 1992), disrupted intimacy within romantic attachments (Riggs, Byrne, Weathers, & Litz, 1998), and are less likely to form and maintain intimate relationships (Cook, Riggs, Thompson, Coyne, & Sheikh, 2004). Accordingly, leading treatment interventions for PTSD focus on strengthening emotional regulation and on re-establishing stable interpersonal relationships, factors considered key to the amelioration of PTSD-related symptoms and their associated effects on functioning (Lanius, Bluhm, & Frewen, 2011). Unfortunately, many individuals diagnosed with PTSD are resistant to treatment, particularly when appropriate interventions are not delivered in a timely fashion (Foa, Keane, Friedman, & Cohen, 2008).

Despite knowledge of alterations in memory and information processing in PTSD, key questions remain unaddressed concerning the nature of interpersonal functioning experience in trauma survivors, including trauma survivors' ability engage in social cognition, the ability to understand and respond to the thoughts and feelings of others. This ability is thought requisite to successful interpersonal interactions and adaptive functioning in the social world. Current literature suggests that performance on social cognition tasks involving empathy, theory of mind (ToM), and moral reasoning relies on a joint contribution of cognitive and affective processes (Gallese, Keysers, & Rizzolatti, 2004; Greene, 2015; Hoffman, 1991). Since cognitive and emotional processes are known to be altered in PTSD, we investigated whether these alterations extend to social cognition performance. Finally, many of the sample neural regions and networks essential for optimal social cognitive function are also altered in patients with PTSD (Adolphs, 2001; Liberzon & Martis, 2006; Robinson & Shergill, 2011). This thesis addresses fundamental questions about the underlying processes contributing to the disruption of interpersonal functioning in individuals exposed to trauma, leading to enhanced diagnosis practices and treatment interventions.

Unfortunately, psychological traumatization is very prevalent in today's society. Approximately every 3 in 4 Canadians experienced at least one traumatic event within their lifetime, with an estimated lifetime prevalence of PTSD being around 9-10% (Van Ameringen, Mancini, Patterson, & Boyle, 2008). The prevalence of PTSD is much higher in military service members (15%), particularly those who were deployed or experienced combat (25%) (Parliament of Canada, 2011). Psychological trauma manifests in many

shapes and forms, but is usually dichotomized as single-blow (short-lived, one-time event) or prolonged, such as in the case of childhood neglect or abuse. Recently, more research has been directed towards understanding how moral transgressions may impact an individual and whether these guilt- and shame-inducing events may manifest in similar PTSD symptomatological profiles (Litz et al., 2009). Despite the source or type of trauma, there is a central need for studying trauma's impact on the individual. We do this in the hopes that if we cannot avoid trauma, at least we can take action to limit the impact it has on our lives.

Considering the high frequency of transportation accidents, natural disasters, child abuse, and assaults, the study of PTSD is highly applicable to the general population. Despite extensive programs being put into place to protect our children, the most vulnerable part of our society, childhood abuse and neglect is still prevalent to this day. Although childhood abuse frequently goes unreported, some estimate that approximately 20-35% of children in developed countries experience some form of abuse (Afifi et al., 2014; Mullen, Martin, Anderson, Romans, & Herbison, 1996). A recent study has shown that approximately 1 in 3 Canadian children experience some type of childhood abuse (Afifi et al., 2014). Critically, the unique cognitive, emotional, and behavioural profiles that protect an individual during early-life adversity may be incongruent with safe environments encountered during adulthood. In turn, this may contribute to the interpersonal dysfunction and functional impairment frequently observed in adult survivors of developmental trauma (Cloitre, Miranda, Stovall-McClough, & Han, 2005). Social cognition unfolds over a lengthy developmental window and is highly dependent

upon optimal social experiences. Therefore, alterations in social cognitive functioning (e.g., ability to recognize emotion, empathic responding, perspective-taking) stemming from childhood experience would be expected to contribute significantly to interpersonal disruptions observed in adulthood.

Finally, exposure to trauma in the workplace is another important context of investigation, considering the heightened psychological distress experienced by military personnel (Boulos & Zamorski, 2013; Hoge et al., 2004), emergency first responders (Halpern, Maunder, Schwartz, & Gurevich, 2011; Mitchell, 1984), and healthcare workers (Flannery & others, 1996; Soares, Lawoko, & Nolan, 2000). In Chapter 2, 3, and 5 we explore the performance of specific sociocognitive functions in adult survivors of prolonged childhood abuse. Chapter 4 explores PTSD and associated distress experienced in a military context.

1.1 Social Cognition

Theoretical models have proposed that performance on social cognitive tasks is multidimensional, involving both cognitive (e.g., executive functioning; working memory) and affective (e.g., emotion perception) processing resources (McKinnon & Moscovitch, 2007; Rankin, Kramer, & Miller, 2005) thought to be altered in patients with PTSD (Clark et al., 2003; Hayes, Labar, Petty, McCarthy, & Morey, 2009; Jelinek et al., 2008; Koso & Hansen, 2006; Moores et al., 2008; Vasterling et al., 2002); for reviews see (Etkin & Wager, 2007) and (Moore, 2009)). Although the definition of social cognition is quite variable within the scientific literature, it is essentially an umbrella term that encapsulates all mental processes necessary to optimally interact with other individuals

(Adolphs, 2001; Gallese et al., 2004). This includes the perception, comprehension, and proper responses to others' behaviour, intentions, and mental states. Successful social interactions involve the domains of emotion perception and comprehension (see Section 1.1), theory of mind (ToM; the ability to attribute complex mental states to oneself and others; see Section 1.2), empathy (the ability to share the affective experience of another individual; see short summary in Section 1.2), and moral reasoning (the ability to judge whether one's behaviour meets one's own and society's moral standards and expectations; see Section 1.3).

The ability to interact with the outside world is heavily dependent on early-life experiences and environmental feedback. Socio-cognitive skills develop over the first five years of life and are honed into adolescence (Blakemore & Choudhury, 2006; Wellman, Cross, & Watson, 2001). Accordingly, this developmental period is associated with inherent risks and opportunities, where childhood experiences may shape long-lasting patterns of behaviour, including social cognitive ability. In cases of developmental trauma, particularly that which is chronic and inflicted by trusted individuals who would be expected to provide safety and support, children may develop distinct behavioural responses that include dissociation and learned helplessness (Lanius et al., 2010b; Lanius, Frewen, Vermetten, & Yehuda, 2010a). These responses may represent optimal adaptations for survival in environments where the option of escape is persistently non-existent (Lanius et al., 2010a) and which differ qualitatively from symptoms experienced in PTSD stemming from a single-blow trauma or trauma experience during adulthood (Lanius et al., 2010b).

Critically, the unique cognitive, emotional, and behavioural profiles (e.g., dissociation) that protect an individual during early-life adversity may be incongruent with safe environments encountered during adulthood and may contribute to the interpersonal dysfunction and functional impairment frequently observed in seen adult survivors of developmental trauma (Cloitre et al., 2005). Here, alterations in social cognitive functioning (e.g., ability to recognize emotion, empathic responding, perspective-taking) stemming from childhood experience would be expected to contribute significantly to interpersonal disruptions observed in adulthood. For example, the ability to engage in moral reasoning unfolds over a lengthy developmental window, and is highly dependent on the emergence of moral emotions, the maturation of empathic and perspective taking abilities, and optimal attachment styles (Malti, Ongley, Killen, & Smetana, 2014).

The rest of this chapter explores the theoretical and clinical literature of each socio-cognitive domain and its application to individuals experiencing psychological distress after exposure to psychological trauma.

1.1. Emotion Comprehension

Emotion comprehension (EC) is defined as the ability to perceive and comprehend emotions in speech (termed as prosody) and facial expressions. Paradigms investigating EC include the presentation of images, sounds, video, and direct observations. EC generally emerges around the age of 3-to-4 years and continues to develop into adolescence (Aguert, Laval, Lacroix, Gil, & Le Bigot, 2013; Pons, Harris, & de Rosnay, 2004; Pons, Lawson, Harris, & de Rosnay, 2003).Evidence from lesion and functional

magnetic resonance imaging (fMRI) studies demonstrate that emotion comprehension relies on a network of neural regions involving the amygdala, insula, medial prefrontal cortex (MPFC), ventrolateral prefrontal cortex (VLFPC), orbitofrontal cortex (OFC), and the anterior cingulate cortex (ACC) insula (Fusar-Poli et al., 2009; Hamann, 2012; Phan, Wager, Taylor, & Liberzon, 2002). Although specific role each neural region has in EC is difficult to establish, literature points to valence-dependent activation. Specifically, happy emotions are associated with activity in dorsal ACC and amygdala, sad emotions with subgenual ACC and amygdala, fear with amygdala, anger with OFC and insula, and disgust with insula (Fusar-Poli et al., 2009; Hamann, 2012; Phan et al., 2002). Meanwhile the MPFC is commonly activated across a range of emotions (Phan et al., 2002) and is likely required for its role in emotional decision-making (Damasio et al., 2000) and emotional self-regulation (Davidson & Irwin, 1999). Furthermore, some studies suggest EC is mildly lateralized to the right hemisphere (Borod, Bloom, Brickman, Nakhutina, & Curko, 2002; Yuvaraj, Murugappan, Norlinah, Sundaraj, & Khairiyah, 2013), although others suggest right lateralization for negative emotions and left lateralization for positive emotions (Ahern & Schwartz, 1979; Davidson, Mednick, Moss, Saron, & Schaffer, 1987). Affective prosody comprehension is known to specifically engage the right posterior–superior temporal region (Ethofer et al., 2006), the thalamus (Ross & Monnot, 2008), putamen (Paulmann, Pell, & Kotz, 2008; Ross & Monnot, 2008), and higher-cognitive modulatory systems involving the orbitofrontal cortex (OFC;(Sander et al., 2005) and the medial frontal cortex (MFC; (Ethofer et al., 2006). Although more work is necessary to elucidate how EC relates to other domains of social cognition, prominent

theoretical frameworks consider EC to be a stage of low-level sensory processing and integration, and is likely a precursor for successful ToM and empathic responding (Corrigan, 1997; Ochsner, 2008).

Only a few studies have examined the performance of patients with PTSD on tests of emotion recognition in prosody and facial expressions. One study reported that relative to controls, Vietnam War veterans with PTSD demonstrated generalized deficits in the identification of affective prosody, showing deficits similar to that found in individuals with focal right hemisphere brain damage (Freeman, Hart, Kimbrell, & Ross, 2009). Individuals with PTSD were also found to be more likely to perceive fear in children's facial expressions (Knezevic & Jovancevic, 2004) and more likely to rate a set of facial expressions (neutral, fear, happy) more negatively than healthy individuals (Shin et al., 2005). Finally, a recent study exploring predictors of deployment-related PTSD within a sample of military personnel found that shorter fixations for fearful faces prior to deployment predicted the PTSD diagnosis status after deployment (Beevers, Lee, Wells, Ellis, & Telch, 2011). Despite evidence of deficits in facial perception, several studies demonstrated that facial expressivity in individuals with PTSD is intact (Orsillo, Batten, Plumb, Luterek, & Roessner, 2004; Wagner, Roemer, Orsillo, & Litz, 2003).

In parallel to behavioural changes, neuroimaging studies employing facial processing paradigms have also shown functional alterations in patients with PTSD. Patients with PTSD showed increased activity in the dorsolateral prefrontal cortex (DLPFC) during the presentation of threatening stimuli, and in the OFC and dorsal ACC during aversion of threatening stimuli in patients with PTSD (Fani et al., 2012).

Exaggerated amygdala response to fearful and negative facial expressions has also been reported (Bryant et al., 2008; Mazza et al., 2012a; Rauch et al., 2000; Shin et al., 2005). Finally, a recent study found that healthy individuals exposed to trauma during childhood also demonstrate amygdala hyper-responsivity, along with reduced gray matter volumes in the hippocampus, ACC, caudate, and OFC (Dannlowski et al., 2012). It must be noted that many of these neural regions are responsible for social cognition (Adolphs, 2001). Alterations of the OFC and the MFC have been frequently reported in PTSD literature, demonstrating changes in structure (Nardo et al., 2013; Thomaes et al., 2010), function during emotional processing (Liberzon & Martis, 2006), and neuropsychological performance (for review see (Aupperle, Melrose, Stein, & Paulus, 2012)).

In Chapter 2 we explore the ability of individuals with PTSD to comprehend basic emotions in speech. Specifically, using a computer-based task, we presented participants with short speech excerpts spoken in Hebrew (in order to prevent semantic processing). The speech excerpts consisted of happy, sad, angry, or fearful emotions. Accuracy and reaction times (RT) were analyzed.

1.2. Theory of Mind

Theory of mind (ToM) pertains to the ability to understand and infer the thoughts and feelings of others and is a central component of social interaction and functioning (Adolphs, 2001; Premack & Woodruff, 1978). ToM allows an individual to be aware that others may hold beliefs, perspectives, and intentions that are different from one's own. ToM ability has been considered to be composed of two sub-functions (Sabbagh, 2004) that rely on distinct neural circuitry (Abu-Akel & Shamay-Tsoory, 2011; Cao, Li, Li, &

Li, 2012): decoding (the ability to infer mental states based on immediate sensory stimuli) and reasoning (the ability to infer mental states based on mental representations) (Sabbagh, 2004). In Chapter 3, we explore ToM decoding performance in a group of women with PTSD stemming from chronic childhood trauma.

In order to infer mental states of others based solely on sensory information, individuals must *decode* the incoming sensory information (e.g., prosody, facial expressions, eye gazes, other non-verbal behaviour), integrate it, and pass it to the memory and higher-level cognitive decision-making processes in order to allow for mental state attribution (Corrigan, 1997). ToM decoding relies heavily upon optimal EC functioning. Indeed, tasks such the RMET and Interpersonal Perception Task-15 (IPT-15; where the participant must view short videos displaying social interactions correctly judge intentions and behaviours of others based on subtle non-verbal cues), have been shown to require both ToM and EC processing (Adolphs, 2003; Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001). Therefore, successful ToM decoding likely relies first on successful sensory perception and integration (Beer & Ochsner, 2006; Chakrabarti, Bullmore, & Baron-Cohen, 2006). On the other hand, ToM reasoning relies solely on one's own mental representations of others' perspectives. Although not completely conclusive, lesion studies have demonstrated partial double-dissociation between EC and ToM function (Baird et al., 2006; Goukon, Noguchi, & Hosokawa, 2007). Generally, ToM reasoning is assessed using tests such as the social faux pas scenarios (McKinnon & Moscovitch, 2007), Happe's Strange stories (Happé, 1994), and false-belief tasks (Baron-Cohen, Leslie, & Frith, 1985). In these tasks, individuals are

presented with descriptions of specific social situations (usually with several characters, each holding different perspectives and beliefs). Mental representations are formed based on this information and subsequently allow the individual to predict the intentions, behaviours, and beliefs of different characters/perspectives in the scenarios. Some ToM reasoning paradigms further delineate distinct types of ToM. For instance, a task by McKinnon and Moscovitch (McKinnon & Moscovitch, 2007) further divides perspective-taking questions in order to differentially query affective inference ("how does she feel?"; affective ToM) and cognitive inference ("what is she thinking?"; cognitive ToM). Although not directly assessed in the experimental studies contained in this thesis, cognitive and affective ToM rely on slightly different neural networks and show differential patterns of performance under certain conditions (Mitchell & Phillips, 2015). Unfortunately, the literature is not consistent with definitions of different types of ToM and other related socio-cognitive domains. For instance, empathy, the ability to share the emotional experience of another individual, is commonly split into cognitive empathy (ability to understand how another person might feel) and affective empathy (ability to personally experience emotions felt by another individual) (Blair, 2005; Shamay-Tsoory et al., 2007). Applying the above definitions, cognitive empathy is equivalent to affective ToM. Future studies must be cognizant of nomenclatural inconsistencies in the literature and clearly define the sociocognitive domain under investigation.

Generally, ToM relies on the recruitment of a distinct network of neural regions, including the temporo-parietal junction (TPJ), medial prefrontal cortex (MPFC), precuneus, anterior temporal lobes, and inferior frontal gyrus (IFG) (see ref. (Schurz,

Radua, Aichhorn, Richlan, & Perner, 2014) for review). Critically, neuroimaging findings in PTSD suggest disruptions in many of these regions (see ref. (Sartory et al., 2013) for review). Considering the previous reports of socio-cognitive dysfunction in PTSD and the overlap in neural regions implicated in ToM function and the pathophysiology of PTSD, we predicted to find disruptions in ToM decoding performance.

ToM decoding performance in PTSD has only been investigated in two previous studies. Nietlisbach, Maercker, Rössler, & Haker (2010) have shown that individuals with syndromal and subsyndromal mixed-etiology PTSD were just as competent as healthy controls at judging complex mental states of others based solely on the visual information from others' eye region using the RMET. However, [pmid:22397917] reported deficits in the same task in military police officers that developed PTSD compared to police officers that did not develop PTSD.

To date, only one study has previously explored ToM reasoning in individuals with PTSD. Mazza et al. (2012b) found no deficits on a ToM reasoning task involving the interpretation of irony, white lies, and figures of speech in a group of military police officers with PTSD. However, the findings by Mazza et al. (2012b) are limited by the ceiling effect observed across all groups on the ToM reasoning task; the ToM reasoning task was low in difficulty and may not have been sensitive enough to discern potential group differences. Furthermore, the study sample included individuals with PTSD due to combat-related trauma, the results of which may not be applicable to individuals exposed to chronic developmental trauma. Overall, there is a gap in the literature; no previous

studies have explored ToM (neither decoding nor reasoning) performance in individuals exposed to developmental trauma.

1.3. Morality

For most of us, we do not need to stop and think of whether a behaviour we carry out is socially acceptable or if it breaks any inner moral code – it feels innate. Studying moral judgments attempts to uncover the underlying thought processes during those critical times, be it donating blood or saving the life of a stranger. The term moral reasoning encompasses the judgments behind moral issues and moral behaviour, and determines whether actions meet personal and societal moral expectations. Moral reasoning has primarily been studied in the field of developmental psychology (Decety, Michalska, & Kinzler, 2011; Turiel, 2008) and more recently in that of forensic (Blair, 2007) and neurocognitive psychology (Greene, 2015).

Since moral reasoning involves the comparison of behaviours to social and moral standards, one must first be able to successfully integrate multiple perspectives, emotions, mental states, and intentions. It is not a surprise then, that moral reasoning is highly linked to successful ToM (Moran et al., 2011; Young, Cushman, Hauser, & Saxe, 2007). Indeed, many of the same neural regions are involved in both socio-cognitive functions (Young et al., 2007).

Moral behaviour and reasoning is usually placed on a continuum of utilitarianism on one side and deontology on the other. Utilitarianism involves the understanding that

the correct action is the one that results in greater good (Mill, 1998). By contrast, deontology posits that certain actions are always amoral, regardless of how good the outcomes are (Kant, 1959). Greene, Nystrom, Engell, Darley, & Cohen (2004, 2001) proposed the dual-process theory – whereas utilitarian choices are based upon cognitive reasoning, deontological choices are driven by more innate, emotional responses. Greene et al. (2004, 2001) further delineates moral contexts into personal and impersonal dilemmas. A personal moral dilemma involves the decision of whether or not to inflict harm directly onto another person (i.e., footbridge dilemma (Thomson, 1986); you must throw someone onto the tracks of an oncoming out-of-control trolley that is imminently going to kill five people. The body of the victim that you pushed will stop the trolley and consequently save the five people). In an impersonal dilemma, the harm to the victim is indirect (via a proxy). For example, the modified trolley dilemma (Thomson, 1986) also involves saving the lives of five people by killing one, except here the path of the trolley is redirected by means of a switch. The increased complexity of personal dilemmas (Greene et al., 2004) is thought to arise due to conflict between the "emotional" response (avoidance of inflicting direct harm) and the purely "cognitive" response (saving five lives over one).

Moral judgment is not a global neural process but rather is dependent upon a distinct interaction of neural regions, primarily concentrated in the orbitofrontal cortex (OFC) (Beer, Heerey, Keltner, Scabini, & Knight, 2003; Moll & de Oliveira-Souza, 2007), dorsolateral prefrontal cortex (DLPFC) (Greene et al., 2004; Moll & de Oliveira-Souza, 2007), anterior cingulate cortex (ACC) (Greene et al., 2004), and amygdala

(Berthoz, Grèzes, Armony, Passingham, & Dolan, 2006). Greene et al. (Greene et al., 2001) suggest that whereas the OFC is responsible for eliciting emotional responses, the DLPFC is involved in evoking a cognitive response. When the two responses are both strong, this conflict may be resolved by the ACC. Studies of patients with focal OFC damage demonstrate that an inability to utilize the OFC leads to increased DLPFC activation, consecutively eliminating emotions that aid in moral decision-making, leading to overly utilitarian judgments (Lough et al., 2006). For instance, in frontotemporal dementia, where symptoms of emotional blunting are central, patients are more likely to approve of the utilitarian choice in the footbridge dilemma (Mendez, Anderson, & Shapira, 2005). In addition, individuals diagnosed as psychopaths demonstrate difficulties in using the proper emotional connotations to match the knowledge of social norms in order to yield socially acceptable decision-making and behaviour (Blair, 2007). By contrast, care-based morality in associated with increased OFC activation (Moll et al., 2002; Robertson et al., 2007). Finally, landmark research has shown that the neural regions that are responsible for emotional/deontological moral reasoning are also related to shame and guilt (Michl et al., 2012), symptoms prominent among individuals with PTSD (Lee, Scragg, & Turner, 2001; Leskela, Dieperink, & Thuras, 2002).

Neuroimaging studies provide compelling evidence that the neural regions thought to be involved in moral reasoning are also implicated in the pathophysiology of PTSD. Specifically, patients with PTSD demonstrate structural and/or functional changes in the medial prefrontal cortex, ACC, OFC, and amygdala (see (Francati, Vermetten, & Bremner, 2007; Liberzon & Sripada, 2008) for review). Other studies (Bluhm et al., 2009;

Daniels, Frewen, McKinnon, & Lanius, 2011; Lanius et al., 2010c) identify alterations in the default mode network (DMN), a collection of neural regions activated in situations where one is at rest, and during tasks of self-referential processing, theory of mind, and autobiographical memory (Rabin, Gilboa, Stuss, Mar, & Rosenbaum, 2010; Spreng & Grady, 2010). Critically, studies of healthy subjects and individuals with psychopathy (Reniers et al., 2012) have demonstrated that the DMN is also recruited during moral judgment processing of personal dilemmas. Chiong et al. (2013) have extended moral reasoning neuroimaging findings to include the role of the salience network (SN) in causally modifying the DMN during moral judgment. Chiong et al. (2013) proposed a reframing of Greene's dual-processing model of moral judgment by highlighting that the neural regions classically known to be associated with emotional processing engaged during personal dilemmas are actually DMN nodes, which are in turn modified by SN's more classically "cognitive" processing. Critically, the DMN/SN equilibrium and switching has been shown to be altered in PTSD both at rest (Sripada et al., 2012) and during active task processing (Daniels et al., 2010).

1.5. Overall Goals

We set out to determine whether individuals exposed to trauma show altered social cognition responding. We investigated the social cognition domains of emotion comprehension, theory of mind decoding, and moral reasoning. Furthermore, we explored whether severity of emotion dysregulation, dissociative features, or parental bonding styles affect social cognition performance. In our experimental studies (Chapters 2, 3, and 5), participants completed an extensive battery of well-validated social cognition tasks

shown previously to rely on cognitive and affective processing resources. We hypothesised that individuals with PTSD related to chronic psychological trauma in their childhood would experience alterations and deficits in performance across all socio-cognitive domains. Furthermore, we predicted that heightened PTSD symptomatology would be associated with poorer social cognition performance.

1.6. Thesis Outline

The following chapters delve into the socio-cognitive alterations seen in patients with PTSD. In each of the Chapters 2, 3, and 5, a specific socio-cognitive domain is explored in a sample of adult women diagnosed with PTSD related to prolonged childhood trauma using a case-control study design. Chapters 2,3, and 5 are primary, experimental investigations. Each study had a comparator group consisting of women without a psychiatric diagnosis and no history of childhood abuse or neglect. Chapter 2 explores the comprehension of emotional prosody while Chapter 3 explores ToM decoding performance. Chapter 4 is a systematic scoping review that explores the interaction of morality, the experience moral emotions (such as guilt and shame), and the emergence of adverse mental health outcomes, specifically focused on a military context. Chapter 4 acts as an introduction to morality and an excellent transition into Chapter 5, where we explore the moral reasoning performance in individuals exposed to prolonged developmental trauma. Finally, Chapter 6 is a gestalt discussion on the primary findings of this thesis; limitations and future directions are discussed.

CHAPTER 2:

COMPREHENSION OF AFFECTIVE PROSODY IN WOMEN WITH POSTTRAUMATIC STRESS DISORDER RELATED TO CHILDHOOD ABUSE

Foreword to Chapter 2

In this chapter we explore emotion comprehension performance in women diagnosed with PTSD related to childhood trauma. Specifically, we assessed prosodic comprehension using two tasks designed by G. Schellenberg, one of the authors of the study. Participants were instructed to listen to short speech experts and then identify the emotion conveyed in the voice of the actor. In the second task, participants listened to two speech excerpts presented consecutively. They were then prompted to discern whether the two speech excepts conveyed the same emotion or different emotions. In this study, we explored the identification and comprehension of four emotions, namely, happiness, sadness, anger, and fear. Finally, the severity of childhood abuse and clinical symptomatology (symptoms of PTSD, dissociation, and depression) were recorded. This study explores EC, which is considered to be the simplest of all socio-cognitive domains and occurs in the initial stages of the social informational processing stream. This is a novel contribution to the literature considering no previous study has explored prosodic function exclusively in individuals with PTSD due to developmental trauma.

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Comprehension of affective prosody in women with posttraumatic stress disorder related to childhood abuse

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Abstract

Objective: Although deficits in memory and cognitive processing are evident in post-traumatic stress disorder (PTSD), difficulties with social cognition and the impact of such difficulties on interpersonal functioning are poorly understood. Here, we examined the ability of women diagnosed with PTSD related to childhood abuse to discriminate affective prosody, a central component of social cognition.

Method: Women with PTSD and healthy controls (HCs) completed two computer-based tasks assessing affective prosody: (i) recognition (categorizing foreign-language excerpts as angry, fearful, sad, or happy) and (ii) discrimination (identifying whether two excerpts played consecutively had the 'same' or 'different' emotion). The association of performance with symptom presentation, trauma history, and interpersonal functioning was also explored.

Results: Women with PTSD were slower than HCs at identifying happiness, sadness, and fear, but not anger in the speech excerpts. The presence of dissociative symptoms was related to reduced accuracy on the discrimination task. An increased severity of childhood trauma was associated with reduced accuracy on the discrimination task and with slower identification of emotional prosody.

Conclusion: Exposure to childhood trauma is associated with long-term, atypical development in the interpretation of prosodic cues in speech. The findings have implications for the intergenerational transmission of trauma.

Key words: Social Perception; Speech; Stress Disorders, Post-Traumatic; Adult Survivors of Child Abuse; Dissociation.

Significant Outcomes

- Compared to healthy women, women with post-traumatic stress disorder (PTSD) related to childhood abuse were slower to identify prosodic cues conveying fear, happiness, and sadness but not anger; Increased severity of childhood trauma was associated with longer latencies in identifying affective prosody and decreased sensitivity in discriminating between different emotions in speech.
- The presence of dissociative symptoms was related to decreased sensitivity in discriminating between different emotions in speech.

Limitations

- Limitations of this study include the retrospective nature of self-report measures, the modest sample size, and the cross-sectional design.
- Our findings cannot be generalized to men, individuals who experienced single-incident trauma, or to individuals exposed to trauma occurring outside of developmentally critical periods.

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Introduction

Difficulties in emotion regulation are considered central to the onset and maintenance of post-traumatic stress disorder (PTSD) (1–4) and are thought to contribute to interpersonal dysfunction (e.g. family, friendship) that is often observed among trauma survivors (3). Emotional competence contributes to psychological and social wellbeing (5–7), which implies that social cognition is an important area of investigation for improving our understanding of psychopathology, including PTSD, and related emotional and interpersonal difficulties. Critically, exposure to chronically abusive environments during developmentally critical periods may result in alterations of social cognitive processes (e.g. Theory of Mind – ToM) that remain evident in safer contexts, even in adulthood.

In a pattern similar to that observed in patients with mood disorders (8–11), patients with PTSD display altered performance across several domains of social cognition, including ToM (12, 13), empathy (14, 15), and emotion recognition (16, 17). Auditory and visual stimuli are used to judge behaviour, intentions, and mental states of others. It is therefore surprising that most studies examining the ability to recognize emotion among patients with psychopathology (e.g. depression, schizophrenia) focus primarily on the ability to recognize emotions as depicted in facial expressions, with the ability to recognize emotions conveyed through speech (affective prosody) being largely overlooked. Indeed, only one study has investigated comprehension of affective prosody in PTSD. Freeman et al. (18) found that, in comparison with age-matched controls, Vietnam veterans with current and lifetime PTSD experienced difficulty identifying and discriminating affective prosody. Although this result reveals evidence of alterations in

the recognition of affective prosody among adult trauma survivors, it does not inform how early developmental experiences of trauma may affect this core social cognitive ability. Moreover, no data were presented concerning how alterations in the ability to recognize affective prosody may differ across the particular emotions that are conveyed.

Post-traumatic stress disorder due to chronic, developmental trauma may be different from PTSD stemming from exposure to a single event or to trauma occurring in adulthood, with developmental trauma being associated with a unique symptom cluster (19) and higher burden of illness (4, 20). Trauma occurring during childhood, particularly that which is chronic, may disrupt highly sensitive, developing brain systems responsible for core affective and cognitive processes, resulting in dysfunction that extends into adulthood (21–23). Patients with PTSD due to developmental trauma are also at a heightened risk of developing symptoms of dissociation (20, 24–26), which may further exacerbate potential alterations in social cognitive processes through disruption of attentional resources (27–31), disorganized interpersonal attachment (32), and phobias of experiencing emotions (33), factors that collectively may influence the comprehension of emotion (34, 35). Because the ability to decode affective prosody emerges at around age 4 and continues to develop into adolescence (36), early life experiences that alter key affective and cognitive processes are likely to influence the optimal development of this ability and thus translate into prosodic dysfunction that may be observed during adulthood.

Aims of the study

The primary aim of this study was to investigate the comprehension of affective prosody in patients with post-traumatic stress disorder stemming from adversity in early life. Because the ability to decode and comprehend prosody develops over the course of childhood and adolescence, we predicted that exposure to chronic trauma in childhood would disrupt the comprehension of prosody in speech. Our paradigm also allowed us to assess separately the processing of four basic emotions (happiness, sadness, fear, and anger), as opposed to an omnibus analysis of aprosodia. Finally, we examined whether severity of childhood trauma and dissociative symptoms would predict prosodic comprehension.

Material and methods

Participants

Fifty women were recruited to participate in this study, 29 individuals with a primary diagnosis of current PTSD related to childhood abuse [PTSD group; mean age 42.0 (SD = 12.3) years] and 21 healthy controls [HC group; mean age 39.9 (SD = 14.7) years]. The groups were matched for age and sex. Women with PTSD were recruited at the London Health Sciences Centre (LHSC; London, ON, Canada) through out-patient programmes. The HC subjects were recruited through word of mouth and local advertisements at LHSC and St. Joseph's Healthcare Hamilton (Hamilton, ON, Canada). HC participants had no current or lifetime history of psychiatric illness. The study sample was drawn from the same pool of participants described in Nazarov et al. (12).

Diagnosis of PTSD was confirmed via the Structured Clinical Interview for DSM-IV (SCID) (37). PTSD symptom severity was assessed using the Clinician-Administered

PTSD Scale (CAPS) (38), and depression symptom severity was measured with the Beck Depression Inventory (BDI) (39). Symptoms of dissociation and histories of childhood trauma were assessed by the Multiscale Dissociation Inventory (MDI) (40) and the Childhood Trauma Questionnaire (CTQ) (41) respectively. Demographic and clinical summaries are provided in Table 1. HCs were administered the same measures to rule out the presence of current and past psychiatric illness and history of childhood maltreatment. Exclusion criteria for all groups were (i) substance-use-related disorder within the past 6 months as determined by the SCID, (ii) use of alcohol or illicit psychoactive substance within 48 h of testing, (iii) significant medical illness, (iv) history of head injury with loss of consciousness lasting more than 60 s, (v) history of neurological disease, and (vi) knowledge of the Hebrew language (see below).

Affective prosody tasks

All participants completed two computer-based behavioural tasks that assessed the recognition and discrimination of prosodic cues to emotion. The stimuli were created specifically for this study. The stimuli were pre-recorded 2-s excerpts spoken in Hebrew by a female speaker. There were 16 stimuli in total: four semantically neutral sentences spoken in four different ways such that the prosodic cues clearly expressed happiness, sadness, fear, or anger.

Stimuli were presented over headphones at a comfortable volume, which participants could control individually. Response options were presented on a monitor in a 2 × 2 grid of equidistant boxes for the identification task and a 1 × 2 grid of equidistant boxes for the discrimination task. The response options, their locations, and the visual

parameters, did not vary across trials. Participants used a computer mouse to click on the appropriate response for each trial. They were instructed to respond as quickly and as accurately as possible. Each trial was preceded by a 'ready?' prompt. By pressing the space bar, participants indicated that they were ready for the next trial. For both tasks, trials were presented in randomized order. Each trial had one correct answer. Accuracy and reaction times (RT) were recorded by a computer for each trial.

In the recognition task, participants were required to determine which one of four basic emotions (happiness, sadness, anger, or fear) was conveyed in each speech excerpt. All 16 stimulus sentences were presented, preceded by four practice trials.

In the discrimination task, participants heard a standard and a comparison sentence presented consecutively. This task utilized all 16 stimulus sentences. On each trial, the two sentences always differed semantically. The task was to identify whether they conveyed the same emotion or different emotions. There were 24 trials, with 12 'same' emotions and 12 'different' emotions. For 'same' trials, each of the four sentences was paired with the three other sentences with identical emotions, in both orders. The sentences were paired identically for different trials except that the comparison sentence conveyed an emotion different from the standard. Sentences and emotions were counter-balanced so that each occurred equally often as standard and comparison. The task was preceded by two practice trials.

Statistical methods

To examine group differences on the demographic and clinical variables, two-tailed independent-samples t-tests were used. All analyses were pre-ceded by the

Shapiro–Wilk test of normality. Identification accuracy measures could not be transformed (i.e. scores were integers between 0 and 4), remained non-normal, and were analyzed using a mixed-effects model for nonparametric data (42) (this analysis has been shown to be more powerful in comparison with chi-squared as it takes into account the within- and between-factors present in our experimental design). RT measures were log-transformed to adjust for non-normality and Winsorized to 95% of the distribution to account for outliers. Group differences in RT were analyzed using a mixed-design ANOVA, with diagnosis as a between-subjects factor and emotion (happy/sad/ angry/fearful) or discrimination type (same/different) as a repeated measure. Bonferroni corrections were applied for follow-up comparisons. Associations were calculated using Pearson's r or Spearman's r_s (two tailed). Effect sizes were estimated by partial eta-squared (η_p^2) and Cohen's d. Significance was set at $\alpha = 0.05$ for all analyses. Analyses were conducted with *SPSS 21* (IBM, Armonk, NY, USA) and *R 3.0* statistical software (R Foundation for Statistical Computing, Vienna, Austria).

Results

The clinical and demographic characteristics of the study sample are displayed in Table 1. As expected, the PTSD group had significantly higher scores on all clinical variables (CAPS, BDI, CTQ, and MDI, Ps < 0.05). Age of participants did not differ significantly between groups.

For the recognition task, there were no group differences in accuracy because the stimuli were constructed to be emotionally unambiguous. On average, performance was very good, which provided evidence for stimulus validity. Recognition accuracy was

89%, 84%, and 83% correct (chance = 25%) for sentences intended to portray anger, sadness, and happiness respectively. Performance was lower (54%) for fearful-sounding stimuli, presumably because of confusions based on arousal level or valence (43) and associated acoustic cues (44). There was, however, a main effect of group on RTs ($F_{1,45}$ = 20.1, $P < 0.001$, $\eta_p^2 = 0.31$). Compared with HCs, women with PTSD were significantly slower at identifying emotions. The interaction between group and emotion ($F_{3,135} = 2.57$, $P = 0.057$, $\eta_p^2 = 0.054$; Fig. 1) approached statistical significance. RTs were slower in the PTSD than in the HC group for fearful ($t_{46} = 4.00$, $P < 0.001$, $d = 1.12$), happy ($t_{48} = 4.04$, $P < 0.001$, $d = 1.12$), and sad ($t_{48} = 5.26$, $P < 0.001$, $d = 1.51$) sentences, but not for angry sentences ($t_{47} = 1.18$, $P > 0.05$).

For the discrimination task, there were no differences in accuracy between groups. There was a significant main effect of diagnosis on RTs, however ($F_{1,48} = 28.5$, $P < 0.001$, $\eta_p^2 = 0.373$), because women with PTSD were significantly slower at discriminating emotions.

When we examined only the women with PTSD, we found negative associations between severity of childhood trauma history (as assessed by the CTQ) and RTs on the identification task (Fig. 2). Specifically, increased latency to recognize angry and sad emotions was related to increased reports of emotional abuse, emotional neglect, physical abuse, and physical neglect. Longer latencies for recognition of fear were related to increased reports of emotional abuse and neglect. Longer latencies for recognition of happiness were related to increased reports of emotional neglect and marginally associated with increased physical neglect. On the discrimination task, longer latencies

were related to increased reports of physical abuse. There was also an association between history of childhood trauma and accuracy on the discrimination task: Women with a more severe history of emotional were less accurate at discriminating emotions. A similar but marginal association was evident with physical neglect.

For dissociative symptoms (as assessed by the MDI), the ability of women with PTSD to discriminate between different emotions was negatively associated with identity dissociation (r_s = -0.484, P = 0.008) and depersonalization (r_s = -0.429, P = 0.020), and marginally associated with derealization (r_s = -0.345, P = 0.067).

Discussion

This is the first study to demonstrate altered comprehension of affective prosody in women with PTSD stemming from childhood trauma. In comparison with matched healthy subjects, women with PTSD exhibited increased latencies in identification of happy, sad, and fearful prosody, but not for anger. Patients with a more severe history of childhood trauma and increased dissociation symptoms (driven particularly by identity dissociation and depersonalization) displayed lower accuracy for discriminating prosodic patterns that are markers of different emotions. RT across all emotions were strongly associated with increased severity of reports of childhood trauma in women with PTSD, particularly emotional abuse, emotional neglect, and physical neglect.

Although identification was slowed in response to happy, sad, and fearful expressions, women with PTSD performed as well as controls in response to expressions of anger. Several studies have demonstrated selective deployment of attention toward angry cues in individuals exposed to childhood maltreatment (45–48). For example,

maltreated children who are presented with facial expressions that are morphed between sad and angry emotions are more likely to attribute ambiguous expressions as angry (49). Preservation of a normal reaction to anger among women with PTSD is consistent with the findings from maltreated childhood and suggests that maltreatment leads to heightened *sensitivity* rather than habituation to anger, which allows individuals to anticipate aversive encounters.

Nevertheless, we also found that increased severity of childhood maltreatment was related to slowed responding across *all* emotions, including happiness, sadness, and fear as well as anger. Exposure to childhood trauma may lead to heightened sensitivity to expressions of emotion that are most pertinent to one's safety (e.g. recognition of angry as opposed to happy emotions), but chronicity may create further alterations in higher-cognitive networks that contribute to global psychomotor slowing and attentional deficits, manifesting in slowed RT to emotional stimuli in general. Future research could explore the interaction between trauma chronicity, sensitization of emotion processing, and frontal-lobe activation patterns in response to emotionally evocative stimuli.

In our PTSD sample, we found that increased severity of childhood trauma (particularly emotional and physical neglect) was also related to decreased ability to *discriminate* prosodic cues that signal different emotions. Among children, the ability to discriminate faces that express different emotions is impaired for those who are neglected but not for those who are abused (48). Considered jointly, these findings suggest that different childhood emotional experiences during abuse and neglect create distinct developmental trajectories that involve deficits in emotion processing. Moreover,

maladaptive emotional experiences may have global effects on emotion processing that manifest within multiple sensory domains.

The cortico-limbic inhibition model of dissociative PTSD hypothesizes that the detachment from emotional experience may be due to affective dampening and overmodulation by higher cortical regions (for review see Ref. 50). In line with this view, we found that discrimination accuracy for affective prosody decreases in tandem with increasing symptoms of dissociation, particularly identity dissociation and depersonalization. Individuals presenting with higher dissociation symptoms may have experienced overmodulation of affective processing, which, in turn, could lead to decreased sensitivity to emotional stimuli in general and ultimately to discrimination errors between different emotions. Implementation of neuroimaging in future studies may elucidate whether individuals with stronger symptoms of dissociation exhibit inhibited neuronal activation patterns in response to prosodic cues to emotion.

Finally, our results parallel our previous finding of altered ToM performance in complex PTSD related to childhood trauma (12). There is still much debate regarding the interaction of basic emotion comprehension with higher-level socio-cognitive processing (e.g. decoding abilities in ToM) and whether deficits in these socio-cognitive domains act independently (51, 52). To determine whether comprehension of basic emotions acts as an independent contributor to social-cognition performance, future studies could assess the contributions of each socio-cognitive domain to successful interpersonal functioning and examine how deficits in one domain are accompanied by deficits in other domains.

Our findings have implications for the intergenerational transmission of trauma, where developmental alterations in prosodic ability may impact future parenting interactions with associated consequences for offspring. For example, parental PTSD contributes to the experience of trauma among children of Holocaust survivors (53, 54). Specifically, higher levels of emotional abuse and neglect are reported among children of parents with PTSD, factors that correlate with increased cortisol secretion among offspring (53). Accordingly, disruptions in emotion comprehension may relate to disrupted interpersonal attachments that contribute to a non-optimal parenting style and emotional neglect toward the child.

The limitations of the present study require consideration, particularly the retrospective nature of trauma assessments and the modest sample size. Furthermore, our study can only be generalized to women exposed to chronic childhood trauma. As our control sample consisted of women with minimal to no exposure to childhood maltreatment, we cannot distinguish between the effects of early trauma exposure and of PTSD on prosodic function. Thus, inclusion of a trauma-exposed non-PTSD control group is warranted. Future studies should also examine prosodic functioning in PTSD patients with and without the dissociative subtype. Moreover, matching for years of education should be considered in the future as covariation was not appropriate within our sample (55). Finally, although there have been null findings of alterations in psychomotor speed in non-combat-related PTSD (56–58), future studies of emotion recognition in PTSD could explore the contribution of psychomotor speed to individual differences in task performance.

The novel findings reported here point to altered comprehension of affective prosody in women with PTSD related to childhood trauma. In comparison with healthy women, women with PTSD showed slower identification of prosodic cues to happiness, sadness, and fear but not to anger. A more severe history of childhood trauma was associated with even slower recognition of emotions, and with a decreased ability to discriminate between distinctive patterns of acoustic cues that are associated with emotions expressed through prosody. The ability to discriminate such emotions was also associated with the presence of dissociation symptoms. Although a definitive causal pathway needs to be documented, the finding of prosodic alterations in our sample suggests strongly that exposure to childhood trauma leads to developmental changes in prosodic function.

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Declarations of interest

None.

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Tables and Figures

Table 1. Clinical and demographic characteristics of study sample

Characteristic	Control ($n = 21$) *n*	PTSD ($n = 29$) *N*
Sex		
Male	0	0
Female	21	29
	Mean	Mean
Age	39.9 (14.7)	42.0 (12.3)
Education	16.3 (2.5)	13.7 (2.3)*
CAPS	0.1 (0.5)	80.1 (15.4)*
BDI	3.5 (5.7)	32.0 (12.0)*
Childhood Trauma Questionnaire		
Emotional abuse	6.1 (1.5)	18.5 (5.2)*
Physical abuse	5.5 (1.1)	13.0 (5.7)*
Sexual abuse	5.2 (0.4)	15.5 (7.3)*
Emotional neglect	7.4 (2.2)	17.9 (4.9)*
Physical neglect	6.2 (1.7)	11.6 (5.5)*
MDI (total)	34.7 (6.0)	75.1 (21.9)*
Disengagement	7.6 (2.4)	17.0 (4.0)*
Depersonalization	5.2 (0.4)	10.8 (5.1)*
Derealization	5.5 (1.7)	11.7 (4.2)*
Emotional constriction	5.5 (1.1)	13.0 (6.1)*
Memory disturbance	5.6 (1.5)	12.1 (4.5)*
Identity dissociation	5.2 (0.5)	10.6 (6.2)*

BDI, Beck Depression Inventory; CAPS, Clinician-Administered PTSD Scale; MDI, Multiscale Dissociation Inventory; PTSD, post-traumatic stress disorder.
Values are *n* or mean (standard deviation).
*Significant group effect ($P < 0.05$).

Figure 1. Mean RT for identification of affective prosody between groups (±SE).

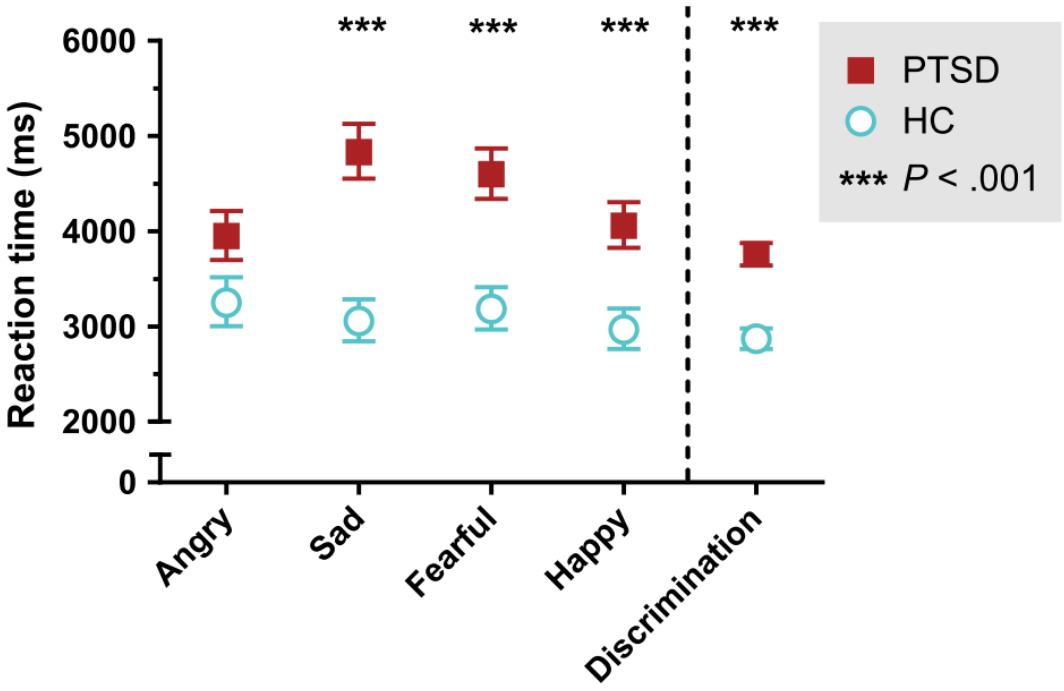
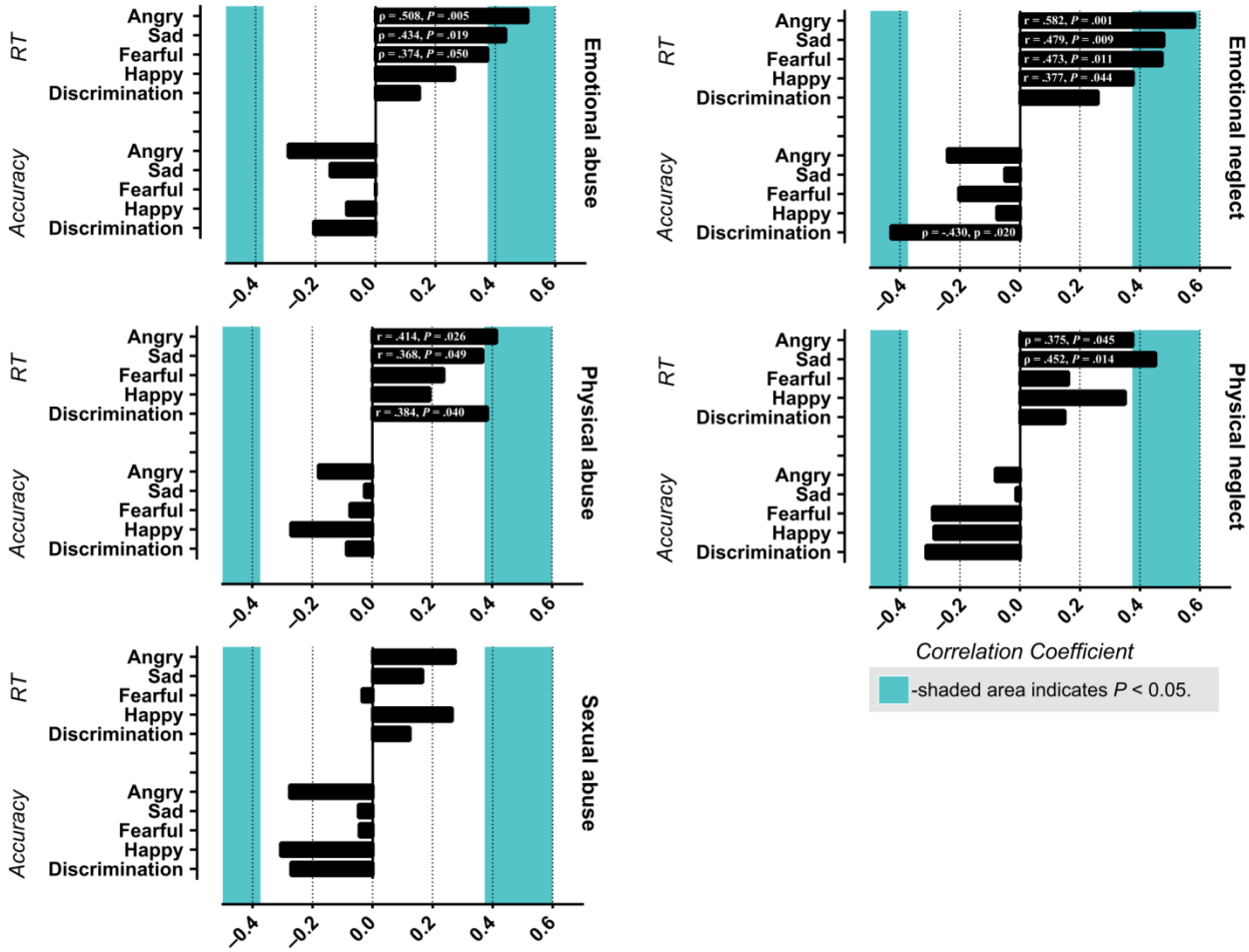


Figure 2. Correlation matrix between childhood trauma scores (on the CTQ) and comprehension of prosody.



CHAPTER 3:

THEORY OF MIND PERFORMANCE IN WOMEN WITH POSTTRAUMATIC STRESS DISORDER RELATED TO CHILDHOOD ABUSE

Foreword to Chapter 3

The ability to attribute complex mental states to self and others is a central domain of social cognition and is thought to rely upon the joint contribution of cognitive and affective processing resources. Since individuals with PTSD experience deficits in several cognitive and affective processes, we are interested in investigating whether these alterations extend to ToM performance. In this chapter we explore ToM decoding performance in women diagnosed with PTSD related to childhood trauma. Specifically, we assessed ToM using one two tasks: the RMET and the IPT-15. This study builds upon the findings from the EC showing alterations in prosodic function in trauma-exposed individuals. ToM decoding has been shown to be highly related to proper EC function. This investigation explores the next step in the social-informational processing stream. The severity of childhood abuse and clinical symptomatology (symptoms of PTSD, dissociation, and depression) were assessed in relation to ToM performance. This is a novel contribution to the literature considering no previous study has explored ToM function exclusively in individuals with PTSD due to developmental trauma. Furthermore, we used employed a valence-based categorization of the RMET trials, an analysis rarely considered in the RMET literature.

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Theory of mind performance in women with post-traumatic stress disorder related to childhood abuse

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Abstract

Objective: Key questions remain unaddressed concerning the nature of interpersonal functioning in trauma survivors, including the ability to understand and interpret other people's thoughts and feelings. Here, we investigate theory of mind (ToM) performance of women with PTSD related to childhood abuse in comparison to healthy controls.

Method: Participants completed two ToM tasks, the Interpersonal Perception Task-15 (IPT-15) and the Reading the Mind in the Eyes Task – Revised (RMET).

Results: Relative to controls, women with a history of childhood trauma had difficulty recognizing familial relationships depicted in the IPT-15 ($P = 0.005$). No other category of the IPT-15 showed significant group differences. In addition, while healthy women displayed faster RMET reaction times to emotionally valenced mental states (positive: $P = 0.003$; negative: $P = 0.016$) compared with neutral mental states, the PTSD group showed similar reaction times across all valences. The presence of dissociative symptoms (e.g., disengagement, amnesia, identity dissociation) was strongly associated with hindered accuracy of complex mental state identification and altered perception of kinship interactions.

Conclusion: Women with PTSD stemming from childhood trauma show changes in ToM abilities particularly those often involved in the interpretation of family interactions. In addition, individuals with PTSD showed slower reaction times during the recognition of complex mental states from emotionally salient facial/eye expressions in comparison with healthy subjects.

Key words: Social Perception; Theory of Mind; Stress Disorders, Post-Traumatic; Adult Survivors of Child Abuse

Significant Outcomes

- Women with post-traumatic stress disorder (PTSD) related to childhood abuse show deficits in theory of mind performance, particularly during interpretations of familial interactions.
- Women with PTSD are slower at recognizing complex mental states from emotionally salient facial/eye expressions in comparison to healthy women.
- The presence of dissociative symptoms is strongly associated with hindered accuracy of complex mental state identification and altered perception of kinship interactions.

Limitations

- Retrospective nature of self-report measures, modest sample size, and the cross-sectional design are limitations of this study.
- Our findings cannot be generalized to individuals who experienced single-incident trauma, or to individuals exposed to trauma occurring outside of developmentally critical periods.
- Study sample did not include men, therefore limiting the generalizability of these findings only to women.

Introduction

Posttraumatic stress disorder (PTSD) is an illness that can have debilitating effects on multiple facets of daily living, and in particular on interpersonal relationships (1). Previous work has shown that individuals with PTSD report diminished cohesion and disrupted functioning of the family unit (2), lower life satisfaction (3), disrupted intimacy within romantic attachments (4), and are less likely to form and maintain intimate relationships (5). Furthermore, individuals exposed to childhood trauma display deficits in emotion regulation (6, 7), report disrupted interpersonal functioning (8, 9), and are at higher risk of suicide (9, 10), psychosis (11), and an unfavorable course of illness in mood disorders (12, 13).

Despite strong evidence of disruptions in interpersonal functioning among survivors of trauma, little work has systematically investigated the specific impairments in social cognition, such as theory of mind (ToM) deficits, which may mediate these poor outcomes. ToM is defined as the ability to adopt the perspectives of others to understand their behaviour, intentions, and the emotions they may be experiencing (14). Preliminary work points to alterations in social cognitive performance among patients with PTSD, with the majority of work focused on alterations in empathic responding and in emotion recognition (15). Critically, empathic responding is thought to require ToM abilities as the ability to take another's perspective is required prior to engaging in emotional reciprocity. These findings are in line with numerous studies demonstrating deficits in recognizing facial emotion (e.g., anger, happiness, sadness) among individuals with PTSD (16, 17) (but see (18, 19) for conflicting findings in facial expressivity).

By contrast, ToM performance among patients with PTSD has received little attention in comparison with patients with related (and commonly co-morbid) diagnoses of mood disorders (20, 21). Some studies found less accurate judgment of the complex mental states of others based solely on the visual information available from these individuals' eye region (Reading the Mind in the Eyes Task – Revised; RMET) in individuals with PTSD (22), although others have not observed this (15). The results of the latter study, however, remain equivocal due to variable symptom severity and trauma exposure in the study sample (for a recent review see (23)). However, in the Mazza et al. (22) study, group differences were not observed in an adaptation of Happe's Strange Stories, a complex ToM task involving the interpretation of social interactions including white lies, figures of speech, and irony. Accordingly, evidence suggestive of ToM deficits in PTSD subjects remains preliminary and equivocal to date.

Aims of the study

To extend previous research concerning theory of mind performance in individuals with posttraumatic stress disorder related to childhood trauma. Given there is a strong association between childhood trauma, disruptions in parent–child relationships, and the negative effect of trauma on psychosocial development, we hypothesized that individuals exposed to trauma during childhood would experience deficits in ToM, particularly in scenarios involving familial interactions. The influence of varying symptom presentation (e.g., the presence of depressive or dissociative symptoms) was also explored.

Material and methods

Participants

Fifty-one women were recruited to participate in this study; 31 individuals with a primary diagnosis of current PTSD related to childhood abuse and 20 healthy controls (HC) of similar age. Women with PTSD were recruited by London Health Sciences Centre (LHSC; London, Ontario, Canada) through out-patient programs. The HC subjects were recruited through word of mouth and local advertisements by LHSC and St. Joseph's Healthcare Hamilton (Hamilton, Ontario, Canada). HC participants had no current or lifetime history of psychiatric illness.

Diagnosis of PTSD was confirmed via the Structured Clinical Interview for DSM-IV (SCID) (24). PTSD symptom severity was assessed using the Clinician-Administered PTSD Scale (CAPS) (25), whereas depression symptom severity was measured with the Beck Depression Inventory (BDI) (26). Additionally, all women with PTSD reported moderate-to-severe histories of childhood trauma on the Childhood Trauma Questionnaire (CTQ) (27). Finally, the National Adult Reading Test – Revised (28) was also administered to estimate verbal intelligence quotient (IQ). Please refer to Table 1 for demographic and clinical summaries. Healthy controls were administered the same measures to rule out the presence of subthreshold psychiatric illness and history of childhood maltreatment. The following were the exclusion criteria for all groups: i) substance use–related disorder within the past 6 months as determined by the SCID; ii) lifetime history of substance dependence as measured by the SCID; iii) use of alcohol or illicit psychoactive substance within 48 h of testing; iv) significant medical illness; v)

history of head injury with loss of consciousness lasting more than 60 s; and vi) history of neurological disease.

Social cognition tasks

Reading the Mind in the Eyes Test – Revised (RMET)

The RMET (29) is a computer-based behavioural task that quantifies the ability to attribute complex mental states to others and is widely used in ToM investigations (15, 29, 30). In this task, participants are presented with cropped photographs of individuals that only display the eye region. Subsequently, participants are presented with four adjectives and are instructed to choose the one that best describes what the person (in the photograph) might be thinking or feeling. There are 36 different photographs/trials. Reaction times (RT) and accuracy scores were recorded. The trials were also grouped by emotional valence (positive, neutral, and negative) using a method previously established by Lee et al. (30). Since recent literature suggests that performance on the RMET may be partially accounted for by verbal IQ (31), it was kept as a covariate, despite only a trending difference between groups.

Interpersonal Perception Task-15 (IPT-15)

The IPT-15 is a video-based task that provides a valid measure of social perception (32). In this task, participants are presented with fifteen 1-minute video clips depicting various interactions between individuals that are categorized into five domains: kinship, status, competition, deception, and intimacy. After watching each video clip, participants are presented with a multiple-choice question regarding the interaction depicted within each scene. The scenes provide no explicit information pertaining to the

question; instead, the participant must pay attention to non-verbal cues to correctly answer each question. For example, one kinship trial includes a conversation between a child and two adults. Based on verbal and non-verbal behaviour of the three characters, the participant must make a decision of which of the two adults is the child's parent. Each question has one correct answer, with potential scores thus ranging between 0 and 3 for each of the five IPT domains. Higher scores on the IPT-15 represent increased ability to correctly interpret social interactions. Participants were also instructed to provide a subjective estimate of their performance.

Trauma-related assessments

Trauma-related assessments included the Multiscale Dissociation Inventory (MDI) (33) measuring symptoms of dissociation (disengagement – emotional/cognitive separation from one's environment; depersonalization – altered perception of the self; derealization – altered perception of the surroundings; emotional constriction – dampened emotional responsiveness; memory disturbance – inability to recall personal events/amnesia; identity dissociation – experiencing multiple personalities) and the Parental Bonding Instrument (PBI) (34) assessing maternal and paternal parent–child bonding during the first 16 years of life.

Statistical methods

To examine group differences on the demographic and clinical variables, a two-tailed t-test was used. Due to non-normality (Shapiro–Wilk test), group differences on IPT-15 variables were analyzed using the Mann–Whitney U-test. Group differences on RMET variables were analyzed using a repeated measures ANCOVA, using diagnosis as

a fixed factor and emotional valence (positive, neutral, negative) on the RMET as repeated factor (covaried for years of education and IQ). Both accuracy and RT (only for correct answers) were analyzed on the RMET. Bonferroni correction was applied for subsequent multiple comparison t-tests. Effect sizes were estimated by partial eta-squared (η^2) and Cohen's *d*. Partial correlation analysis was conducted within the PTSD group to examine the relation between ToM performance and clinical and demographic variables, controlling for verbal IQ and years of education. Once a correlation between a ToM measure and an omnibus assessment score was identified, further correlations with the assessment's subscales were performed. All correlations were preceded by the Shapiro–Wilk test of normality. Accordingly, Pearson's *r* or Spearman Rho (ρ) values were reported (two-tailed; $\alpha = 0.05$).

Results

Demographic and clinical variables

Among the demographic variables, the mean years of education differed significantly between women with PTSD and healthy controls (Table 1). Group difference on verbal IQ was trending at $P = 0.059$. As expected, the PTSD group had significantly higher scores on all clinical variables (CAPS, BDI, CTQ, and MDI, Ps < 0.05).

Group comparisons for performance on theory of mind measures

Interpersonal perception task-15 performance

Relative to controls, women with past childhood trauma had difficulties interpreting scenes depicting kinship interactions on the IPT-15 ($U = 172$, $z = 2.83$ $P =$

0.005; Fig. 1). No other category of the IPT-15 showed significant group differences. There were no group differences in the subjective performance (subj) on the IPT-15.

Reading the mind in the eyes task performance

Analyzing the response times on the RMET, we found a significant interaction between emotional valence and diagnosis ($F(2,86) = 3.44$, $P = 0.037$, $\eta^2 = 0.074$; Table 2). Between-group analysis of RMET reaction times yielded no significant differences across all mental state valences. However, while healthy women displayed significantly faster reaction times on positively ($t(18) = 3.50$, $P = 0.009$, $d = 0.81$) and negatively valenced mental states ($t(18) = 2.67$, $P = 0.048$, $d = 0.72$) compared with neutral mental states, women with PTSD showed statistically similar reaction times across all valences (Table 2; although positive compared to neutral trials was trending ($t(28) = 2.47$, $P = 0.06$, $d = 0.46$)).

Accuracy of mental state identification was equivalent across women with childhood trauma and matched controls ($P > 0.05$). To explore whether the comparable accuracy scores between patients and controls were associated with increased response latencies in patients, we also ran a repeated-measures ANCOVA while covarying for response times. The null results remained unchanged.

Relation between ToM tasks, dissociation, and depressive symptoms

We found significant associations between ToM performance, dissociation, and depressive symptoms in the PTSD sample (See Table 3). Increased dissociative symptoms (driven by derealization symptoms ($\rho = -0.42$, $P = 0.028$)) were related to poorer accuracy of kinship interactions on the IPT ($\rho = -0.43$, $P = 0.026$). A correlation

emerged between total accuracy on the RMET and severity of depressive symptoms on the BDI (r = -0.44, P = 0.02). Specifically, poorer accuracy in classifying negative mental states on the RMET was strongly associated with elevated depressive symptoms (r = -0.523, P = 0.006). There was also a trending association between poorer accuracy in interpreting positive mental states and increased depressive symptoms (ρ = -0.379, P = 0.056).

Several significant associations also emerged between total RMET accuracy and dissociative symptoms. Specifically, overall lower accuracy on the RMET was associated with higher dissociation (r = -0.53, P = 0.01) and, examined at the subscale level, particularly with higher levels of disengagement (r = -0.66, $P < 0.001$), memory disturbance (r = -0.40, P = 0.04), and identity dissociation (r = -0.63, P = 0.001). Stratifying by emotional valence, lower accuracy in labeling eyes portraying positive mental states was also associated with higher levels of dissociation (r = -0.44, $P < 0.01$), again mainly driven by increased levels of disengagement (ρ = -0.62, P = 0.001), memory disturbance (ρ = -0.48, P = 0.01), and identity dissociation (ρ = -0.51, P = 0.008). The accuracy of labeling eyes portraying neutral mental states was also found to be poorer in individuals with higher levels of dissociation (r = -0.48, $P < 0.01$), again mediated primarily via increased disengagement (r = -0.52, P = 0.006) and identity dissociation (r = -0.58, P = 0.002). In comparison, the association between accuracy of labelling negative mental states, and RMET reaction times across all valences, were not significantly associated with MDI total scores.

Relation between ToM tasks and parental bonding

We assessed both, the categorical dimensions of the PBI (i.e., affectionate constraint, affectionless control, neglectful parenting, or optimal parenting) (34), and its scales (care and overprotection) with respect to ToM performance. No significant interactions between ToM performance and parental bonding were found.

Comorbidity analysis

Exploratory analysis revealed no effect of depression comorbidity status on ToM performance on the RMET or IPT-15. Covarying RMET performance for depression symptom severity as assessed by the BDI yielded similar results.

Discussion

To our knowledge, this is the first study to investigate theory of mind performance in individuals with PTSD related to childhood trauma. Here, we found deficits in ToM performance in women with PTSD compared with healthy controls. Specifically, women with past childhood trauma had difficulties interpreting scenes depicting kinship interactions. Additionally, this group displayed slowed reactions in response to photographs depicting emotionally salient mental states.

The altered perception of familial interactions in women with complex childhood trauma is a substantial finding. To accurately perceive social interactions on the IPT-15, one must integrate non-verbal cues while assuming the perspectives of others. As no other significant group differences emerged among the remaining IPT-15 subscales, this suggests that ToM deficits in women with PTSD related to childhood abuse may be specific to situations involving family relationships. Indeed, women that have experienced childhood sexual abuse frequently report difficulties in marital functioning

(35) and problems with attachment in adult relationships (36). Additionally, women who have experienced childhood physical or sexual abuse tend to perceive their family environments as less cohesive (37). However, our results do not demonstrate an association between decreased ToM performance and lower levels of parental bonding directly.

Despite comparable accuracy in labeling complex mental states, we found that women who have experienced PTSD related to childhood abuse displayed longer response latencies compared with healthy controls. Further, slower response times were only present during the labeling of emotionally salient (both positive and negative) mental states of the RMET, and not in response to neutral mental states. On the surface, it seems reasonable to suggest then that women with PTSD may have slower processing speeds during trials that require the integration of emotional and cognitive information. However, in our study, healthy controls exhibited faster response times on the emotionally salient trials in comparison with neutral trials. This is consistent with past research showing that the presence of an emotional component within facial expressions generally shortens neural processing speeds (38). However, it has been established that emotional processing of facial stimuli is a top-down process, requiring the availability of attentional resources (39). Following this notion, it is possible that women with childhood abuse were overwhelmed or distracted by the emotions presented in the photographs, rather than having slowed reaction times due to slower emotional processing speeds. The emotion-based distraction within the RMET task may have depleted the attentional resources necessary for the higher cognitive processing during perspective-taking. Further

studies investigating the role of attention in perspective-taking, especially during emotionally salient situations, are warranted.

Several clinical measures were associated with ToM performance in our sample. The presence of dissociative symptoms was strongly associated with hindered accuracy of complex mental state identification and altered perception of kinship interactions. Interestingly, only the accuracies of positive and neutral mental states were adversely affected by the presence of dissociative symptoms (specifically disengagement, memory disturbance, and identity dissociation). It is possible that due to the emotional overmodulation and related distancing from the emotional experience frequently experienced as a result of dissociation, these individuals were unable to optimally engage in affective perspectivetaking, thus having difficulties interpreting specific situations that contained emotional undertones. It is also worth noting the possibility of an alternative origin of ToM deficits found in our study sample. The consistent correlations between increased measures of trait dissociation, heightened depressive symptoms, and hindered ToM performance in the PTSD sample may alternatively suggest that it is not childhood maltreatment or related PTSD per se that is contributing to ToM deficits, but rather the related symptomatology such as dissociation, depression/dysphoria, and emotion dysregulation. Although no previous literature has explored the role of dissociation in ToM, some studies have alluded to the moderating effect of depressive symptoms on ToM performance in mood disorders (40, 41). Future studies exploring the mediating and moderating factors affecting ToM performance in trauma-exposed individuals should

include longitudinal study designs and compare ToM performance profiles across groups of individuals with categorically distinct trauma etiologies.

Contrary to literature focused on dysphoria (42, 43) showing increased accuracy to negatively valenced emotions, we found that trauma-exposed women with heightened depressive symptoms were less likely to correctly identify complex mental states, especially during negatively valenced trials. Depressive symptoms in women with PTSD due to childhood trauma may have a unique emotional processing influence that does not parallel the commonly found mood congruent bias (42–44). Colinearity between dissociative and depressive symptoms was assessed but was not found to be significant, indicating that in this sample, the depressive symptoms affect the perception of emotionally salient mental states independent of dissociation.

Despite knowledge of alterations in memory (45) and information (46) processing in PTSD, key questions remain unaddressed concerning the nature of interpersonal functioning experienced in trauma survivors, including trauma survivors' ability to engage in social cognition. Indeed, past research has shown alterations in empathy and emotional processing of facial expressions and prosody in individuals with PTSD (15, 19, 47, 48). However, findings on ToM performance in PTSD have been more scarce and conflicting (15, 22). Additionally, it must be noted that many studies contain patient samples with varying etiologies of the disorder, hindering proper comparison. As there are variations in the findings between these study groups, the pattern of social cognition processing may depend on the nature of the trauma (e.g., duration, developmental window of the trauma, physical/emotional/sexual, and attachment trauma). Due to the

predominance of child abuse in our society and its cascading deleterious effects on psychosocial functioning in adulthood, we have focused our investigation exclusively on women who were exposed to complex developmental trauma.

In parallel to behavioural changes, neuroimaging studies of patients with PTSD have found functional and structural alterations in neural regions that overlap highly with regions known to be responsible for social cognition (1, 49–51). Investigations into the default mode network (DMN), a collection of interconnected neural regions that are related to introspection and self-referential processing, have further elucidated the nature of functional alterations present in PTSD. Bluhm et al. (52) found reduced coactivation within the DMN activation, particularly between anterior (medial prefrontal cortex) and posterior (posterior cingulate cortex) nodes of the network, within women with chronic PTSD due to early-life trauma. This finding resembled the activation patterns seen in healthy 7- to 9-year-old children (53), suggesting that the developmental trajectory of the DMN may be highly sensitive to early-life stress. Interestingly, many of the brain regions found in the DMN are also implicated in many socio-cognitive functions including autobiographical memory and ToM (54). Since early-life trauma has been shown to cause a deleterious effect on DMN activation and its function has been associated with ToM performance, our findings of altered ToM performance in women that have undergone complex developmental trauma fall in line with this pattern of research.

Our modest sample size and the cross-sectional design are limitations of this study. Furthermore, all self-reports measures were of retrospective nature. Due to consistent evidence of ToM deficits in major depressive disorder (MDD) (55–57) and

high cross-comorbidity between MDD and PTSD (58), future studies should include additional depressed comparison groups with and without childhood abuse to elucidate similarities and differences between these two symptomatically overlapping disorders. Additionally, our study sample was exclusive to females exposed to complex childhood trauma; our findings therefore findings cannot be generalized to both sexes, to individuals who experienced single-incident trauma, or to individuals exposed to trauma occurring outside of developmentally critical periods. Since our study investigated only trait dissociation measures, future research should explore whether state dissociation is another possible mechanism contributing to the observed differences in ToM. Finally, despite covariation of RMET results for the group differences in years of education and IQ, we were not able to control for these differences in our non-parametric analysis of IPT performance.

Here, we provide initial insight into the theory of mind deficits experienced by women with complex childhood trauma. Specifically, these deficits appear to extend to the interpretations of social interactions involving familial relationships. We also found a disrupted pattern of processing of emotionally salient complex mental states, with the presence of dissociation symptoms compounding this effect. Having knowledge of altered mentalizing in individuals exposed to trauma may facilitate the development and utilization of socio-cognitive training treatments, specifically focusing on restructuring of schemas related to kinship interactions and increasing top-down cognitive control over emotionally salient facial expressions. In turn, this may provide more avenues to social

support by enhancing family cohesion and increasing emotion regulation during poignant social interactions.

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Tables and Figures

Table 1. Clinical and demographic characteristics of study sample.

Characteristic	Control ($n = 20$)	PTSD ($n = 31$)
	n	*n*
Sex		
Male	0	0
Female	20	31
	Mean	Mean
Age	35.8(13.2)	42.1 (12.0)
Education	16.5(2.6)	13.8 (2.4)*
Verbal IQ	110.2(9.1)	104.8 (9.7)†
CAPS	0.5(1.6)	79.4 (15.4)*
BDI	2.6(4.4)	31.8 (12.3)*
Childhood trauma questionnaire		
Emotional abuse	6.2(1.6)	18.4 (5.2)*
Physical abuse	5.5(1.1)	12.6 (5.7)*
Sexual abuse	5.0(0.0)	15.2 (7.3)*
Emotional neglect	7.0(1.9)	17.6 (4.9)*
Physical neglect	5.9(1.5)	11.3 (5.4)*
MDI (Total)	34.2(5.8)	74.6 (21.8)*
Disengagement	7.3(2.2)	16.7 (4.0)*
Depersonalization	5.2(0.4)	10.6 (4.9)*
Derealization	5.4(1.6)	11.5 (4.2)*
Emotional constriction	5.5(1.2)	13.2 (5.8)*
Memory disturbance	5.6(1.5)	11.9 (4.5)*
Identity dissociation	5.1(0.5)	10.3 (6.1)*

Values are *n* or mean (standard deviation).

BDI, Beck Depression Inventory; CAPS, Clinician-Administered PTSD Scale; IQ, Intelligence Quotient; MDI, Multiscale Dissociation Inventory; PTSD, posttraumatic stress disorder.

*Significant group effect ($P < 0.05$).

†Trending group effect ($P < 0.06$).

Table 2. Within- and between-group comparisons of reaction times (ms) on the Reading the Mind in the Eyes Task (Bonferroni-adjusted *P* values).

	Emotional valence		
	Positive	Neutral	Negative
Within-group sig.	$P = 0.009$**	$P = 0.048$*	
HC [mean (SD)]	9694 (5029)	11 119 (6129)	8964 (4187)
Within-group sig.	$P = 0.06$†	NS	
PTSD [mean (SD)]	9520 (4614)	11 272 (5145)	11 351 (6771)
Between-group sig.	NS	NS	NS

HC, healthy controls; PTSD, posttraumatic stress disorder; Sig, significance.
*Significant within-group effect ($P < 0.05$).
**Significant within-group effect ($P < 0.01$).
†Trending within-group effect.

Table 3. Partial correlations between theory of mind performance and clinical measures in the PTSD sample.

	BDI	MDI
Interpersonal perception task		
Kinship	−0.074	−0.429*
Intimacy	−0.319	−0.020
Competition	0.084	0.038
Status	0.155	−0.150
Deception	0.219	0.106
Total	0.070^{r}	-0.246^{r}
Subjective deviation (total–subjective)	0.316^{r}	0.109^{r}
Reading the mind in the eyes task		
Accuracy		
Positive	−0.379	−0.435*
Neutral	-0.220^{r}	-0.481^{*r}
Negative	-0.523^{**r}	-0.328^{r}
Total	-0.443^{*r}	-0.530^{**r}
Response time		
Positive	−0.055	−0.049
Neutral	−0.136	0.012
Negative	−0.225	0.014
Total	−0.150	−0.158

Partial correlations controlling for years of education and verbal IQ.

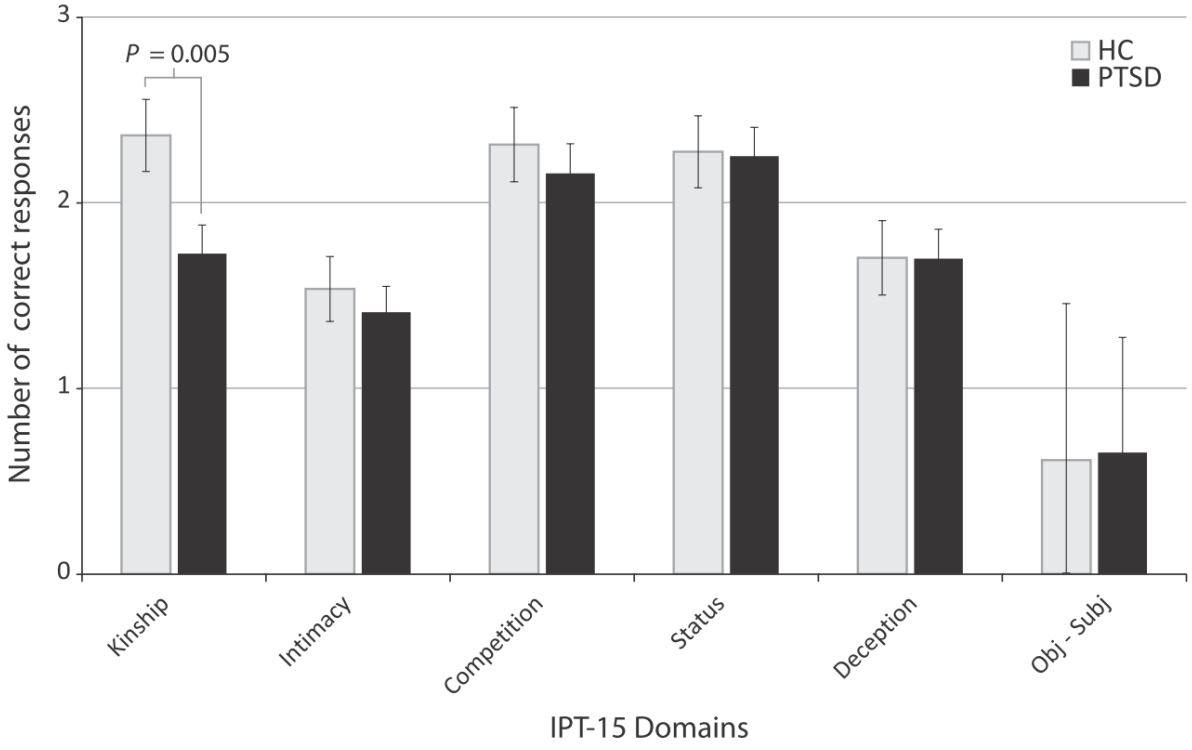
Values are Spearman *rho* partial correlation coefficients unless denoted by *r,* indicating a Pearson partial correlation coefficient.

BDI, Beck Depression Inventory; MDI, Multiscale Dissociation Inventory.

*$P < 0.05$.

**$P < 0.01$.

Figure 1. Mean performance on the Interpersonal Perception Task-15 domains (±st.err).



CHAPTER 4:

ROLE OF MORALITY IN THE EXPERIENCE OF GUILT AND SHAME WITHIN THE ARMED FORCES

Foreword to Chapter 4

This chapter is a systematic scoping review exploring the role of morality in the experience of guilt and shame in the military. This publication acts as an excellent review of the morality literature and acts as a per-amble to the experimental moral reasoning investigation presented in Chapter 5. This is a novel contribution to the literature as we systematically and thoroughly tie together concepts that were previously in silos. The exploration of moral injuries is particularly pertinent to military service members. Here, we explore how moral standards and moral transgressions subsequently factor into the emergence of guilt, shame, and classic combat-related adverse mental health outcomes, such as PTSD, MDD, and suicidal ideation.

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Role of morality in the experience of guilt and shame within the armed forces

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Abstract

Objective: Despite advances in our understanding of mental health issues among military forces, a large proportion of military personnel continue to exhibit deployment-related psychological issues. Recent work has identified symptoms of guilt and shame related to moral injury as contributing significantly to combat-related mental health issues. This systematic scoping review explores the association between morality and symptoms of guilt and shame within military forces.

Method: A search of the literature pertaining to guilt, shame and morality within military samples was conducted.

Results: Nineteen articles were selected for review. There is strong evidence linking exposure to and the perceived perpetration of moral transgressions with experiences of guilt and shame. Critically, symptoms of guilt and shame were related to adverse mental health outcomes, particularly the onset of post-traumatic stress disorder (PTSD). No studies have explored moral judgment in conjunction with assessments of guilt or moral injury.

Conclusion: These findings have important implications for the prevention and treatment of PTSD-related symptoms in military samples. By measuring moral judgment prior to deployment, it may be possible to predict the likelihood of incurring moral injuries and the development of associated symptoms. Early intervention programmes aimed at ameliorating guilt and shame are required to prevent the long-term development of deployment-related psychological distress.

Key words: post-traumatic stress disorder; military personnel; morality; guilt; shame; moral injury

Summations

- The increased number of veterans and active military personnel seeking mental health services points towards an imminent need for an enhanced understanding of how military operations affect the psychological health of army personnel during training, active duty, postdeployment and after release.
- There is accumulating evidence suggesting a link between the perceived transgression of moral standards, symptoms of guilt and shame, suicidal ideation and PTSD within military samples.
- Recent research surrounding the concept of moral injury suggests that experiences of guilt and shame may represent the pathological core of many combat-related PTSD cases.

Considerations

- To date, leading treatment interventions for PTSD have centred predominantly on fear-based symptoms; treatment interventions that target symptoms of guilt and shame in military populations are urgently required.
- Early intervention programmes targeting personnel that endorse postdeployment moral injuries may reduce the development of guilt-based PTSD.
- Assessment of predeployment styles of moral judgment may predict the likelihood of perceived moral injury and of experiencing symptoms of guilt and shame and therefore the risk of developing combat-related PTSD.

Introduction

The United States (US) Armed Forces and the Canadian Forces (CF) collectively employ over 2 400 000 personnel (2 344 000 US; 100 000 CF), representing 1.5% and 0.5% of the countries' total labour forces respectively (1). As of 2013, there are 1 520 100 US and 60 000 CF active personnel, with units deployed across 150 countries (1). With an increase in CF and US veterans seeking mental health services (2–4), Canada's Department of National Defense (DND) and the US Department of Defense (DoD) have placed increased emphasis on ensuring the mental health of military personnel. This emphasis is evident through the introduction of: more streamlined access to care (5), mental health surveys (6), and educational programs for personnel and their families geared towards raising mental health awareness (7, 8) and training to cope with stressors (7, 9). Despite increased efforts to dampen the residual effects of military operations on the psychological health of personnel, operational stress injuries (OSI; persistent psychological difficulties resulting from military duties) are still prevalent. Post-traumatic stress disorder (PTSD) accounts for the largest proportion of OSI encountered in the CF (2) and remains one of the most common disorders seen after deployment in US personnel (10). In addition to classical symptoms associated with PTSD (e.g. nightmares, trauma avoidance (11)), recent work indicates that combat personnel diagnosed with PTSD also show marked disruptions in emotion regulation (12, 13), autobiographical memory (14), attention (15), theory of mind (16) and interpersonal functioning (17–20). Furthermore, the presence of guilt and shame frequently reported by military personnel (21–23) may interact with these domains and further exacerbate the alterations (24) (e.g.

impede relationships through isolation and self-deprecation, distort autobiographical memory narrative). Critically, these disruptions are present despite rigorous mental health screening during the selection process, and the presumptive selection of personnel that represent a more resilient subset of the population.

A recent study of 2000 CF personnel deployed to Afghanistan (2001–2008) indicates that within 4 years of returning home from the combat theatre, approximately 14% were diagnosed with a deployment-related mental disorder, with PTSD being the most common diagnosis at 8% (25), followed closely by major depressive disorder (MDD) at 6%. Within this sample, being deployed to combat-heavy zones increased PTSD rates to 25% (25). The cumulative risk of developing deployment-related PTSD plateaued at approximately 6 years following return home from first deployment. The authors of this study, however, suggest that these rates may be underestimated, considering the mental health information of the sample was available only when diagnosis was made by CF mental health services and only over the course of a median follow-up period of 3.7 years. Interestingly, these findings parallel reports from the DoD in the United States, where the estimated rate of PTSD is 11% among US veterans of the war in Afghanistan (10, 26). Similar to the Canadian experience, rates of PTSD in US veterans who served in what has been described as heavier combat, particularly in the Vietnam War, Iraq War and Gulf War, have been estimated at 30% (27), 20% (26) and 10% (28) respectively. This is in line with reports suggesting a linear association between combat exposure and PTSD symptomatology (29). Although it is difficult to compare PTSD rates between civilian and military samples, according to research conducted prior

to the war in Afghanistan, it is estimated that lifetime prevalence of PTSD in Canada is at least two times greater for soldiers involved in combat than for the general population (30, 31).

Critically, in the United States, veterans comprised 22% of all nationwide suicides in 2012 (32). Given that 60% of all veteran committing suicide were 50 years of age or older, a large proportion of the veteran sample represents Vietnam or Korean War veterans, and therefore may not be indicative of mental health issues faced by current military personnel. As of 2012, however, suicide (349 deaths; 915 attempts) has overtaken combat operations (311 deaths) as the most common cause of death in personnel currently serving in the US military (33), with almost 70% of all currently serving US military suicides involving personnel 29 years old or younger (34). Since the onset of the war in Afghanistan and Iraq, the US military has seen a 100% increase in number of suicides within active duty personnel (35). Over the last decade, VAC saw a 600% increase in the number of veterans seeking VAC services due to OSI (from 2000 to 14 500)(36), with over 60% of CF personnel seeking VAC mental health services after deployment (25). These findings signify an imminent need for a comprehensive understanding of how military operations affect the psychological health of army personnel during training, active duty, postdeployment and after release.

A series of studies indicate that experiences of guilt and shame are reported widely in individuals with PTSD (21–23) and that both guilt and shame are closely linked to suicide and suicidal ideation in military samples (37–39). Notably, symptoms of guilt and shame have been cited as the leading cause for seeking US VA mental health services

(40). Despite a breadth of research on fear-based PTSD, research on guilt and shame as a core symptom (41, 42) of PTSD psychopathology has been comparatively scarce. Classically, a diagnosis of PTSD assumes that an individual is exposed to a trauma where he/she experiences fear, helplessness or horror in response to the threat to his/her life or the life of someone else. The work of Herman (42), in addition to more recent theories (21, 41), however, has proposed that, in some cases, PTSD may derive from deep feelings of guilt and/ or shame after traumatic events, with symptoms of fear being non-existent or secondary in severity.

Although guilt is described in DSM-IV, generally posited as an associated symptom within MDD, it is a common experience for victims of trauma, including but not limited to sexual assault, transportation accidents, natural disasters and after exposure to combat/war. Indeed, DSM5 now acknowledges 'persistent distorted blame of self or others for causing the traumatic event or for resulting consequences' among the core symptoms of PTSD, falling within Criterion D: negative alterations in cognitions and mood. Guilt and shame are complex cognitive and emotional experiences (43) that arise when one perceives one's behaviour to transgress an internal moral standard (44). The extent to which guilt and shame independently relate to adverse mental health outcomes has proven difficult to evaluate. Shame proneness is associated with PTSD (45), MDD (46–48), generalized anxiety disorder (49) and suicidal ideation (50). Guilt, however, is associated with negative psychological outcomes only when it is paired with experiences of shame (51). Indeed, a recent meta-analysis by Kim et al. (52) found that whereas guilt is not related to MDD symptoms when controlling for shame, shame is significantly

associated with MDD symptoms when controlling for guilt. Problematically, in the context of the DSM, the term guilt is captured in a single construct—as a maladaptive, inappropriate sense of responsibility. In the meta-analysis by Kim et al. (52), shame was indistinguishable from maladaptive guilt (e.g. guilt experienced in the aftermath of uncontrollable negative events), suggesting that these two interrelated concepts may be most relevant to psychopathology, including depression and PTSD. Numerous theories postulate that to experience guilt and shame one requires a sense of social comparison and the ability to interpret others' perspectives (53) (e.g. theory of mind, an ability known to be altered in PTSD (54)). Correspondingly, whereas simple emotions (e.g. sadness, happiness, anger, fear) appear developmentally early in life, experiences of guilt and shame arise only at approximately the age of 3–4 years (55), alongside the emergence of theory of mind (56–58) and autobiographical memory (59).

Although the terms guilt and shame are frequently used synonymously, they represent distinct psychological constructs. One of the primary distinctions between the two concepts is the object of negative evaluation after a moral transgression; with guilt, the object of evaluation is the specific transgressing behaviour, whereas shame entails an extrapolation of that behaviour to a global evaluation and redefinition of the self (60). Accordingly, shame entails the process of self-blame for global personal inadequacies or flaws that are perceived as being stable over time and not mendable (60– 62). The accompanying experiences of worthlessness, powerlessness and inferiority translate into behaviours of avoidance and withdrawal. By contrast, guilt involves an acknowledgement of the deleterious effect of behaviour on others, an appropriate sense of responsibility and

an understanding that despite the moral transgression, one is still virtuous, future goals are attainable, and reparation is possible (63). Here, the experiences of tension, regret and remorse are translated into an 'approach-and-amend' behaviour. Whereas the psychological distress in shame involves an inward focus of distress leading to eventual annihilation of the self (64), the distress in guilt is channelled outwardly towards interpersonal reparation (65). Indeed, whereas individuals experiencing guilt display enhanced interpersonal sensitivity via increased empathy (66) and theory of mind performance (65), shame is associated with decreased empathy and theory of mind (65) and reduced interaction with others (67). Importantly, outcomes differ significantly between guilt and shame; shame yields self-condemnation, while guilt creates an opportunity for self-forgiveness.

To experience guilt or shame, one must perceive one's behaviour as diverging from the moral values and standards with which one identifies. In a landmark review by Litz et al. (21) of psychological injuries among war veterans, a moral injury was identified as 'any personal action/inaction that transgresses this subjective moral standard'. A moral injury may occur not only while being the perpetrator of the transgressing behaviour, but also when: one, bearing witness to it; two, failing to prevent it; or three, experiencing certain emotions after learning of transgressing behaviours, with the emotions, upon reflection, being considered subjectively amoral. It has been classically observed that a traumatic memory may facilitate the onset of fear-based PTSD. A moral injury may also act as, or in lieu of, a traumatic memory, creating a similar symptom profile (68). Specifically, experiences of shame mirror the re-experiencing and

avoidance/emotional numbing symptom clusters of PTSD (68). Persistent re-experiencing of moral violations is considered aversive because it weakens self-esteem, reinforces feelings of worthlessness and in turn, leads to increased self-condemnation and withdrawal (21). Considering the large overlap between guilt, shame and PTSD within the military, the experience of guilt and shame may be the fundamental pathological core of most combat-related PTSD cases (21, 38, 64).

Moral injuries are considered to be much more prevalent in today's military, due primarily to the increased unconventionality of several domains of today's military operations that go against schematic beliefs about warfare (see Litz et al. (21) for a comprehensive review). Specifically, increased urban warfare and unmarked enemy combatants pose a greater risk to not only military personnel but also increases the risk of harm being inflicted on civilians. Despite military training geared towards preparing soldiers for a multitude of situations expected during combat operations, a study of US soldiers serving in Iraq/Afghanistan revealed that up to 30% faced morally ambiguous situations where they were unsure of how to properly react (69). Additionally, in a survey of a similar sample of US military personnel, over 20% reported being responsible for a non-insurgent's death (26). Equally concerning is the large proportion of suicides by military personnel that never experience combat. For example, a study of suicide within the US Air Force showed that only 25% of personnel that committed suicide had ever been deployed, with only 7% seeing combat (34). It is possible that military operations within non-deployed personnel may also result in exposure to moral injuries, albeit more subtly.

Given that the moral integrity (and at times, disengagement) of military personnel is central to a functional military organization, recent awareness of the potential impact of moral injuries and the high incidence of psychological distress within the military personnel that is comorbid with the experience of moral emotions (guilt and shame symptoms), it is critical to identify how these factors interact.

Aims of the study

In this review, we explore the literature on the association between morality (moral judgment or exposure to moral transgressors) and the experience of guilt and shame within the military. A secondary aim was to explore the relation of morality, guilt and shame to the development of adverse mental health outcomes among military members, including PTSD.

Material and methods

To obtain relevant literature, four internet databases (PsycINFO, EMBASE, MEDLINE and CINAHL) were searched for articles published between January 1900 and June 2014. To be included in this review, articles must have explored three research domains: morality, guilt/shame and military (see Table 1 for search terms). To ensure our search strategy was comprehensive, the initial search results contained articles that explored at least two of the three domains. We placed no other restrictions on the initial search. Articles resulting from the search were independently screened by two raters. In addition, the references of included articles were searched for studies not captured by the initial search terms. The search terms and strategy were confirmed by a health sciences librarian.

Inclusion criteria during title and abstract screen:

i. Assessed moral judgment or explored moral transgressions.
ii. Explored experiences of guilt and shame.
iii. Studied a military sample.

Inclusion criteria during full-text screen:

i. Text available in full.
ii. Primary, peer-reviewed research (no dissertations).
iii. Written in English.
iv. Confirmation of focus on the three domains.

Results

A total of 6325 references were screened with 19 articles being selected for review (see Fig. 1 for the systematic review screening process). Inter-rater reliability was high (title and abstract screen: 0.96; full-text screen: 0.94), as assessed by Gwet's AC1/2 inter-rater reliability coefficient (70). Please refer to Table 2 for study characteristics and Table 3 for a summary of the results of included articles.

Correlations between exposure to and the perceived perpetration of atrocities and the onset of guilt symptoms in military personnel have been widely reported (40, 71–79). This relation holds even when controlling for combat exposure (1, 75, 76, 79; see Table 3). In studies that reported this association, the majority of study samples were comprised of primarily Vietnam War veterans (sample size mean = 775, SD = 694), although two studies confirmed this relation in Ugandan former child soldiers (77) and in Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) (78). Tools used to assess guilt in

the study samples varied greatly and ranged from validated guilt/ shame scales to dichotomously coded items derived from open-ended interviews. In no instance was morality assessed globally (via moral reasoning or judgment) nor with validated scales and instead typically involved identifying whether the respondent was exposed to morally injurious events. Combat exposure was assessed primarily by the Combat Exposure Scale (80). Notably, these studies have several important limitations, pointing towards the need for additional study: all involved retrospective self-report and were thus vulnerable to memory decay and systematic reporting biases (e.g. halo effect). Social desirability factors may contribute further to underreporting of morally transgressive actions perceived as unacceptable to others. In addition, sample sizes were relatively small in the majority of studies surveyed (73, 74, 78, 81–84) and, as noted, relied upon non-validated measures to assess morality, guilt and shame. Moreover, civilian control groups were not included to assess the relation between morally injurious acts (e.g. denying a patient medical care) and experiences of guilt and shame in non-military samples.

In one key validation study of the Moral Injury Evaluation Scale (MIES), also relying upon retrospective self-report, Nash et al. (85) provided additional evidence implicating moral transgressions as a source of psychological distress experienced after deployment. Although Nash et al. (85) did not measure specifically symptoms of guilt and shame, the authors did examine experiences of moral injury, which include feelings of guilt and shame experienced in the aftermath of moral transgressions (86). Specifically, Nash found that increased perception of moral injuries was related to PTSD and MDD symptomatology and a lower index of social support. Critically, MIES scores were not

related to the degree of combat exposure, supporting the notion that moral injuries provide an independent source of psychological distress.

Several studies (while also limited by retrospective self-report) have differentiated further the impact of being either an observer or an agent of moral transgressions, finding that guilt is experienced by military members after both perpetration (40, 71, 72, 76, 77) and observation (73, 76, 77, 79) of moral transgressions. Two studies involving restricted samples of Vietnam veterans, however, reported null findings where the perpetration of atrocities was not identified as a common source of guilt (81, 86); critically, however, the Vargas et al. study relied upon archival data, which may have limited significantly the scope of participant responses available for analysis.

Among the articles selected for review, several reported associations between guilt (with or without exposure to perceived moral transgressions) and symptoms of PTSD (74, 75, 82, 87) and of MDD (82, 87) in military members, including the onset of re-experiencing (74, 75) and avoidance symptoms (74). These findings contribute to the growing body of literature relating experiences of guilt with poor mental health outcomes among military members (37, 38, 52, 64, 88, 89); notably, these studies did not assess independently experiences of guilt and of shame, and cross-contamination of these concepts is probable across measures. Direct exposure to and/or perpetration of moral transgressions has also been related to several mental health outcomes such as severity of PTSD (71, 73, 75, 77, 78, 83, 85), severity of MDD (73, 77, 85) and suicidal ideation (72). Critically, in one study, formal mediation analysis revealed that combat-related guilt mediated the relation between exposure to and participation in retrospectively reported

perceived atrocities and subsequent diagnoses of PTSD and MDD (76). The results of this study suggest that the onset of symptoms of guilt and shame following either participation in or observation of perceived atrocities contributes significantly to the onset of PTSD and of MDD in military samples. Interestingly, a statistical prediction instrument developed by Marx and colleagues (90) containing items relating to guilt and moral transgressions predicted a diagnosis of PTSD more accurately than did the PTSD Keane Scale (91) and almost as accurately as the Mississippi PTSD Scale (92).

Several studies have explored further the concept of morality via changes in religious functioning among military members. Fontana et al. (40) found that in personnel who completed military service, guilt symptoms mediated the association between retrospective self-report of perpetration of atrocities and reduced comfort derived from religious faith. Furthermore, negative religious coping and alienation from God were related to increased PTSD (83, 87) and MDD (87) symptomatology. Ogden et al. (83) found that religious factors predicted 14% of the variance in PTSD symptomatology in a group of veterans who experienced combat in OEF/OIF; moral injury was not assessed directly in these studies. Studies relating to other topics of morality include the work of Laufer et al. (71), who found that participation in violence was associated with higher demoralization in African American Vietnam veterans and lower demoralization in Caucasian Vietnam veterans. Moreover, among veterans who participated in perceived abusive violence, whereas Caucasian veterans described feeling indifference to the fate of civilians and the maintenance a full war mentality, African Americans veterans reported dissonance between their current attitude and behaviour in the combat theatre. Finally,

despite assessing guilt and moral transgressions separately and being included in this review, two studies did not go on to explore the association between guilt and morality, thus yielding no interpretable findings for the current analysis (84, 93). As reviewed, the studies reported here suffer several significant limitations, summarized on a study-by-study basis in Table 3.

Discussion

The primary scope of this review was to explore how morality contributes to the experiences of guilt and shame within military samples; the relation of guilt, shame and morality to subsequent mental health outcomes was also examined. Our review of the extant literature strongly suggests that exposure to and perceived perpetration of morally transgressive acts that result in the incurrence of moral injuries during military service are associated with the emergence of symptoms of guilt and shame. The emergence of symptoms of guilt and shame following moral injury appears to mediate the onset of psychopathology, including PTSD and MDD, among military members and may increase risk of subsequent suicide. Critically, this association holds regardless of the degree of combat exposure. To our knowledge, however, no studies have directly explored the association between validated measures of global moral reasoning/judgment and the onset of symptoms of guilt within military personnel. This effort will have important implications for understanding how moral injury, guilt, and shame interact to influence mental health outcomes among military personnel.

The study of morality is particularly pertinent to the military as military service exposes individuals to unique, morally salient situations. The army is a tool of war.

Participating in the military generally involves an assumption that one creates a better world, for the nation or humanity, albeit by the use of force (also assuming that all other non-violent means have failed). As the use of force involves the violation of individual rights, the concept of using violence as an instrument of peace parallels the idea of sacrifice for greater good. Moral conflict generally arises during these types of situations, where one's innate feelings of what is right and wrong (deontological thought) are pitted against a more cognitive, calculated, objectively advantageous outcome (utilitarianism). Converging with neuroimaging data (94–97), moral emotions (e.g. guilt and shame) and empathic concern are generally associated with a more deontological morality. Nonetheless, morality is dynamic, subjective and open to socio-cognitive influence (98). Social psychologists, particularly Bandura (98), have coined the term moral disengagement – the phenomenon when an individual or a group of individuals disconnect their internal moral code from moral action and, ultimately, one's conduct is not perceived as immoral but is seen as honourable. Generally, diffusion and displacement of responsibility (i.e. through division of labour), euphemistic language (e.g. bombing referred to as 'clean, surgical strikes', suggesting acts of healing) and dehumanization all attribute to the removal of the self as inflicting direct harm, therefore dampening emotional contagion from otherwise complex moral dilemmas (98). We conceptualize moral disengagement as the disengagement of deontological thought, where the value of the moral decision is placed exclusively on the calculated outcome. Within a military context, the amplitude of utilitarianism is assumed to be high, with the goodness of the outcome generally defined by authority and meant to be taken at an

authoritarian face value. The military is an organization that generally functions through utilitarian methods, suggesting that, over time, military personnel will develop a shift towards a more utilitarian moral judgment. This idea remains to be explored, however.

The studies reviewed have several limitations. As with any situation involving feelings of shame, full disclosure may be associated with significant hesitation and fear of judgment by others. Reporting observation of or participation in the perpetration of acts that transgress moral standards during deployment is no exception, suggesting that these types of events may be underreported (73). Moreover, self-reports of guilt and shame have been shown to be moderated by cultural factors (99). As mentioned previously, the interchangeable use of terms guilt and shame within the majority of studies limits our ability to explore the independent roles of distinct experiences of guilt and shame. Although the studies reviewed here included samples comprised primarily of Caucasian Vietnam War veterans, the increased multiculturalism of today's Western military may add additional variance surrounding the propensity to report guilt and/or shame within military personnel. A significant proportion of the studies sampled included treatment-seeking veterans tested several years after combat; non-random sample selection, memory decay and retrospective reporting add additional bias to the findings. Finally, the findings reported here are correlational and do not provide direct evidence that moral injuries lead to the onset of guilt and related psychopathological symptoms. Longitudinal studies are instead urgently required to establish the course of psychopathology stemming from moral injury and attendant guilt and distress.

In addition to moral injuries stemming from observed or perceived moral transgressions in the combat theatre, several other factors may influence moral emotions, moral judgment and psychopathology as they relate to military service. Specifically, a past history of childhood trauma has been associated with combat-related PTSD in soldiers (100), shame-inducing thoughts (48) and shame proneness (101). Notably, military personnel are frequently separated from traditional sources of social support, potentially altering the dynamics and stability of these relationships (102, 103); lack of perceived social support has been a robust predictor of chronic PTSD (103, 104). Critically, the perception of forgiveness from others mediates self-forgiveness over time (105), pointing further towards the vital importance of maintaining social support in populations at risk for PTSD and for moral injury. In addition, military sexual trauma (MST; sexual assault, rape or harassment occurring during military service) has received increasing attention in recent years, where approximately 20% of female and 1% of male VA healthcare users report experiencing at least one MST during their service, representing almost 100 000 personnel positively screened by the VA in 2008 alone (106); sexual trauma is closely linked to intense guilt and shame among personnel and represents a key intervention target. Moreover, perpetrators of MST may present with similar patterns of guilt and shame, particularly upon return from service and integration into civilian life. Finally, in the aftermath of moral injury, a proportion of soldiers may experience changes in religious faith and difficulty finding meaning in their actions postdeployment; treatment of individuals with combat-related psychological distress must address the spiritual and existential changes involved with such experiences (40, 77, 83).

Given the high rates of PTSD within the military and the increasing number of veterans seeking VAC mental health services, there is an urgent need for research that increases the capacity for the prevention and treatment of combat-related PTSD. The results of the present review point towards strong relations between the incurrence of a moral injury, the subsequent development of symptoms of guilt and shame and the emergence of psychopathology, including MDD and PTSD. Although it is not possible to predict who will be exposed to morally questionable events during deployment, it may be possible to predict who is more likely to perceive such events as morally injurious. By assessing predeployment styles of moral judgment using validated assessment tools (e.g. Defining Issues Test (107), Moral Competence Test (108)), we may be better able to identify those military members most likely to experience moral injuries, to have resulting symptoms of guilt and shame and thereby a greater risk of developing combat-related PTSD and/or MDD. Given that the emergence of guilt and shame (additional targets of systematic measurement) is dependent on one's perception of behaviour as diverging from personal moral values and standards, assessing these moral standards prior to deployment may elucidate how individuals may emotionally respond to morally ambiguous circumstances in the combat theatre. Members identified as being at risk for moral injury may then be targeted by preventive and/or early intervention efforts. Pre-emptive screening and removal from service of individuals at risk for moral injury and associated symptoms of guilt and shame is not warranted, where instead it is those individuals with an appropriately high sense of personal responsibility and intolerance for moral transgressions who are actively sought among military ranks. Interestingly, a

survey conducted with OIF US personnel reported that although 45% of personnel agreed that non-combatants should be treated with respect, 17% of the sample believed that non-insurgents should be treated in the same manner as insurgents (69). Identification and pre-emptive screening of those individuals most likely to engage in moral transgressions in the combat theatre may further limit the exposure of other military members to witnessing transgressive acts that result in downstream consequences of guilt and shame. Recent evidence has shown that leader-led training in battlefield ethics reduces unethical behaviour of soldiers during deployment (109), further signifying the need for a broad integration of ethics training and moral judgment assessment for optimal personnel and operational preparedness (110).

Given that longer durations of experiences of shame are linked to a lower likelihood of self-forgiveness (105), military forces may also implement early intervention programmes targeting personnel that endorse postdeployment moral injuries. Targeted early intervention programmes of this nature would be expected to inhibit the development of guilt-based PTSD. Accordingly, it will be crucial to explore further the relation between guilt and shame in military populations and its implications for the onset, maintenance and treatment of combat-related PTSD in service personnel. Treatment options for combat-related PTSD that rely, for example, on cognitive processing therapy may not yet be sufficient for targeting psychological distress caused by moral injuries (see (21) for a comprehensive overview of future treatment directions). Although PTSD treatments to date have centred predominantly on fear-based PTSD symptoms, a novel exposure protocol focused on adaptive disclosure of moral injuries

appeared highly promising (84). Employing group-based therapy that targets specifically symptoms of guilt and shame may allow participants to discuss a wider range of experienced symptoms and to move past fear-based conceptualizations of military PTSD. Treatment interventions that concentrate on symptoms of guilt and shame in the military population will need to be a priority as research and clinical efforts address the enduring impact of moral injuries on military personnel.

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Declaration of interest

None.

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Tables and Figures

Table 1. Domains and associated search terms investigated in the scoping review.

Domain[†]		
Guilt/Shame	Morality	Military
Guilt	Morality	Military
Shame	Morals or moral	Army
Humiliation	Moral development	Service member
or ashamed or		Arm* force
embarrass* or		Military personnel
Disgrace* or		Veteran
dishono* or		Military schools
forgiveness or		Military deployment
condemn*		Military attrition
		Enlisted military personnel
		Military veterans
		Military medical personnel
		Military duty status
		Military psychology
		Military training
		Volunteer military personnel
		Military psychologists
		Military enlistment
		Military recruitment
		Military families
		War
		Military services

[†]where appropriate, search terms were mapped to keyword headings of each database and had its term exploded.

*search was conducted on any combination of characters proceeding the keyword.

Table 2. Study parameters of reviewed articles

Author (year), Country	Sample groups	PTSD assessed	Sample size	Combat exposure assessed	Theatre of operations	Guilt/Shame assessments	Morality assessments	Moral transgression assessments
Laufer (1984), USA (71)	Veterans	Stress Scale (111)	350	Combat Scale (non-validated) (71)	Vietnam War	Psychiatric Epidemiological Research Interview (112) (feelings of guilt subscale)	Psychiatric Epidemiological Research Interview (112) (feelings of demoralization subscale)	Exposure to Abusive Violence (Interview – non-validated) (71)
Glover (1990), USA (93)	Veterans	DSM-III diagnosis	339		Vietnam War	VREQ (93)		VREQ (93)
Yehuda (1992), USA (73)	Veterans	SCID (DSM-III-R) (113); M-PTSD (92); Figley Scale for Combat PTSD (Figley & Stretch, unpublished)	40	CES (80)	Vietnam War	Not explicitly reported – potentially HAM-D (114) Guilt Items		The Atrocity Scale (Brett & Laufer, unpublished)
Fontana (1992), USA (72)	Veterans	SCID (DSM-III-R) (113)	1709	Revised Combat Scale (115); War Stress Interview (116)	Vietnam War	AGENT cluster; FAILURE cluster (guilt sx over failing to fulfil duties/save the wounded, etc.)		AGENT cluster (Guilt sx due to being the agent of killing) measured according to convention used by Laufer et al. (117)
Henning (1997), USA (74)	Veterans	CAPS (118); M-PTSD (92)	40	Revised Combat Scale (80)	Vietnam War (85%); WWII (5%); Korea (5%); Gulf War (5%)	The Guilt Inventory (119); CGS (74) (created for present study)		Combat Guilt Scale (74) (created for present study. Subscales: survival guilt, guilt about acts of commission, guilt about acts of omission, guilt about thoughts/feelings)
Kubany (1997), USA (81)	Veterans	M-PTSD (92); PCL (120)	106	CES (121)	Vietnam War	Harder Personal Feelings Questionnaire (122); The Guilt Inventory (119); TRGI (123)		STRGS-WZ (81)
Beckham (1998), USA (75)	Veterans	M-PTSD (92); CAPS (118); Davidson Trauma Scale for PTSD (124)	151	CES (121)	Vietnam War	TRGI (123)		Vietnam Era Stress Inventory (125) (Atrocities Exposure subscale)
Fontana (2004), USA (40)	Veterans	M-PTSD (92)	1385	No objective measure – distressing experiences only (see moral transgression column)	Vietnam War (95%); WWII (5%)	Laufer-Parsons Guilt Inventory (126)	Two questions querying changes in religious faith (FAITH cluster)	Indicated whether 11 experiences were distressing, based on structured interviews (AGENT cluster – killing others, excitement from killing others, participating in atrocities)
Witvliet (2004), USA (87)	Veterans	CAPS (118); M-PTSD (92); Davidson Trauma Scale for PTSD (124)	213	CES (121)		Forgiveness of Others and Forgiveness of Self Scales (127)	The Brief RCOPE (128)	
Marx (2008), USA (90)	Veterans	SCID (DSM-III-R) (113); M-PTSD (92); PTSD Keane Scale (91)	1081	CES (121); War Stress Interview (116)	Vietnam War	Items from Laufer-Parsons Inventory (115)		Items from Laufer-Parsons Inventory (115)
Klasen (2010), Germany (77)	Former Child Soldiers	MINI-KID (129)	330	CSTQ (130)	Uganda	Guilt Cognitions Scale of the TRGI (123)	The Brief RCOPE (128)	CSTQ (130) (Perpetrator Subscale)
Marx (2010), USA (76)	Veterans	SCID (DSM-III-R) (113)	1323	CES (121)	Vietnam War	Laufer-Parsons Inventory (115)		One item from the War Stress Inventory (116)

Table 2 (Continued)

Table 2. (Continued)

Author (year), Country	Sample groups	PTSD assessed	Sample size	Combat exposure assessed	Theatre of operations	Guilt/Shame assessments	Morality assessments	Moral transgression assessments
Berg (2011), USA (82)	Veterans	Watson PTSD Interview (131)	94		Vietnam War	Berg Spiritual Injury Scale* (non-validated)	Spiritual Profile Assessment (132); Intrinsic/Extrinsic Religious Motivation Scale (133)	Berg Spiritual Injury Scale* (non-validated)
Ogden (2011), USA (83)	Veterans	PCL (120)	110	CES (121)	OEF/OIF	Religious Comfort and Strain Scale (134) (religious guilt subscale)	Religious Comfort and Strain Scale (134); The Brief RCOPE (128); PTGI (135)	
Gray (2012), USA (84)	Active Duty	PCL-M (120)	44		OEF/OIF	PTCI (136)		Used sx of MDD as a proxy for distress result from traumatic loss and moral injury
Stein (2012), USA (78)	Active Duty	PSS-I (137)	122		OEF/OIF	TRGI (123)		(Validation of Moral Injury Categories for war-zone exposure)
Nash (2013), USA (85)	Active Duty	PCL (120)	1039	CES (121)	OEF/OIF	MIES (85)		MIES (85)
Vargas (2013), USA (86)	Veterans	None (NVVRS average: 31% lifetime PTSD; 15% current PTSD)	300		Vietnam and other areas served between 1964 and 1975	'Self-deprecation' cluster from open-ended interview probing moral injuries	'Spiritual/Existential Issues' cluster from open-ended interview probing moral injuries	Open-ended interview probing moral injuries (86)
Currier (2014), USA (79)	Veterans	M-PTSD (92); Diagnostic Interview Schedule (138)	1203	Traditional combat exposure scale (139)	Vietnam War	3 dichotomous guilt questions during NVVRS		Four-item measure to assess atrocity exposure

CAPS, Clinician-Administered PTSD Scale; CES, Combat Exposure Scale; CGS, Combat Guilt Scale; CSTQ, Child Soldiers Trauma Questionnaire; DSM, Diagnostic and Statistical Manual of Mental Disorders; HAM-D, Hamilton Rating for Depression; M-PTSD, Mississippi Scale for Combat-Related PTSD; MDD, Major Depressive Disorder; MIES, Moral Injury Evaluation Scale; MINI-KID, Mini International Neuropsychiatric Interview for Children and Adolescents; NVVRS, National Vietnam Veterans Readjustment Study; OEF/OIF, Operation Enduring Freedom and Operation Iraqi Freedom; PCL, PTSD Checklist; PSS-I, Post-traumatic Symptom Scale, Interview Version; PTCI, Post-traumatic Cognitions Inventory; PTGI, Post-traumatic Growth Inventory; PTSD, Post-traumatic Stress Disorder; SCID, Structured Clinical Interview for DSM Disorders; STRGS-WZ, sources of trauma-related guilt survey-war-zone version; sx, symptoms; TRGI, Trauma-Related Guilt Inventory; VREQ, Vietnam Related Experiences Questionnaire.

*Found on www.spiritualassessment.com/sis.pdf

Table 3. Summary of results from reviewed studies.

Author (Year), Country	Results*	Limitations
Laufer (1984), USA (71)	Caucasian veterans: participation in violence was associated with lower levels of feelings of demoralization ($b = -7.5$, $P < 0.05$) and guilt ($b = -11.1$, $P < 0.05$) vs. those who did not participate in violence African American veterans: participation in violence was associated with higher levels of feelings of demoralization ($b = 11.4$, $P < 0.05$) and guilt ($b = 11.5$, $P < 0.05$) vs. those who did not participate in violence	Retrospective Non-validated interview was used to assess exposure to abusive violence
Glover (1990), USA (93)	Factor analysis of the VREQ items showed that both types of guilt (survival guilt and guilt related to acts of abusive violence) were loaded onto the same factor ($\lambda = 4.6$). Participants in atrocities may be exposed to a greater number of combat stressors and therefore exposed to both types of traumatic events.	Combat exposure was not assessed Retrospective No control group
Yehuda (1992), USA (73)	Strong correlation between exposure to atrocities and HAM-D scores ($r = 0.46$, $P < 0.05$). No associations between combat exposure and HAM-D scores ($r = 0.10$, $P > 0.05$). Increased exposure to atrocities ($r = 0.70$, $P < 0.05$), but not exposure to combat ($r = 0.07$, $P > 0.05$), was strongly associated with PTSD sx	Small sample size Retrospective No control group Associations with HAM-D guilt items were not explicitly reported Non-validated measure of moral transgression exposure
Fontana (1992), USA (72)	Participation in atrocities was related to increased sx of guilt ($r = 0.54$, $P < 0.0001$) Guilt sx over participation and failure to prevent atrocities was related to an increased risk of suicide ($b = 0.09$, $P < 0.01$; $b = 0.11$, $P < 0.0001$), more so than to a diagnosis of PTSD ($b = 0.07$, $P < 0.05$; $b = 0.08$ $P < 0.001$)	Clinician-based measure of exposure to traumas Retrospective (up to 20 years) Treatment-seeking only
Henning (1997), USA (74)	Most frequently endorsed items on the CGS related to acts of commission and omission, whereas items reflecting survival guilt, guilt about one's thoughts and feelings during combat, and shame were less frequently reported. Increased guilt on the CGS was related to overall PTSD severity (M-PTSD) ($r = 0.49$, $P < 0.001$) and the re-experiencing ($r = 0.46$, $P < 0.01$) and avoidance ($r = 0.45$, $P < 0.01$) subscales of the CAPS.	Small sample size No control group Retrospective Did not separately analyse different sources of guilt Dichotomous format for guilt items
Kubany (1997), USA (81)	Most common sources of guilt on the STRGS-WZ did not include guilt due to perpetration or exposure to moral transgressions. Inconsistent with popular view that perpetration of atrocities is most common source of Vietnam-related guilt	Collection of studies developing and validating the STRGS-WZ scale Retrospective
Beckham (1998), USA (75)	Controlling for combat exposure, PTSD ($b = 0.54$, $R^2 = 0.14$, $P < 0.05$) and guilt sx ($b = 0.04$, $R^2 = 0.13$, $P < 0.05$) were highly associated with exposure and/or perpetration of atrocities	Retrospective Non-validated assessment of perpetration/exposure to atrocities No control group
Fontana (2004), USA (40)	Guilt sx mediated the association between perpetrations of atrocities and reduced comfort derived from religious faith after service (direct b: −0.08; indirect: (0.34)(−0.11)) Guilt sx ($b = 0.09$) and weakened religious faith ($b = -0.08$) were strongest predictors for increased use of VA mental health services.	Retrospective interview-based assessment of traumas No control group
Witvliet (2004), USA (87)	Negative religious coping and unforgiving of self was related to increased PTSD (M-PTSD) ($b = 0.25$, $P < 0.001$; $b = 0.19$, $P < 0.01$) and depression ($b = 0.29$, $P < 0.001$; $b = 0.22$, $P < 0.001$) sx	Retrospective No control group Moral injury and general moral reasoning was not assessed
Marx (2008), USA (90)	Statistical prediction instrument (containing guilt items) identified the presence of PTSD more accurately (sensitivity = 0.98, specificity: 0.43) than the PTSD Keane Scale (sensitivity = 0.98, specificity: 0.33) and almost as accurate as M-PTSD Scale (sensitivity = 0.99, specificity: 0.54).	Retrospective Development and validation study
Klasen (2010), Germany (77)	Resilient child soldiers endorsed less perpetration of moral transgressions vs. child soldiers with PTSD ($M = 2.87$ vs. $M = 3.55$, $P = 0.005$) Severity of perpetration of moral transgressions and exposure to atrocities were significantly associated with guilt sx ($r = 0.27$, $P < 0.001$; $r = 0.20$, $P < 0.001$), PTSD sx ($r = 0.24$, $P < 0.001$; $r = 0.28$, $P < 0.001$), depression sx ($r = 0.22$, $P < 0.001$; $r = 0.32$, $P < 0.001$) and lowered perception of spiritual support ($r = 0.18$, $P < 0.01$; $r = 0.12$, $P < 0.05$)	Retrospective Unique sample – not generalizable to common military settings Psychopathology may be also related to trauma related to family separation
Marx (2010), USA (76)	Combat-related guilt indirectly mediated the relation between exposure to abusive violence and PTSD (indirect effect: 0.24) and MDD (indirect effect: 0.16) diagnoses Relation between participation in abusive violence and PTSD (indirect effect: 0.21) and MDD (indirect effect: 0.12) diagnoses was fully mediated by combat-related guilt	Mediation analysis on cross-sectional data Retrospective Small sample size
Berg (2011), USA (82)	Guilt sx, lack of meaning and religious doubt (subscales from the Spiritual Injury Scale) were strongly correlated with depression ($t = 4.95$, $P < 0.001$; $t = 8.23$, $P < 0.001$; $t = 2.92$, $p = 0.004$) and PTSD ($t = 4.05$, $P < 0.001$; $t = 5.91$, $P < 0.001$; $t = 2.63$, $P = 0.01$) sx	Did not differentiate between trauma aetiology Moral injury and general moral reasoning was not assessed
Ogden (2011), USA (83)	PTSD sx were related to alienation from God ($r = 0.36$, $P < 0.001$) and religious fear and guilt ($r = 0.25$, $P < 0.001$) Religious factors predicted 14% of variance in PTSD sx	Moral injury and general moral reasoning was not assessed Only generalizable to Christian faith treatment-seeking sample only

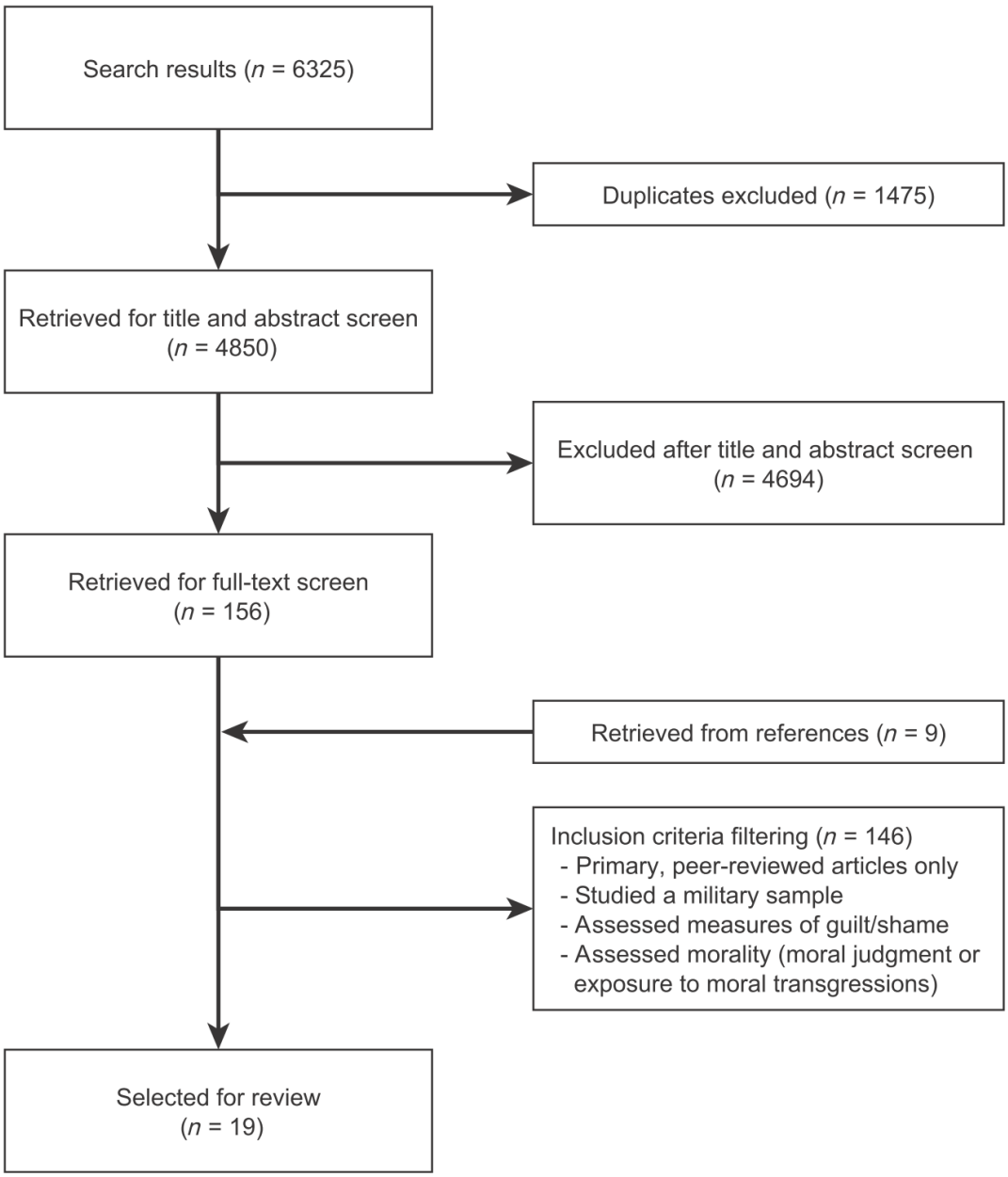
Table 3 (Continued)

Author (Year), Country	Results*	Limitations
Gray (2012), USA (84)	Despite improvements in PTSD sx, veterans did not demonstrate significant reductions in self-blame severity after adaptive disclosure treatment (pretest $M = 2.51$ vs. posttest $M = 2.31$, $P = 0.14$)	Small sample size
Stein (2012), USA (78)	Moral injury by self was associated with re-experiencing symptoms ($b = 0.28$, $P = 0.015$) and TRGI Hindsight-Bias/Responsibility ($b = 0.39$, $P = 0.003$) and Wrongdoing ($b = 0.26$, $P = 0.043$) subscales.	Review of non-validated structured clinical interviews Retrospective treatment-seeking sample only Event coding was ambiguous
Nash (2013), USA (85)	Perceived moral injury was not associated with combat exposure ($r = 0.08$) Perceived moral injury was associated with increased depression sx ($r = 0.40$), anxiety sx ($r = 0.28$), negative affectivity ($r = 0.29$), PTSD sx ($r = 0.28$) and lower social support ($r = -0.29$) (Interpersonal Support Evaluation List)	Development and validation study Retrospective
Vargas (2013), USA (86)	Based on an interview exploring symptoms experienced in the aftermath of moral injury, guilt and shame (Self-Deprecation theme) were found to be within the moral injury construct; however, frequency of this theme is lower than of feelings of loss of trust and existential/spiritual problems.	No mental health outcomes archival data Raters were not blind
Currier (2014), USA (79)	Severity of guilt sx was associated with degree of exposure to atrocities (SEM estimate = 0.19. $P < 0.001$) (controlling for combat exposure)	Lack of validated measures for guilt and atrocity exposure Retrospective

CGS, Combat Guilt Scale; HAM-D, Hamilton Rating for Depression; M-PTSD, Mississippi Scale for Combat-Related PTSD; MDD, Major Depressive Disorder; PTSD, Post-traumatic Stress Disorder; STRGS-WZ, sources of trauma-related guilt survey-war-zone version; sx, symptoms; TRGI, Trauma-Related Guilt Inventory; VREQ, Vietnam Related Experiences Questionnaire.

*Positive results and associations reported in this table were statistically significant.

Figure 1. Flow diagram of systematic article selection.



CHAPTER 5:

MORAL JUDGMENT IN WOMEN WITH POSTTRAUMATIC STRESS DISORDER RELATED TO CHILDHOOD ABUSE

Foreword to Chapter 5

Here, we explored moral reasoning performance in women with PTSD due to developmental trauma. Participants were presented with moral dilemmas and were asked whether certain actions were morally acceptable and whether they would carry out the action themselves if required to do so. Following the decision, participants were asked for the judgments behind their decision. This is unique chapter in the thesis, as it encapsulates both quantitative and qualitative analyses. Moral reasoning is very challenging to assess and quantify. Despite the modest sample size, we were successful at finding very specific group differences that aligned with our original hypotheses.

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Running head: Moral Reasoning in PTSD

Moral reasoning in women with post-traumatic stress disorder related to childhood abuse

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Abstract

Objective: Preliminary evidence suggests that relative to healthy controls, patients with post-traumatic stress disorder (PTSD) show deficits on several inter-related social cognitive tasks, including measures of theory of mind, and of emotion comprehension. Systematic investigations examining other aspects of social cognition, including moral reasoning have not been conducted in PTSD stemming from childhood trauma.

Method: Moral reasoning performance was assessed in 28 women with PTSD related to prolonged childhood trauma and 19 matched healthy controls. Performance was assessed using 12 modified moral dilemmas and was queried in three domains: utilitarian/deontological sacrificial dilemmas (personal and impersonal), social order *vs.* compassion, and altruism *vs.* self-interest. Participants were asked whether a proposed action was morally unacceptable or unacceptable and whether or not they would perform this action under the circumstances described. **Results:** Women with PTSD were less likely to carry out utilitarian actions in personal, sacrificial moral dilemmas, a choice driven primarily by consequential intrapersonal disapproval. Increased concern regarding intrapersonal disapproval was related to higher symptoms of guilt in the PTSD group. Patients with PTSD demonstrated less altruistic moral reasoning, primarily associated with decreased empathic role-taking for beneficiaries.

Conclusion: Women with PTSD due to childhood trauma show alterations in moral reasoning marked by decreased utilitarian judgment and decreased altruism. Childhood trauma may continue to impact moral choices made into adulthood.

Key words: Morals; Social Perception; Stress Disorders, Post-Traumatic; Adult Survivors of Child Abuse.

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Introduction

Post-traumatic stress disorder (PTSD) is a debilitating mental illness that may develop after exposure to traumatic or psychologically stressful life events and is marked by symptoms of re-experiencing, avoidance, negative cognitions, and arousal alterations. Individuals with PTSD often display alterations in intrapersonal function across multiple functional domains, including work, intimate relationships, and familial interactions (1–3). Given the centrality of social support in the recovery process for PTSD (4), decreased capacity to interact optimally with others represents a critical target for treatment intervention. Here, we explore moral reasoning performance among individuals with PTSD stemming from developmental trauma exposure, with a particular emphasis on differences in motivation for moral choices among this sample. Given previous research suggesting that exposure to developmental trauma alters key social cognitive processes that unfold over critical developmental periods (e.g., theory of mind (5,6), emotion comprehension (7)), we predicted that exposure to trauma in childhood would have long-standing effects on moral reasoning performance that persist into adulthood.

The ability to interact with the outside world is heavily dependent on early-life experiences and environmental feedback. Socio-cognitive skills develop over the first five years of life and are honed into adolescence (6,8). Accordingly, this developmental period is associated with inherent risks and opportunities, where childhood experiences may shape long-lasting patterns of behaviour, including social cognitive ability. In cases of developmental trauma, particularly that which is chronic and inflicted by trusted individuals who would be expected to provide safety and support, children may develop

distinct behavioural responses that include dissociation and learned helplessness (9,10). These responses may represent optimal adaptations for survival in environments where the option of escape is persistently non-existent (9) and that differ qualitatively from symptoms experienced in PTSD stemming from a single-blow trauma or trauma experience during adulthood (10).

Critically, the unique cognitive, emotional, and behavioural profiles (e.g., dissociation) that protect an individual during early-life adversity may be incongruent with safe environments encountered during adulthood and may contribute to the interpersonal dysfunction and functional impairment frequently observed in adult survivors of developmental trauma (3). Here, alterations in social cognitive functioning (e.g., ability to recognize emotion, empathic responding, perspective-taking) stemming from childhood experience would be expected to contribute significantly to interpersonal disruptions observed in adulthood. For example, the ability to engage in moral reasoning unfolds over a lengthy developmental window, and is highly dependent on the emergence of moral emotions, the maturation of empathic and perspective taking abilities, and optimal attachment styles (11). Alterations in these processes as the result of childhood trauma exposure would be expected to result in long-standing differences in moral reasoning performance relative to that of individuals that did not experience developmental trauma exposure, with differences persisting into adulthood.

Indeed, accumulating evidence suggests that social cognition, the ability to interact optimally and to navigate within the social world, may be altered in adults exposed to psychological trauma. Previous studies, including work conducted by our

laboratory, have shown alterations in empathic responding (12,13), prosodic comprehension (14), and theory of mind (15,16) in this population. A reoccurring theme surrounding alterations in social cognition among individuals with PTSD is alterations in its performance in emotionally salient social contexts. For example, Nazarov et al. (15) reported that individuals with PTSD are slower to identify complex mental states for emotionally salient trials only but not neutral trials. In a study exploring self-reported empathic concern in women with PTSD, Parlar et al. (12) found increased personal distress in response to emotionally charged social situations. Moral reasoning is a highly complex domain of social cognition that draws upon social norms to frame human interactions, requiring the engagement of theory of mind, self-referential processing, and empathy, and is seldom void of emotional salience (17–19). Accordingly, we sought to explore moral reasoning performance in women with PTSD due to childhood trauma, where exposure to trauma during key developmental periods would be expected to alter the development and expression of this key component of social interaction.

Although the study of morality has been left mainly to philosophy, recent advances in developmental (20,21), forensic (22), and neurocognitive psychology (23) have greatly increased our understanding of how our minds deliberate moral issues, and in turn, direct moral actions. There are two contrasting aspects to the classic understanding of morality – utilitarianism and deontology. Utilitarianism involves the understanding that the correct action is the one that results in greater good, regardless of the means to an end (24). By contrast, deontology posits that certain actions are always amoral, regardless of how good the intentions or outcomes are (25). The dual-process

theory proposed by Greene et al. (23,26) provides a framework for the complex process of moral decision-making, particularly in situations where deontological and utilitarian values are in conflict. Here, it is generally understood that whereas more utilitarian choices are based upon effortful cognitive reasoning, deontological choices draw upon more innate, emotional responses. Greene et al. (23,26) further suggests that there are two types of moral dilemmas, personal and impersonal. A personal moral dilemma places the participant in a situation where he/she must decide whether or not to inflict harm directly onto another person. An example of this type of dilemma is the footbridge dilemma (27) – you must throw someone onto the tracks of an oncoming out-of-control trolley that is imminently going to kill five people. The body of the victim that you pushed will stop the trolley and consequently save the five people. In an impersonal moral dilemma, the harm to the victim occurs less directly. For example, the modified trolley dilemma (27) also involves saving the lives of five people by killing one, except here the path of the trolley is redirected by means of a switch. Personal moral dilemmas tend to evoke a stronger emotional response, making the decision more complex and harder to resolve (26). This increased complexity is thought to arise due to conflict between the "emotional" response (avoidance of inflicting direct harm) and the purely "cognitive" response (saving five lives over one in spite of the negative emotional connotations) (26).

Critically, moral reasoning relies heavily on a network of neural regions shown previously to be impacted in PTSD including the orbitofrontal cortex (OFC) (28,29), dorsolateral prefrontal cortex (DLPFC) (26,29), anterior cingulate cortex (ACC) (26), and amygdala (30). Greene et al. (23) suggest that whereas the OFC is responsible for

eliciting emotional responses, the DLPFC is involved in evoking a cognitive response. When the two responses are both strong, this conflict may be resolved by the ACC. A wide body of evidence indicates that patients with PTSD demonstrate structural and/or functional changes in the medial prefrontal cortex, ACC, OFC, and amygdala (see (31,32) for review), with deficits emerging in fronto-temporally mediated domains of cognition, including working memory and attention required for performance of social reasoning tasks (33).

In order to obtain a comprehensive assessment of moral reasoning performance in the present study, we examined performance on moral dilemmas exploring three different domains: utilitarianism *vs.* deontology, social order *vs.* compassion, and altruism *vs.* self-interest. Participants were asked whether a proposed action was morally unacceptable or unacceptable and whether or not they would perform this action under the circumstances described. We hypothesized that individuals with PTSD due to chronic childhood trauma would experience alterations in moral reasoning performance both as a function of early life experience and ongoing alterations in the cognitive and emotional processes mediated by neural regions impacted in PTSD.

Methods

Participants

Forty-seven women were recruited to participate in this study; 28 individuals with a primary diagnosis of current PTSD related to childhood abuse (PTSD group; mean age 42.0 [SD = 11.6] years) and 19 healthy controls of similar age (HC group; mean age 36.1 [SD = 13.5] years). Women with PTSD were recruited at the London Health Sciences

Centre (LHSC; London, Ontario, Canada) through outpatient programs. The HC subjects were recruited through word of mouth and local advertisements at LHSC and St. Joseph's Healthcare Hamilton (Hamilton, Ontario, Canada). HC participants had no current or lifetime history of psychiatric illness. The study sample was drawn from the same pool of participants described in Nazarov et al. (15).

Diagnosis of PTSD was confirmed via the *Structured Clinical Interview for DSM-IV* (SCID) (34). PTSD symptom severity was assessed using the *Clinician-Administered PTSD Scale* (CAPS) (35), and depression symptom severity was measured with the *Beck Depression Inventory* (BDI) (36). Symptoms of dissociation and childhood trauma history were assessed by the *Multiscale Dissociation Inventory* (MDI) (37) and the *Childhood Trauma Questionnaire* (CTQ)(38), respectively. Demographic and clinical summaries are provided in Table 1. Healthy controls were administered the same measures in order to rule out the presence of current and past psychiatric illness and history of childhood maltreatment. Exclusion criteria for all groups were: (1) substance-use related disorder within the past 6 months as determined by the SCID; (2) use of alcohol or illicit psychoactive substance within 48 h of testing; (3) significant medical illness; (4) history of head injury with loss of consciousness lasting more than 60 s; and (5) history of neurological disease.

Moral Judgment Task

This task was designed to test participants' on-line ability to reason about complex moral situations, and was modeled on a series of dilemmas created by Greene et al. (23). A total of 12 moral dilemmas were presented individually (See Appendix A for a complete list of

moral dilemmas). Each dilemma and response options were read aloud by the interviewer, with a written copy of the dilemma being available to the participant. Four variables were recorded for each dilemma: judgment decision ("morally okay or not okay"), judgment stage ("why is it morally okay or not okay?"), intent decision ("would you do it?"), and intent stage ("why or why not would you do it?"). In order to reduce memory demands, our stories were relatively brief (50 –75 words) with both stories and questions available for inspection until a response was made. Responses were audio-recorded and transcribed. The moral dilemmas were equally divided by type: 6 dilemmas where the actions involved physical harm and 6 dilemmas where the actions involved no physical harm. The six physical harm dilemmas were further categorized into three personal (direct infliction of harm) and three impersonal (indirect infliction of harm) dilemmas. The physical harm moral dilemmas were of primary focus in this investigation as they elicited the dual cognitive and emotional processes. The non-physical harm dilemmas contained 4 moral dilemmas probing social order *vs.* compassion, and 2 moral dilemmas probing altruism *vs.* self-interest. Two blind, independent raters qualitatively categorized the judgments behind moral decisions using the moral judgment categorization found in Gibbs et al. (39) as a guideline (see Appendix 2 for categories scored in this sample). Conflicting categorizations were resolved upon rater consensus.

Statistical Methods

In order to examine group differences on the demographic and clinical variables, two-tailed independent-samples *t*-tests were used. All analyses were preceded by the Shapiro-Wilk test of normality. Group differences in moral decision making were

analyzed using a mixed-design ANOVA, with diagnosis as a between-subjects factor and physical harm type (physical harm/no physical harm), harm infliction type (personal/impersonal), or moral knowledge *vs.* intent as a repeated measure. Associations were calculated using Pearson's *r* or Spearman's r_s (two-tailed; $\alpha = 0.05$). Effect sizes were estimated by partial eta-squared (η_p^2) and Cohen's *d*. Fisher's exact test and odds ratios (OR) were used for qualitative analysis. Analyses were conducted with *SPSS 21* and *R* (3.0) statistical software. Qualitative scoring was conducted with *QSR NVivo 10*.

Results

Clinical and demographic characteristics

There were no group differences in age, however, women with PTSD had significantly fewer years of education than controls ($p = 0.001$; see Table 1 for demographic and clinical characteristics). As expected, patients with PTSD had significantly higher scores on the CAPS, BDI, CTQ, and MDI compared to controls ($ps < .05$).

High-conflict physical harm dilemmas

For moral choices involving high-conflict physical harm dilemmas, there was a significant interaction between morality type (knowledge/intent), harm type (personal/impersonal), and PTSD diagnosis ($F(1, 45) = 7.36$, $p = 0.009$, $\eta_p^2 = 0.141$; Figure 1). Patients with PTSD were less likely to approve a utilitarian action in comparison to controls only in situations where physical harm was to be personally inflicted ($t(45) = 3.67$, $p = 0.001$). However, there were no significant differences between patients and controls on impersonal physical harm dilemmas.

Although patients with PTSD and HCs endorsed equivalent rates of moral approval (moral knowledge) for utilitarian action involving high-conflict personal dilemmas, several qualitative differences emerged between groups (see Figure 2 for most common themes and group differences). Specifically, patients with PTSD were more likely to avoid the dichotomy of the utilitarian/deontological trade-off and suggest instead the possibility of an alternative outcome that avoided the need to execute the utilitarian action in order to save others (OR = 3.70, 95% CI [1.02-13.50], p = .041). There was also a trend towards differences in expression of normative expectations across groups on moral knowledge of personal harm dilemmas. Patients with PTSD were less likely to mention normative expectations (e.g., "people deserve to live", "it's the human thing to do", "how could anyone do/not do this?") in comparison to controls (OR = 0.17, 95% CI [0.03-0.91], p = .051).

Judgments surrounding decisions to *personally* carry out the utilitarian actions in high-conflict personal harm moral dilemmas varied greatly between PTSD and HC samples. PTSD patients were significantly less likely to mention the greater good (OR = 0.21, 95% CI [0.10-0.47], p < .001), generalized caring (OR = 0.29, 95% CI [0.13-0.63], p = .002), and prosocial intentions (OR = 0.30, 95% CI [0.14-0.65], p = .002) when inquired what choice they would make if presented with such situations. On the other hand, PTSD patients were more likely to mention intrapersonal approval (e.g., guilt, shame) (OR = 6.87, 95% CI [0.85-55.5], p = .051) and alternative suggestions (OR = 2.75, 95% CI [0.95-7.96], p = .064) in comparison to HC (trending significance**).** Indeed,

all individuals mentioning intrapersonal approval and alternative suggestions refused to carry out the utilitarian action if personally presented with the dilemmas.

Non-physical harm dilemmas

For non-physical harm dilemmas, there was a significant interaction between morality domain (altruism/social order) and PTSD diagnosis ($F(1, 45) = 4.48$, $p = 0.040$, $\eta_p^2 = 0.09$; Figure 1). In comparison to patients with PTSD, HCs were more likely to approve and carry out altruistic actions when pitted against self-interest ($F(1, 45) = 5.55$, $p = 0.023$, $\eta_p^2 = 0.11$; Figure 1) In describing their reasoning behind the moral permissibility of an altruistic act, patients with PTSD were more likely than HCs to mention personal freedoms (OR = 14.1, 95% CI [0.78-252], $p = .019$) and were less likely to mention generalized caring (OR = 0.38, 95% CI [0.16-0.90], $p = .034$). When considering their own agency in the dilemma, patients with PTSD were less likely than HCs to assume an empathic stance towards the potential beneficiary of the altruistic act (OR = 0.33, 95% CI [0.12-0.92], $p = .043$).

There were no significant differences between patients and controls on moral dilemmas probing social order *vs.* compassion.

Relation to clinical symptoms

Within the patient sample, individuals who have mentioned intrapersonal approval as reasoning behind their moral choices reported significantly higher symptoms of guilt due to omission/commission on the CAPS ($t(14) = 2.47$, $p = 0.027$).

No other clinical characteristics were associated with moral reasoning in our patient sample.

Discussion

To our knowledge, this is the first study to explore moral decision-making performance in PTSD due to childhood trauma. Here, we used a novel study design to discern both quantitative and qualitative differences in moral reasoning performance, allowing us to explore different types of moral dilemmas and the potential divergence between moral reasoning and moral intent. When presented with high-conflict personal moral dilemmas, in comparison with healthy women, women with PTSD were less likely to mention the benefit of greater good and more likely to mention intrapersonal approval/disapproval (guilt/shame) as a consequence of carrying out utilitarian actions. Subsequently, women with PTSD described themselves as less likely to carry out a utilitarian action despite similar decisions concerning whether the action was morally acceptable or not acceptable. Interestingly, concerns regarding intrapersonal approval surrounding moral judgments were related the presence of associated clinical symptoms of guilt surrounding perceived acts of omission and commission. Finally, women with PTSD were less likely to endorse and carry out an altruistic action in altruism *vs* self-interest dilemmas

In this study, we presented participants with a range of moral dilemmas that queried moral judgment on topics including altruism *vs.* self-interest, law *vs.* compassion, and sacrifice for the greater good (deontology *vs.* utilitarianism). Most significantly, we found that despite women with PTSD and HC making similar judgments about the moral

permissibility of a utilitarian action that required each group to exert direct harm, women with PTSD were less likely to endorse personally carrying out those actions if hypothetically required to do so. Critically, analysis of the qualitative reasoning surrounding these moral choices, feelings of guilt and shame were cited as reasons to not follow-through with such sacrificial actions primarily in the PTSD group and not HC. By contrast, healthy subjects were more likely carry out hypothetical utilitarian actions requiring direct harm despite endorsing them as morally unacceptable. Guilt and shame are moral emotions that are expressed when one's behaviour does not align with social and / or personal moral standards (40) thus serving as an adaptive moral compass that utilizes emotional processing based on existing sociocognitive schemas. Recent theories postulate that these experiences of shame and guilt may play a central role in PTSD symptomology (41–43). For example, guilt and shame symptoms are frequently associated with perceived perpetration of and exposure to moral transgressions in military members with PTSD, potentially mediating the relation between trauma exposure and symptom severity in PTSD and major depressive disorder (MDD) (see Nazarov et al. (44) for review). Symptoms of shame and guilt also arise frequently in individuals who have been victimized (e.g., through physical and sexual assault, transportation accidents, and developmental trauma (45); (46)). For example, assuming unwarranted blame for traumatic events over which one had no control may alter sense of self, resulting in feelings of alienation and decreased access to social support (47). These maladaptive symptoms of guilt and shame, particularly following victimization, impede recovery.

In our sample, we found that clinical symptoms of guilt (DSM-IV nomenclature) were associated with the propensity to endorse guilt and shame as consequences of utilitarian actions when required to undertake a morally ambiguous action that required one's own agency. Here, clinical symptoms guilt and shame in our patient sample may have exerted a priming effect on moral decision-making during reasoning about the hypothetical dilemmas. Indeed, previous research has shown that inducing feelings of guilt alters moral reasoning in healthy populations (48). We speculate that individuals with PTSD may experience increased awareness of the debilitating consequences of guilt and shame due to the nature of their symptomatological profile and history of past symptoms of guilt. As a result, they may be more accurate at predicting how these moral emotions will impact intrapersonal approval following the morally transgressive actions.

It is well established that knowledge of moral rules does not necessarily translate to actions that follow the same principles, with psychopathy being an extreme example where a divide exists between moral knowledge and actual behaviour (49). Studies investigating psychopathy have alluded to the reduction in emotional processing of guilt that may be antecedent to moral behaviour (50). Interestingly, in our study, when queried whether an action is morally acceptable or not, minimal endorsements of guilt and shame were made in both the PTSD and HC groups. Requiring participants to reason as to whether or not they would undertake the morally ambiguous (despite potential moral objections) may be a more representative indicator of moral reasoning ability, as it may heighten the emotional salience of the dilemma. Indeed, some paradigms of moral reasoning implement techniques (e.g., closing of eyes during scene descriptions) that have

been shown to maximize perspective-taking and by doing so may evoke emotional processing that may be naturally lacking in laboratory-based artificial settings and hypothetical scenarios (51,52). Here, we attempted to bridge the divide between moral knowledge and moral action by requiring the participants to assume the role of agent.

Given similar judgments of the acceptability of utilitarian actions among women with PTSD and controls, it is possible that women with PTSD experienced a comparable ability to assume the often conflicting (varying with values, actions, intentions, feelings) perspective of characters depicted in the dilemmas. Indeed, Nazarov et al. (15) found that individuals with PTSD due to developmental trauma showed decreased ToM performance only in situations relating to familial interactions. Critically, none of the dilemmas presented in this study required the participants to assume a familial role in relation to the characters in the dilemmas. Surprisingly, some research points to improvements in perspective-taking when feeling guilty (53). In an affect induction study of health participants, Yang et al. (53) found that subjects induced to experience feelings of guilt demonstrated improved perspective-taking performance over the neutral state condition. In contrast, individuals induced to experience shame showed a reduction in perspective-taking. Future studies exploring the interplay of shame, guilt, theory of mind, and moral judgment are warranted.

The dual-processing theory of moral judgment follows the premise that moral judgment is the product of the interplay between cognitive and (at times conflicting) emotional processing (54,55). In our sample, healthy women were more likely to override

the emotional attributes of high-conflict dilemmas and instead emphasise the utilitarian outcomes behind their endorsement of utilitarian action. This difference may relate, in part, to differences in empathic responding between individuals with PTSD and HCs (12). Research on empathy and its relation to moral judgment has been scarce. Patil et al. (56) reported an association between increased utilitarian judgment and decreased empathic concern in individuals with trait alexithymia. Given previous findings of decreased empathic concern in PTSD (but increased personal distress in relation to other's difficulties) (12), we might have expected increased approval of utilitarian actions in our PTSD sample compared to controls. In contrast, our results indicate that despite alterations in empathic concern alterations among individuals with PTSD, utilitarian thought was significantly lower in our PTSD sample when compared with healthy subjects. One line of reasoning that may aid in interpreting these contradictory findings is the PTSD group's reasoning behind the decreased tendency for utilitarian thought. Individuals with PTSD focused on interpersonal disapproval as opposed to the emphasis on the violation of basic rights of the victim reflecting a preoccupation with their own internal emotional states. Indeed, Parlar et al. (12) and Nietlisbach et al. (13) found increased personal distress in response to emotional social contexts in individuals with PTSD. The increase in personal distress in response to other's suffering may represent an erosion of the boundary between self and other, thus heightening the salience of personal consequences of a morally objectionable act. Interestingly, women with PTSD were more likely to generate alternative suggestions in lieu of choosing a utilitarian option. Personal discomfort and fear of emotionally charged contexts may further prevent an individual

from undertaking a difficult moral decision, instead leading to inaction (in this case the avoidance of utilitarian action). Future studies should disentangle the differences between distress-related inaction and intentional deontological choice.

In our study, patients with PTSD were less likely to endorse and carry out altruistic behaviours in comparison with HC. Altruism is a prosocial behaviour that is driven by concern for others rather than concern for oneself and is accompanied with inherent personal costs (e.g., personal risk during the action or as an outcome, opportunity cost) (57). Empathy and perspective-taking are socio-cognitive processes that are central in evoking altruistic behaviours (58), and rely on common neural circuitry (59). Interestingly, individuals high in altruism engage in neural networks related to empathy and theory or mind more so than individuals who are less altruistic (60). Feldman-Hall et al (59) reported that altruistic behaviour is predicted by increased empathic concern for others but not by levels of personal distress. Previous research examining the relation between early childhood trauma and empathic abilities support our observation of reduced altruistic behaviours in patients with PTSD. As demonstrated by Parlar et al.(12), women with PTSD exposed to chronic childhood trauma presented with reduced empathic concern and heightened personal distress. The sustained states of stress, anxiety, and fear may exacerbate the development of self-focused behaviour and competitiveness in trauma exposed individuals as a result of being chronically engaged in subcortically-driven primitive defensive responses (61,62). Individuals who develop under abusive, neglectful, and traumatic circumstances may not develop optimal sociocognitive processes that in turn mediate altruistic behaviour. The lack of altruism demonstrated by

patients with PTSD in our study may be attributable to chronic, early childhood abuse and resulting alterations in empathic functioning.

There are several limitations to this study, including the small sample size. The generalizability of our results is limited to women who have been exposed to chronic childhood trauma and is not applicable to men, single-blow trauma, or chronic trauma not related to childhood victimization. Furthermore, the hypothetical high-conflict moral dilemmas used in this study are generally not encountered in real-life; future studies should explore judgment behind moral dilemmas that are more pertinent to real-life situations. Considering that we found differences in moral judgment only when participants were asked to consider their own agency behind the hypothetical actions, future research should ensure morality paradigms maximize perspective-taking in order to create immersive scenarios. Care must be taken to control the types of scenarios delivered to participants in order to avoid presenting trauma-related cues. Unfortunately, reaction time for moral decision-making was not recorded and should be implemented in future studies given that individuals with PTSD due to childhood trauma have shown delayed latencies during identification of prosody (14) and emotionally salient complex mental states (15). In our study, we did not use an independent measure of guilt and shame but rather a sub-score from the CAPS; future investigations should utilize more accurate instruments of state and trait measures of guilt and shame. Due to differing definitions, interpretations, quantification, and with some research failing to distinguish guilt and shame altogether (63), the extent to which shame and guilt independently relate to adverse mental health outcomes is difficult to evaluate. Researchers intending to capture

the interplay between morality and the experiences of guilt and shame must be cognizant of the distinct underlying psychological constructs of moral emotions (40,63). Longitudinal studies investigating the interaction of moral judgment and existing feelings of shame and guilt are warranted, particularly concerning treatment interventions targeting symptoms of guilt and shame in PTSD populations. Finally, in light of neuroimaging findings alluding the role of DMN and SN in moral reasoning (64) and to disruptions in these networks in PTSD (65), future investigations should longitudinally explore moral reasoning performance before and after DMN-modifying treatments such as EEG neurofeedback (66).

Here, we demonstrated altered moral judgment processing in women with PTSD due to chronic childhood trauma. Critically, in comparison to healthy women, women with PTSD were less likely to approve utilitarian actions when required to assume their own agency in actions involving the infliction of direct physical harm. The decreased likelihood of utilitarian action approval by the PTSD sample was driven by significantly enhanced endorsement of guilt and shame as consequences of such actions. Within the PTSD sample, endorsement of guilt and shame in moral dilemmas was related to increased severity of current clinical symptoms of guilt. Finally, in dilemmas exploring altruism *vs.* self-interest, women with PTSD were less likely to morally approve an altruistic action and were less likely to carry out the altruistic action themselves. This study further extends the growing literature on sociocognitive alterations associated with psychological trauma, the results of which may be applied to interventions aimed at

ameliorating impairments in interpersonal functioning, particularly during morally conflicting and emotionally salient social contexts.

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Tables and Figures

Table 1. Clinical and demographic characteristics of study sample.

Characteristic	**Control** (n=19)	**PTSD** (n=28)
	n	*N*
Sex		
Male	0	0
Female	19	28
	Mean	*Mean*
Age	36.1(13.5)	42.0(11.6)
Education	16.3(2.4)	13.8(2.4)*
CAPS	0.1(0.5)	79.4(16.2)*
BDI	2.5(4.4)	30.8(12.4)*
Childhood Trauma Questionnaire		
Emotional Abuse	5.9(2.14)	18.5(5.2)*
Physical Abuse	5.5(1.1)	13.0(5.7)*
Sexual Abuse	5.2(0.4)	15.5(7.3)*
Emotional Neglect	7.4(2.2)	17.9(4.9)*
Physical Neglect	6.2(1.7)	11.6(5.5)*
MDI (Total)	34.7(6.0)	75.1(21.9)*
Disengagement	7.6(2.4)	17.0(4.0)*
Depersonalization	5.2(0.4)	10.8(5.1)*
Derealization	5.5(1.7)	11.7(4.2)*
Emotional Constriction	5.5(1.1)	13.0(6.1)*
Memory Disturbance	5.6(1.5)	12.1(4.5)*
Identity Dissociation	5.2(0.5)	10.6(6.2)*

Values are *n* or mean (standard deviation).

Abbreviations:

BDI (Beck Depression Inventory); CAPS (Clinician-Administered PTSD Scale); MDI (Multiscale Dissociation Inventory); PTSD (posttraumatic stress disorder)

* Significant group effect ($p < 0.05$)

Figure 1. Judgments on moral dilemmas in patients with PTSD and healthy controls (HC).

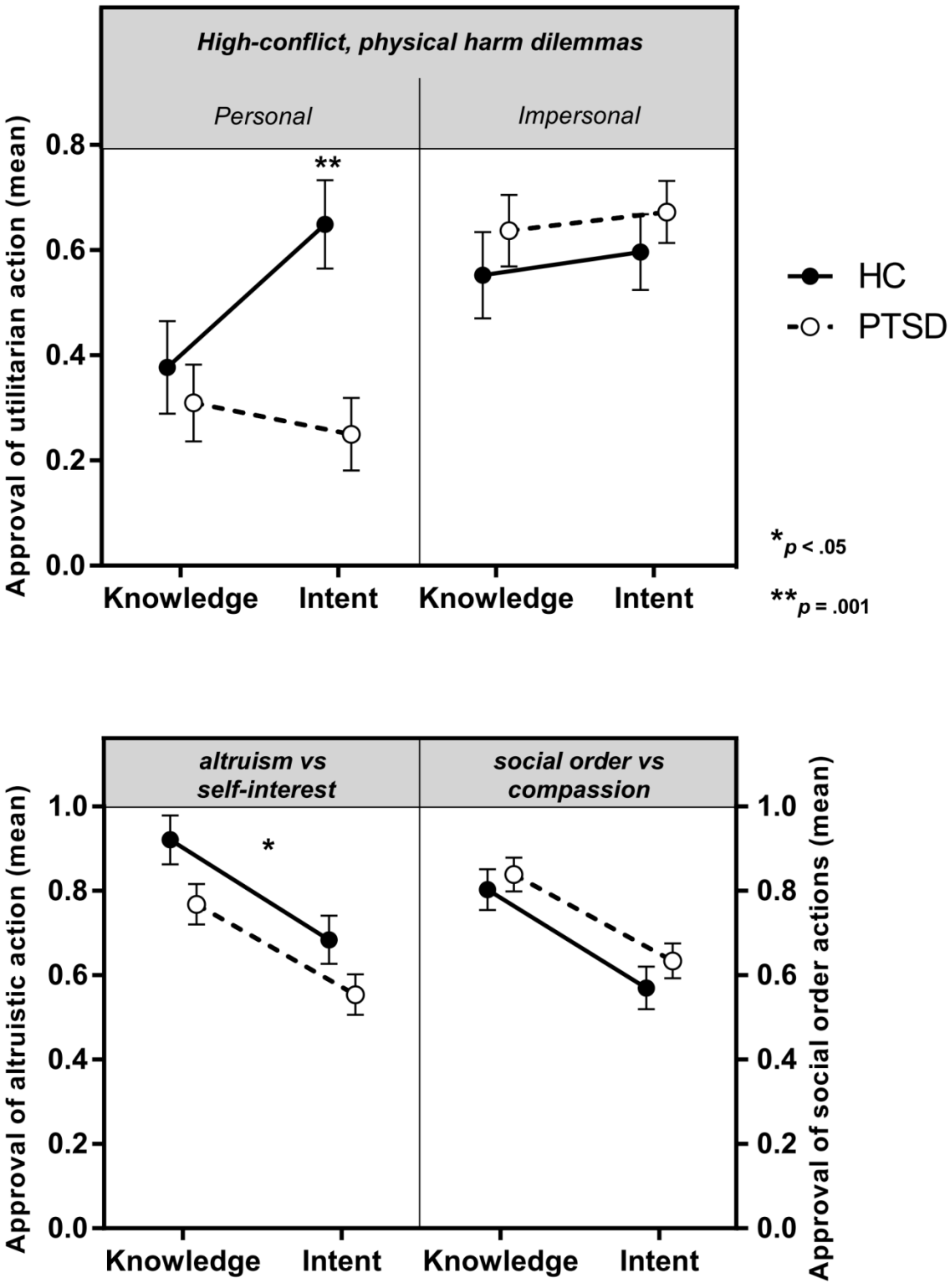

Table 2. Qualitative analysis of moral reasoning performance on personal moral dilemmas.

KNOWLEDGE

Top Thematic Coverage (% of responses)

PTSD	%	HC	%
Generalized Caring	36	Generalized Caring	43
Prosocial Intentions	24	Empathic Role-Taking	37
Empathic Role-Taking	24	Basic Rights or Values	33
Greater Good	22	Prosocial Intentions	30

Group Differences

Theme	% (PTSD)	% (HC)	raw Δ%	RR (95% CI)	*p*
Alternative Suggestion	21	7	+14	3.14 (0.99-10.2)	.041
Norm. Expectations	3	13	-10	0.20 (0.04-0.93)	.051

INTENT

Top Thematic Coverage (% of responses)

PTSD	%	HC	%
Generalized Caring	43	Generalized Caring	72
Empathic Role-Taking	31	Prosocial Intentions	55
Prosocial Intentions	27	Greater Good	55
Alternative Suggestion	25	Empathic Role-Taking	34

Group Differences

Theme	% (PTSD)	% (HC)	raw Δ%	RR (95% CI)	*p*
Greater Good	21	55	-34	0.38 (0.23-0.62)	<.001
Generalized Caring	43	72	-29	0.59 (0.43-0.81)	.002
Prosocial Intentions	27	55	-28	0.49 (0.32-0.77)	.002
Intrapersonal Approval	13	2	+11	6.10 (0.81-46.2)	.051
Alternative Suggestion	25	11	+14	2.32 (0.93-5.80)	.064

Appendix A

UTILITARIANISM VS DEONTOLOGY [PERSONAL]

Military Submarine
You are the captain of a military submarine. An onboard explosion has caused you to lose most of your air supply and has injured one of your crewmembers, who is quickly losing blood. The injured crewmember is going to die from his wounds no matter what happens. There isn't enough air for the whole crew. The only way to save the other crewmembers is to shoot dead the injured crewmember so that there will be just enough air for the rest of the crew to survive.

Shopping Mall Bomb
You are dealing with a terrorist who is about to set off a bomb in a crowded area. You are holding his teenage son at your headquarters.
After lengthy negotiations, you realize that the only way you can stop the terrorist from setting off a bomb that will kill thousands of people, is to break one of his son's arms. You also threaten to break the other arm if he does not give himself up. You also realize that in order to make sure the terrorist believes you, you would have to break the son's limbs yourself and have it videotaped and sent to the boy's father.

Boat at Sea
You are on a big boat at sea. There is a fire on the boat and everyone has to evacuate

ALTRUISM VS SELF INTEREST

Charity
You receive a letter from a highly respected charity. The letter asks you to make a donation of $200. The letter explains that a $200 donation will allow the charity to provide badly needed food and medicine to poor people on the other side of the world. $200 is the amount of money you receive for two days of work at your current job. You consider your financial situation relatively average, but still, it would not be very easy for you to make this kind of donation at this time.

Blood Donation
Your good friend's daughter was diagnosed with colon cancer. She needs a specific blood cell donation, and you were found to be a perfect match. The procedure is lengthy and unpleasant, and requires several days of hospitalization. However, it is not painful or dangerous.

COMPASSION VS SOCIAL ORDER

Lying Mayor
You are a writer for your town's newspaper. You have learned that the Mayor is lying about the amount of money the municipality owes to the

the boat. People get into the lifeboats. All the lifeboats, including yours, have too many people in them. The sea is getting rough, and water is coming in over the sides. If nothing is done the lifeboat will sink and everyone on board will die. A young woman on board proposes to sacrifice herself for the sake of others. If you throw her overboard, the boat will stay afloat and the remaining passengers will be saved. However, she is afraid of the actual drowning, and begs you to cut her throat with your knife and throw her body into the sea.

UTILITARIANISM VS DEONTOLOGY [IMPERSONAL]

Vaccine
You work for the government's public health office. Scientists have made a new vaccine to fight a serious disease, and you must decide whether the government will tell people to use it. Almost everyone who uses the vaccine will get protection from this deadly disease. However, a very small number of the people who take the vaccine will get the disease that it is meant to prevent. Still, the experts all agree that the risk of getting the disease is much higher for people who don't take the vaccine than it is for people who do take it.

Cancer Drug
You are a scientist at a pharmaceutical company. You have been involved in testing a drug that might cure breast cancer. The drug has been found to be safe for bank. Many taxpayers in your town are being forced to pay higher taxes because of the Mayor's lies.

Doctor's Office
Your sister's boyfriend has just had some blood-work done, and she is interested in finding out the results of these tests. She asked him for the results but he was not very forthcoming. You and your sister begin to wonder whether he is hiding the fact that he has a sexually-transmitted infection. You are working at the medical office where the tests were done, so you could photocopy the results for you and your sister to look at. You know these results are confidential and that you should not violate patient confidentiality. On the other hand, you are truly worried about your sister's health.

Employee Fraud
You are the general manager of a big bank. Recently, you have had some cases of fraud by bank employees. In the past, the bank reported all of these cases to the police, and in all cases, the employees were charged with fraud. Your assistant suggests that perhaps some of these employees have had personal problems that had led to the crime. It is in your power to change the policy so that the employees who had personal problems at the time of the crime will not be reported to the police.

School Theft

animals, but it is still not clear if it is safe to give it to humans. Your company wants to begin giving this drug to women who are dying of breast cancer. You are worried, however, that the drug might be unsafe for humans and that it could kill some of the women shortly after they take it. On the other hand, there is a strong possibility this drug could cure breast cancer and save many women's lives.

Chief of Police
You are the Chief of Police. Your police officers have just caught several people known to be involved in terrorism. The terrorists tell you that they have planted a dangerous bomb in a large shopping center but refuse to tell you which one or in what town it is located. The bomb will explode in a few hours. You estimate that it could cause severe casualties. With the limited amount of time at your disposal, the only way to discover the location of the bomb is to order the police officers to torture the terrorists until they tell them where the bomb is located.

You are a schoolteacher in a rough neighborhood. One of your students is an exceptionally bright and caring individual, who has suffered a lot in life. Although the student has been involved in many crimes in the past, he says he is reformed and plans to attend university. You are tutoring him to prepare him for his entrance exams when you notice that an item has clearly been stolen. When you confront the student, he tells you he deeply regrets taking that item. He has not stolen since he took this item, and vows to never steal again. You are not sure whether you should report the theft to the police. Any further arrests could prevent the student from attending university.

CHAPTER 6:

GENERAL DISCUSSION

General Discussion

The goal of this thesis was to investigate whether individuals exposed to psychological trauma experience alterations in social cognition performance. Overall, the results derived from our experimental data suggest that all socio-cognitive domains explored here, specifically, emotion comprehension, ToM decoding, and moral reasoning, are altered in individuals with PTSD related to prolonged childhood trauma. In addition, the systematic review in Chapter 4 conceptualizes the manner in which morality may moderate the emergence of PTSD psychopathology and demonstrates further evidence of the robust relation between trauma exposure and social cognition. This thesis represents a collection of investigations that are first in the literature to explore socio-cognitive disruptions in individuals exposed to prolonged childhood trauma. The findings presented in this thesis add significant and novel understanding in terms of how trauma can impact the way we understand and navigate the social world.

In Chapter 2 we demonstrated that women with PTSD related to childhood trauma were slower than healthy women at identifying emotions within excerpts of emotional speech. Specifically, patients were slower at identifying happiness, sadness, and fear, but not anger. The distinct emotion-dependent deficits are in parallel with past literature showing attention bias towards specific emotional stimuli. For instance, Pollak & Sinha (2002) showed that in comparison to non-trauma-exposed children, trauma-exposed children are more likely to attribute the emotion of anger to ambiguous facial expressions. Furthermore, individuals exposed to childhood abuse have a heightened attention bias to angry stimuli. Since the degree of emotion regulation adaptation is based on context and

environmental stressors, for individuals exposed to chronically abusive environments immediate coping abilities may come at a cost of long-term difficulty. Sensitization to anger may allow individuals to predict threat in their environment.

We found that an increased severity of childhood abuse was related strongly to slowed ability to identify emotions in our patient sample. Furthermore, increased severity of childhood abuse and symptoms of dissociation were related to lower accuracy when discriminating different emotions from two consecutively-presented speech excerpts. The implication is clear: there is a linear association between child abuse severity and the degree of enduring deficits in emotion processing seen in individuals who have developed PTSD.

There are at least three factors at play in our EC findings. First, the sensitization to specific emotional stimuli (anger in voice), as mentioned above, may be an adaptive response to a chronically threatening environment. In other words, an individual exposed to trauma may undergo behavioural changes that aid in avoiding, predicting, or preparing for future traumatic events. Second, the slowed emotional processing seen between study groups and as a function of childhood abuse severity suggests that exposure to trauma may inflict global impairments on emotional processing and potentially, the efficiency of other processes and neural networks. Future studies should explore the interaction of basal emotion processing performance and the modulation of emotion comprehension by the frontal lobes as it pertains to selective attention for affective cues in trauma survivors. The third factor is the effect of dissociation on emotion comprehension. Dissociation, the cognitive and emotional disconnection between the environment and the self, may act as a

protective phenomenon and allow the individual to endure traumatic events as they unfold (de Ruiter, Elzinga, & Phaf, 2006). Unfortunately, many trauma-exposed individuals may experience dissociative symptoms in response to trauma-related triggers, which severely impacts their daily living (Nash, Hulsey, Sexton, Harralson, & Lambert, 1993). In our study of EC, increased symptoms of dissociation were related to reduced ability to discriminate between emotions in voice. Although reduced awareness of emotions may be an adaptive response for the duration of the traumatic event, we have demonstrated that individuals with dissociative features may have trouble differentiating emotions even when present in a non-threatening environment.

In Chapter 3, we demonstrated ToM decoding deficits in women with PTSD related to childhood trauma. On the IPT-15 task, a video test of social perception, we found that women with PTSD showed difficulties in interpreting situations that depicted familial interactions; performance in other contexts was spared. The finding of deficits in the perception of familial interactions on the IPT-15 is one of substantial notion. In order to accurately perceive social interactions on this task, one must integrate non-verbal cues while assuming the perspectives of others. Since no other significant group differences emerged among the remaining IPT-15 subscales, this suggests that ToM deficits in women with complex trauma may be specific to situations involving family relationships. Indeed, women that have experienced childhood sexual abuse frequently report difficulties in marital functioning (Bagley & Ramsay, 1986) and problems with attachment in adult relationships (Alexander et al., 1998). Additionally, women that have experienced childhood physical or sexual abuse tend to perceive their family

environments as less cohesive (Meyerson, Long, Miranda, & Marx, 2002). This alludes to the notion that individuals that have been exposed to complex childhood trauma generally have disrupted relationships with their parents.

In RMET, our second ToM decoding task used in Chapter 3, we have shown that individuals with PTSD demonstrate slowed recognition of complex mental states during emotionally-salient stimuli. Future studies need to explore the nature of ToM processing difficulties, particularly in contexts that may relate to the trauma history or unspecific emotionally-charged contexts. Consistent with findings from Chapter 2 implicating dissociative symptoms in further reductions in EC, we found in Chapter 3 that ToM decoding accuracy is reduced in the presence of increased dissociative symptoms. Altered function of the TPJ has been shown to be related to ToM deficits and to play a role in the production of the "out-of-body experiences" frequently reported during dissociation (Blanke & Arzy, 2005).

In light of reported executive function deficits seen in PTSD (Polak, Witteveen, Reitsma, & Olff, 2012), future studies should explore ToM performance in conditions with varying cognitive processing load. For instance, the social faux pas task by McKinnon & Moscovitch (2007) tests ToM reasoning under low (first-order ToM) and high (second-order ToM) cognitive load. First-order ToM reasoning relates to questions requiring participants to take the perspective of a specific character in a scenario (e.g., "What is Billy thinking?") and represents only one perspective-taking "leap" (i.e., from own perspective to Billy's perspective). Meanwhile, second-order ToM reasoning

pertains to questions requiring the participants jump two perspectives (e.g., What does Billy think Lisa thinks?")

In Chapter 5, we demonstrated alterations in moral reasoning performance in women with PTSD related to childhood trauma. Moral reasoning is very challenging to assess and quantify. Despite the modest sample size, we were successful at finding very specific group differences that aligned with our original hypotheses. In comparison to controls, we found that patients with PTSD were less likely to carry out the utilitarian choice when presented with a personal moral dilemma. When asked about general moral acceptability of such actions, patients and controls had similar rates of moral approval of utilitarian actions. However, healthy women were able to override the emotional context of such dilemmas and justify transgressing certain moral standards in order procure greater good. It may be possible that in comparison to controls, women with PTSD exhibit reduced capacity in their ability to override the emotional salience of a personal moral dilemma with the more cognitive and calculated reasoning. When exploring the qualitative judgments behind their moral choice, the patient group frequently endorsed intrapersonal disapproval (experiences of shame and guilt) as consequence of carrying out a utilitarian action, therefore choosing the deontological behaviour in its place. Symptoms of shame and guilt are common experiences in individuals who have been victimized and suffered developmental trauma (Budden, 2009). Critically, clinical symptoms of guilt and shame were significantly associated with increased endorsement of guilt and shame during the deliberation of own agency in the utilitarian acts or personal moral dilemmas. In other words, we have demonstrated that clinical symptoms of guilt and shame play a

role in moral decision-making. Indeed, this parallels findings from literature of healthy individuals, showing that induced feelings of guilt alter moral judgment (De Hooge, Zeelenberg, & Breugelmans, 2007).

In Chapter 5, we have also demonstrated that patients with PTSD are more likely to act in a self-preserving manner (ensuring personal risk is minimized) when presented with moral dilemmas containing an option to carry out an altruistic action without significant risk to oneself. Empathic concern has been found to predict altruistic behaviours in healthy populations (FeldmanHall, Dalgleish, Evans, & Mobbs, 2015). Critically, reduced empathic concern has been found in women with PTSD exposed to childhood trauma (Parlar et al., 2014).

In Chapter 4, we found consistent evidence suggesting that exposure to and perpetration of moral transgressions may be related to the emergence of symptoms of guilt and shame, and in turn, suicidal ideation and symptoms of PTSD and MDD. Current treatment for combat/military-related PTSD has primarily targeted symptoms based on exposure to fear-inducing events. However, recent literature has shown that action, inaction, and exposure to contexts where one's moral standards are transgressed may lead to a gradual amplification of guilt and shame symptoms, potentially yielding delayed presentations of significant psychopathology. Symptoms of guilt and shame must be assessed and monitored prior-to, during, and after treatment. Assessing guilt and shame symptoms (along with the source of these symptoms) during treatment may guide the therapeutic direction focus on key issues/sources of psychological distress. Shame is related to reduced treatment-seeking behaviour and avoidance of social interaction (Lee et

al., 2001; Wilson, Drozdek, & Turkovic, 2006). Since perceived social support has been found to be a key mediating factor in recovery from PTSD (Charuvastra & Cloitre, 2008), reducing symptoms of shame may facilitate social interaction and, in turn, heighten the perception of social support. With recent focus on moral emotions, particularly guilt and shame, being central symptoms of combat-related PTSD, research must focus on how and why certain individuals are at risk of experiencing shame and guilt, how these symptoms contribute to the development of PTSD and related psychopathologies, and how exposure and perception of moral injuries come into play.

PTSD has been shown to be highly comorbid with MDD, borderline personality disorder, and substance abuse (Najavits, Weiss, & Shaw, 1997). Some epidemiological studies suggest that over 50% of individuals diagnosed with PTSD are also suffering from MDD (Armour et al., 2015; Campbell et al., 2007). Furthermore, over 90% of individuals diagnosed with MDD have a history of psychological trauma exposure (Spinhoven, Penninx, van Hemert, de Rooij, & Elzinga, 2014). In our experimental studies, we explored whether MDD comorbidity had differential effects on sociocognitive performance in our PTSD samples. Overall, dichotomizing the PTSD sample into the presence or absence of MDD diagnosis did not change the pattern of results. However, when assessing depressive symptoms on a spectrum of severity (using the BDI), we found increased depressive symptoms were related with decreased ToM decoding accuracy on the RMET in Chapter 3.

One explanation behind the comorbidity between PTSD and MDD may be the overlapping symptom criteria for the two disorders. In addition, once diagnosed with

PTSD, clinicians may demonstrate increased vigilance and insight into symptoms that they may not have been sensitive to prior to diagnosis. Variances in diagnosis styles and the common presence of comorbidities add further difficulty to the study of an already complex disorder. Future studies in PTSD should investigate symptomatological profiles on multiple spectra instead of relying on dichotomous categorization of either the presence or absence of specific comorbid disorders.

Although not directly explored in this thesis, alcohol misuse is frequently observed after exposure to psychological trauma, particularly in military personnel. Increased consumption of alcohol may be related to its use as a social lubricant and/or as a method of short-acting self-medication. The former reason for alcohol use needs to be explored in the context of social interactions and sociocognitive performance in these individuals. Sociocognitive training/re-training may be a potent alternative method of easing into social situations, particularly in soldiers returning home from extended deployment, or traumatized individuals making new social connections or reintegrating into their pre-existing social network. Considering that perceived social support is the best predictor of PTSD recovery (Kilpatrick et al., 2007), successful social integration and functioning must be a central therapeutic focus.

It is imperative to explore the extent of intergenerational transmission that childhood abuse entails since preliminary evidence suggests that survivors of childhood abuse showcase altered maternal functioning (see (Rumstein-McKean & Hunsley, 2001) for review). In a study by Cohen (1995), mothers who were incest survivors were found to be less skilful at maternal aptitude in comparison to non-abused mothers. Additionally,

low socio-economic status mothers exposed to childhood sexual abuse display an increased use of physical punishment on their children (Banyard, 1997; DiLillo, Tremblay, & Peterson, 2000). Parent-child role confusion may also be a contributing factor to the deficits seen in the perception of familial interactions. Role-confusion (or role-reversal), is defined as the misunderstanding of the role (global responsibilities and actions) one should assume in the relationship between a child and a parent (Jurkovic, 1997). This phenomenon has been of recent focus, with a study by Vulliez-Coady, Obsuth, Torreiro-Casal, Ellertsdottir, & Lyons-Ruth (2013) finding an association maternal role-confusion and the inability to resolve losses. The authors postulate that this may be due to the child's exposure to a parent who was unable to effectively cope with a stressful event and instead engaged in helplessness. Unfortunately, since the extent of traumatic exposure in the parents of the participants in our samples is unknown, the validation of this hypothesis awaits further studies.

Limitations

A major limitation of the experimental studies presented here is the modest sample size and overlapping study samples. Furthermore, our results only apply to women and only to individuals who have experienced prolonged developmental trauma. Future work is necessary to elucidate how trauma characteristics (eg., chronicity, period of life at exposure, source) moderates impact on psychological function. A particular traumatic event is usually constrained to a very small group of victims, with most times the victim being a single individual (e.g, robbery, assault, rape, etc.). For this reason, most investigations include individuals that have been exposed to a diverse range of traumatic

events. The lack of a common event across the study sample presents a significant confounding factor. Efforts need to be focused on establishing research protocols and initiatives to quickly deploy assessments in situations of wide-scale, shared traumatization. In addition to elucidating the effects of trauma exposure while controlling for context, such research initiatives may be jointly associated with early-intervention treatment programs.

Future Directions

Since we propose that a certain type of moral judgment may act as a resilience factor against the development of combat-related PTSD, the CF may consider implementing tests of moral judgment during personnel selection geared for deployment. Considering that longer durations of experiences of shame are linked to a lower likelihood of self-forgiveness, the CF may create early intervention programs targeting personnel that endorse post-deployment moral injuries in order to inhibit the development of guilt-based PTSD.

Implementation of neuroimaging in future studies may elucidate the neural regions implicated in the socio-cognitive deficits seen in patients with PTSD. For instance, one line of research may explore whether individuals with higher dissociation symptoms indeed showcase affective inhibition during recognition of basic emotions in prosody. A recent breakthrough transcranial magnetic stimulation (TMS) study by Young, Camprodon, Hauser, Pascual-Leone, and Saxe Young (2010) showcased the ability to temporarily hinder moral reasoning performance by inactivating the right TPJ. Interestingly, this region has been previously associated with ToM functioning (Bedny,

Pascual-Leone, & Saxe, 2009; Jenkins & Mitchell, 2010). It could be possible that the altered moral reasoning and ToM seen in the PTSD group could be in part related to alterations in a neural network involving the TPJ and its projections to the MPFC. Finally, considering that both PTSD (Lanius et al., 2010c) and socio-cognitive processing (Chiong et al., 2013; Reniers et al., 2012, 2012; Spreng, Mar, & Kim, 2009) are closely linked to DMN and SN activation, future directions may include neuroimaging paradigms that further elucidate their relation.

Several cellular and molecular immuno-inflammatory responses have also been implicated in the pathogenesis of PTSD (e.g., glucocorticoids, interleukins; (Andrews & Neises, 2012; Gill, Saligan, Woods, & Page, 2009; Yehuda, 2009)). Increased cortisol levels and an elevated pro-inflammatory cytokine response has been seen in both, individuals experiencing shame (Dickerson, Kemeny, Aziz, Kim, & Fahey, 2004) and in patients with PTSD (Gill et al., 2009). This suggests that when experiencing shame or PTSD, systemic inflammation co-ordinates the body's sickness behaviours, producing the overlapping manifestation of social withdrawal. The inclusion of biochemical assessments will deepen our understanding of how psychological stress triggers changes in cellular processes.

Finally exploring the interdependence of socio-cognitive domains will allow us to better understand and target deficits in interpersonal functioning. It may be possible that deficits in EC may act as mediators in dysfunction within other higher-level socio-cognitive processes.

Overview

Examining the relationship between all social cognition domains, interpersonal functioning, and symptomatology of PTSD is a novel contribution to the literature. We have demonstrated that individuals with PTSD stemming from childhood trauma have wide-ranging socio-cognitive deficits within all domains social cognition. Gaining a deeper understanding of how trauma-exposed individuals perceive and comprehend social cues will pave way for new directions in treatment, such as focusing on the regulation of affective arousal, normalizing basic emotional cue processing, and maximizing perspective-taking abilities, particularly in emotionally charged social contexts.

References for General Introduction and General Discussion

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