PERSONALITY STYLE, CORTISOL SECRETION AND THE INFLAMMATORY RESPONSE TO TRAUMA EXPOSURE IN A COHORT OF SOUTH AFRICAN METRO POLICE CADETS: A PROSPECTIVE, LONGITUDINAL STUDY

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Declaration

I, Ugasvaree Subramaney declare that this thesis is my own work. It is being submitted for the degree of Doctor of Philosophy in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

Signed ----------

At Johannesburg……...

This ……day of ……., 2011

Dedication

I dedicate this thesis to all South African police officers and to my family Sagie, Meshaylen and Kanushka Moodley, without whose support I would never have completed this thesis.

Publications and Presentations arising out of this work

Poster presentation: Preliminary findings on the first group of 27 were presented at the 26th Neuropsychiatry conference in Sydney, Australia in August 2006. Title of paper: "Urinary cortisol secretion and traumatic stress in a cohort of SA Metro policemen: a longitudinal study"

Oral presentation: The following paper was presented at the Division of Psychiatry, department of Neurosciences annual research day (June 2010): Personality, Trauma exposure, PTSD and depression in a cohort of SA Metro policemen: a longitudinal study.

Oral presentation: The following paper was presented at the South African Society of Psychiatrists biennial congress (SASOP) in 2010: Personality, Trauma exposure, PTSD and depression in a cohort of SA Metro policemen: a longitudinal study.

Abstract

Literature investigating trauma exposure, Posttraumatic stress disorder (PTSD) and cortisol secretion has produced conflicting results with regard to whether cortisol is increased or decreased. With trauma there is also a pro- inflammatory response which is intimately linked with the hypothalamic pituitary axis (HPA). The police population can offer useful information in this regard as they represent a sample that will undergo exposure to traumatic events as part of their normal duties. In South Africa few studies have examined biological correlates of the traumatic stress response in the police population.

This study sought to determine whether correlations exist between cortisol and the inflammatory response in terms of the cytokines Interleukin 6 (IL6) and Tumour Necrosis Factor (TNF) in response to trauma exposure in a cohort of newly enrolled metro police officers, previously naïve to the duty related trauma exposure. Personality styles were assessed, as coping skills and personality have been suggested as factors determining responses to trauma.

The study participants were followed up for one year with repeated measures analysis of urine, blood, and saliva cortisol as well as blood cytokine determination every 3 months. Measures for PTSD [the Clinician Administered Scale for Posttraumatic stress disorder (CAPS) and the revised version of the Impact of Event Scale (IES-R)] as well as for depression [the Hamilton Depression Rating Scale (HAM-D)] were undertaken.

145 new recruits volunteered for the study, of which 120 completed all 5 visits. There were slightly more females than males in the sample and almost 50% of the sample

admitted to alcohol abuse. Trauma exposure on entry into the police force was remarkably high with 99% having been exposed to at least one traumatic event in their lives. The majority (61.1 %) had been exposed to more than one traumatic event. There was evidence for the influence of prior trauma on responses to current traumatic events. MVA's were very common, both duty and non duty related. Certain traumas were associated with greater changes in scores for PTSD and depression in relation to baseline. Over the 5 visits, only a third submitted valid 24 hour urine samples. Of these, the profile of the entire group indicated that 24 hour urine cortisol tended to initially decrease, and then increase with time. Saliva and blood cortisol, which were more reliably measured, tended to decrease with time.

Scores for depression and post traumatic stress disorder were generally low in response to duty related traumatic events, and tended to decrease over time. However, the prevalence of lifetime PTSD as measured by the CAPS was high.

There was a strong linear correlation between TNF and IL6. Results indicate a proinflammatory response, particularly with regard to IL6. There were no significant correlations between blood cortisol and HAM-D and between blood cortisol and CAPS (lifetime). There was an inverse relationship between CAPS (current scores) and blood cortisol. Cortisol and IES-R scores were significant at visit 3 (inverse relationship). For saliva, there were no significant associations with any of the variables for PTSD and depression.

For personality styles, aggressive and antisocial clinical patterns were associated with lower current CAPS scores, while schizoid clinical pattern and the severe syndrome scale of thought disorder showed an association with lower lifetime CAPS score. For the IES-R, only narcissistic clinical pattern was associated with lower scores. A further

analysis of those with low (less than 25% of the median) and high (greater than 25% of the median) cortisol responses was undertaken.

The results indicate a similar trend to some studies showing lowered cortisol levels with chronic trauma exposure, but this did not correlate with sufficiently high scores for PTSD as measured by the CAPS. Similarly, proinflammatory cytokine increases are evident with trauma exposure, but not with scores for PTSD and depression. There were more variables significantly associated with the low cortisol responders than the high cortisol responders; with a suggestion of cumulative trauma exposure correlating with low cortisol response and a corresponding pro inflammatory response in terms of IL6.

The results are discussed with a view to assisting the metro police force with recruitment and counseling strategies and important future research is recommended.

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My mother Uthrapadhi Subramaney: I am who I am because of you and papa. Thank you.

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LIST OF ABBREVIATIONS

ACTH: Adrenocorticotrophic hormone

BR: Base rate

CAPS: Clinician Administered Rating scale for Post Traumatic Stress Disorder

CAR: cortisol awakening response

CIDI: Composite International Diagnostic Interview

CNS: Central Nervous System

CBG: cortisol binding globulin

CD4 cells: Helper lymphocytes

CD8 cells: Killer lymphocytes

CRF: Corticotrophic Releasing Factor

CRP: C Reactive Protein

CSF: Cerebrospinal fluid

DTS: Davidson's trauma scale

DHEA : Dihydroepiandrosterone

DSM-IV TR: Diagnostic and Statistical Manual of Psychiatric Disorders, fourth Edition; Text Revised.

GHQ: general health questionnaire

HAM-D: Hamilton Rating Scale for Depression

HPA: Hypothalamic-Pituitary-Adrenal

I^{125}: Iodine

IES-R: Impact of Events Scale, revised

IL: Interleukin

LC.NE: locus caeruleus-noradrenergic

MCMI: Millon Clinical Multiaxial Inventory

MVA: Motor vehicle accident

NCS: National co morbidity study

NHLS: National health laboratory services

NPY= Neuropeptide Y

OR: Odds Ratio

PTSD: Posttraumatic Stress Disorder

SASH: South African Stress and Health

SAPS: South African Police Services

sgpl30: signal transducing protein

sIL-1r : soluble receptor of interleukin 1

sIL-2R: soluble interleukin-2 receptor

sIL6r : soluble receptor of interleukin 6

TNF: Tumour Necrosis Factor

VH: Vanessa Hemp

Chapter 1

Introduction

"Stress" is a widely used term, and generally refers to the feelings experienced when one is in situations that are physically and/or emotionally demanding. Stress is a risk factor for a variety of illnesses, ranging from metabolic and cardiovascular disorders to mental illness (Heuser I and Lammers CH, 2003). Stress that is traumatic in nature, for example, that due to natural or man made disasters, that due to criminal or domestic violence, sexual or physical abuse; may lead to Post Traumatic Stress Disorder (PTSD). This is a clinical entity recognized in the 4th edition of the Diagnostic Statistical Manual of Mental Disorders, Text revised (DSM IV-TR) as an anxiety disorder (APA, 2000). The main clinical features of this disorder are re experiencing of the traumatic event (e.g. by recurring nightmares), hyperarousal symptoms (such as increased startle reaction), and avoidance/numbing symptoms (e.g. feeling emotionally distant or disengaged). PTSD is frequently diagnosed, but due to the nature of making the diagnosis (it is heavily reliant upon the subjective reporting of symptoms such as nightmares, flashbacks, palpitations and intrusive memories), there may be a tendency to over diagnose it. In addition, there is the possibility of malingering in certain populations, such as policemen, perhaps due to compensation issues. This has brought it as a category into disrepute, and the psychiatric profession along with it (Resnick, 1997).

The stress system coordinates the adaptive response of the organism to real or perceived stressors. The main components of the stress system are the hypothalamic-pituitary-adrenal (HPA) axis/loop and the limbs of the locus caeruleus-

noradrenergic/autonomic (LC.NE) pathways. Catecholamines facilitate the availability of energy to vital organs, while glucocorticoids function as “antistress” hormones, helping to contain or shut down the neural defensive reactions that have been initiated by stress. The adaptive responses are the short activation of the HPA system, the maladaptive responses result from the overproduction of stress hormones and/or the failure of termination of the HPA activation. Chronic stress can result in sustained increases of glucocorticoids, in the case of humans, cortisol. Depending on the nature of the stressor, the HPA system may also become tonically inhibited due to a chronic adaptation to the stressor (Heuser I and Lammers CH; 2003).

Studying the biological responses to traumatic stress in populations such as the police force may provide support for diagnosing conditions that are otherwise dependent only on subjective reporting of symptoms. Due to the hormonal responses to stress, as well as the immune responses noted in the literature (Sutherland et al, 2003; Miller et al, 2001), one important research question to ask centers around the link between traumatic stress, cortisol secretion and the inflammatory response to traumatic stress in the police population. The other pertinent factor may be the individual’s response from a personality perspective, as personality factors have been shown to be linked to posttraumatic stress symptoms in some studies (Kobasa 1979, Kobasa 1982, Lecic-Tosevski et al, 2003). It is this premise that has lead to the rationale for this research study on the personality style, cortisol secretion and inflammatory response to traumatic stress in South African Metro policeofficers.

The Setting

The Metro Police Department in South Africa is a relatively new division of the South African Police services (SAPS), having been established in 2001. Metro police are concerned with law enforcement on the road. Duties include road trafficking, the control of the flow of traffic, as well as attendance to road emergencies such as motor vehicle accidents; where they are often the first to arrive at an accident scene.

In order to qualify as a Metro policeman, a new recruit has to undergo training at a learning academy; which includes a six-month period of theoretical exposure as well as practical experience on the road. After passing their exams, there is a 6-month attachment to SAPS. During this period, they may be exposed to a greater variety of traumas, such as violent crimes and crime scenes. The course at the academy runs every six months, with intakes in January and July.

Every six months, the academy receives more than 1000 applicants to this course. Of these, only 100 are chosen. The selection process consists of:

1) Screening for a criminal record by means of a fingerprint check.

2) Confirmation of a valid matriculation certificate and driver's licence.

3) A physical endurance test. This entails activities such as a 2-kilometer run and basic exercises such as push-ups and sit-ups.

4) A basic literacy test must be passed.

5) A driving competency test must be passed

6) Medical fitness requirements– as specified by an outside practitioner - must be met.

No psychometric tests are administered.

Plans are underway to extend the training period to one year instead of six months, with the attachment to SAPS occurring after one year. The reasons for this seems to be growing concerns about the quality of metro officers being trained due to an inadequate length of time spent learning important theoretical aspects. Some of the theory includes a working knowledge of by laws, policy, firearm handling and other legislature related to policing on the roads.

At the time that this research study was undertaken, the period of learning at the training academy was six months.

The structure of the training programme afforded the researcher the ideal opportunity to investigate the response to traumatic stress after exposure to duty related traumatic events. As this research study undertook to examine cortisol and cytokine responses to traumatic stress as well, this setting was also ideal in that baseline measurements, prior to any exposure to duty related traumatic events were possible in this cohort.

Chapter 2

Literature Review

2.1 INTRODUCTION: THE NORMAL STRESS RESPONSE

In 1936 Hans Selye introduced his classic theory of stress and described the "general adaptation syndrome" – a syndrome that proposed that animals and humans respond in a more or less uniform, stereotyped fashion to a variety of stressful stimuli (Stylianos, 2002). Activation of the hypothalamic pituitary adrenal (HPA) axis and/or the sympathoadrenal (SA) system is generally accepted as the underlying pathophysiological events of the stress syndrome. Selye's original work described the general adaptation syndrome as being composed of three stages. The first stage is the alarm reaction, in which the adrenal medulla releases adrenaline and the adrenal cortex produces glucocorticoids, both of which act to restore homeostasis. In the second stage, that of resistance, defense and adaptation is sustained and optimal. If the stressor persists, the stage of exhaustion follows, and the adaptive response ceases; which may lead to illness and death (Stylianos, 2002).

With advancing knowledge of this subject, it seems that this view of the stress response has been greatly oversimplified. Well-controlled studies of laboratory animals have shown that the nature of the stressor, as well as the way the stressful experience is perceived by the animal, can determine the pattern of the neuroendocrine activation that occurs when the animal is exposed to a particular, investigator-applied stress (Henry JP, Mason JW et al; cited in Stylianos, 2002). Similarly, in humans, the response to stress may be dependent on a variety of factors, including the nature of the stressor as well as the individual make up of the person.

Hans Selye emphasized physical stressors. However, it is now recognized that psychological and experimental factors are among the most powerful stressors for human beings.

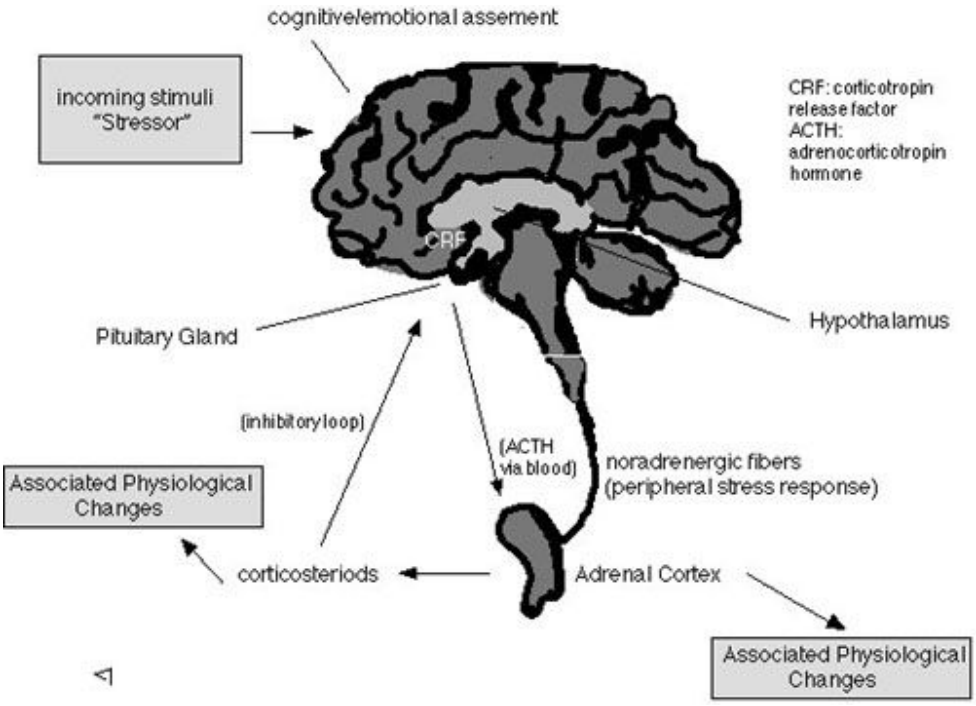

Figure 1: Schematic representation of the normal stress response

The main components of the stress system are the hypothalamic-pituitary-adrenal (HPA) axis/loop and the limbs of the locus caeruleus-noradrenergic/autonomic (LC.NE) pathways (Heuser I and Lammers CH; 2003). During stress, the increased secretion of corticotrophin releasing factor (CRF) and arginine vasopressin (AVP) into the hypophoseal portal system of the anterior pituitary enhances the synthesis and release of proopiomelanocortin-derived peptides, one of which is andrenocorticotrophin (ACTH). Elevated ACTH in turn increases the synthesis and release of adrenal glucocorticoids (Stylianos, 2002). In general, the HPA axis self regulates via negative feedback.

Elevated circulating levels of cortisol lead to suppression of CRF and ACTH release, thus reducing cortisol production.

Prolonged exposure to elevated stress hormones can present a serious risk. Central CRF systems activate ascending serotonergic and noradrenergic pathways so that under conditions of threat, individuals become hyper-vigilant. Glucocorticoids and catecholamines enhance learning for information related to the stressor, whereas glucocorticoids alone impair attention and learning in relation to events not directly associated with the stressor. Elevated central CRF activity is associated with symptoms of anxiety and depression (Francis D et al. 1999). In this way, the core symptoms of PTSD may become manifest when the stressor is traumatic in nature.

Whereas catecholamines facilitate the availability of energy to vital organs, glucocorticoids function as “antistress” hormones, helping to contain or shut down the neural defensive reactions that have been initiated by stress. The adaptive responses are the short activation of the HPA system, the maladaptive responses result from the overproduction of stress hormones and/or the failure of termination of the HPA activation. Chronic stress can result in sustained cortisol release. In some cases, depending on the nature of the stressor, the HPA system may also become chronically adapted to the stressor, leading to inhibition of this system.

2.2 GLUCOCORTICOIDS AND CORTISOL

Cortisol, the most important of the human glucocorticoids, is a product of the HPA axis, and affects every bodily system to a large extent. It is present in higher levels in women than in men (Levine et al, 2007). One major function of glucocorticoids is the rapid mobilization of amino acids and fat from cells that make them available for use as energy as well as for synthesis into new compounds. This is important as it organizes the body's response to physiological and psychological stressors. Glucocorticoids also have mineralocorticoid activity, as well as an anti-inflammatory effect upon traumatized tissues and they suppress the immune system. Centrally, glucocorticoids play an important role in maintaining many brain activities. In addition, glucocorticoids have effects on human behaviour such as sleep patterns, mood, and the reception of sensory input (Levine et al, 2007). In pathological states such as PTSD and depression, cortisol secretion is often abnormal and has been used/proposed as a biomarker of the stress response.

2.3 MEASURING CORTISOL

Cortisol may be measured in urine, blood and saliva.

2.3.1 Urine

Urinary cortisol excretion results from glomerular filtration and is a useful index of integrated 24-hour plasma free cortisol. The earliest research into the neuroendocrinology of PTSD started about 20 years ago with the measurement of urinary free cortisol output. The first few studies revealed relatively low 24-hour urinary cortisol levels in male veterans with PTSD compared with other hospitalized patients and

healthy age matched controls (Mason et al, 1986; Yehuda et al, 1990; Yehuda et al 1993; Yehuda et al 1995). Further studies yielded varied results, suggesting that there may not be a characteristic pattern of cortisol output associated with PTSD. (Kosten et al, 1990; Pitman and Orr, 1990; Lemieux and Coe, 1995; Maes et al, 1998; Baker et al, 1999; De Bellis et al, 1999; Rasmusson et al, 2001; Friedman et al, 2001; Mason et al, 2002). One of the problems may be that 24-hour urinary–free cortisol measurements reflect both baseline and reactive changes in plasma free cortisol levels. These levels are also influenced by more prolonged or habitual patterns of activity.

2.3.2 **Blood**

Cortisol in blood exists in two forms. While most is bound to carrier proteins, a small portion exists in a soluble free form. The biological half-life of cortisol is around 80 minutes. In plasma, cortisol is predominantly bound to corticosteroid-binding globulin, with a small amount bound loosely to albumin, and the remainder free. The remaining free cortisol molecule is lipophilic and has a low molecular weight, passing from capillaries into tissues mainly by passive diffusion (Levine et al 2007).

2.3.3 **Saliva**

Since the early 1980's salivary cortisol has been used with increasing popularity in endocrinology, psychobiology and behavioural medicine research studies. (Kirshbaum and Hellhammer, 1994)

Salivary cortisol is the free cortisol that has entered into the salivary glands primarily by passive diffusion. Point (once off) samples of saliva provide a convenient way of measuring cortisol as the sample is easy to obtain, is non-invasive and can be done unobtrusively, as well as repeatedly. Trained staff and equipment are not necessary and sampling can take place outside of a laboratory setting allowing for sampling at home

and at several times during the day. In addition, cortisol is stable at room temperature and the costs of handling and processing are greatly reduced (Kirshbaum and Hellhammer, 1994). It has also been demonstrated to correlate closely to both total plasma and circulating free cortisol with correlation coefficients between cortisol in saliva and cortisol in serum ranging between r=0.71 and r=0.96, thus determining proportions of total variance between R^2 =0.054 and R^2 =0.864 (Kirshbaum and Hellhammer, 1994). Important diurnal differences in the two measures have been noted, however, and there appears to be discordance both at higher concentrations and regarding the variability of repeated measures, which is more pronounced with salivary cortisol. In addition, the correlation between salivary cortisol and plasma free cortisol appears to be subject-specific as considerable variability is found between subjects for daily paired samples.

2.4 TRAUMATIC STRESS AND PTSD

Stressors that are traumatic in nature, such as serious motor vehicle accidents, man made or natural disasters and violent incidents, may result in PTSD, a psychiatric condition classified as an anxiety disorder in DSM IV TR. Clinically and physiologically, it shares some similarities with major depressive disorder, and high co morbidity occurs between the two disorders. The core symptoms of PTSD are those of re-experiencing the traumatic event, hyper-arousal and avoidance/numbing of responses. These may occur months or years after exposure to the event, and may have an immediate or delayed onset. The traumatic event may be experienced or witnessed. Categories of what entails a traumatic event have evolved over time with the inclusion now of hearing bad news, such as learning that one's child has a life-threatening illness. While these criteria generate the risk of being over inclusive, and hence the possibility of

overdiagnosing PTSD, the experiencing of a traumatic event is necessary but not sufficient for the diagnosis to be made – there is the specifier that during the event the person felt out of control, and also the fulfillment of the three core symptoms with a distinct impact on functioning.

"Subsyndromal" /sub clinical PTSD occurs when people exposed to a traumatic event do not develop symptoms that fit the DSM IV TR criteria necessary for a diagnosis of PTSD, but suffer significant impairment in functioning.

The concept of the disorder has received a good deal of criticism; many would argue that psychiatric symptoms after trauma can be explained in terms of depressive and anxiety symptoms, so that an independent category of PTSD is unnecessary. It is now widely accepted however, that the disorder represents a distinct clinical entity with neurobiological underpinnings, and results in marked morbidity. Controversy about PTSD is understandable, given that PTSD may be used for purposes of compensation and that secondary gain is a possibility. On the other hand, there is notable under recognition of symptoms as well as under treatment.

2.5 **EPIDEMIOLOGY OF PTSD**

Investigations into the epidemiology of PTSD show that exposure to traumatic experiences is common in the population with a range from 39% (Breslau et al, 1991) to almost 90% (Kessler et al, 1995). In the Kessler study, among those who had been exposed, 12.5% of women and 17% of men had a history of more than three exposures to traumatic situations in their lifetime. Lifetime prevalence rates of PTSD range from 1% (Helzer JE et al, 1987 cited in Yehuda R, 2006) to 9.2% (Breslau et al, 1991). There

are variations by nation and ethnicity however, and lower rates, were however found in Nigeria and in South Africa in the World Mental Health Survey (Kessler et al 2007).

2.6 SOUTH AFRICAN PREVALENCE STUDIES OF ANXIETY DISORDERS

Recent data on the lifetime prevalence of psychiatric disorders in South Africans have revealed that anxiety disorders were the most prevalent (15.8%) and mood disorders 9.8 %*(Stein et al, 2008). This was the first nationally representative study undertaken in South African households. Despite these prevalence rates being not as high as in the United States – where at least 50% of the population meets lifetime criteria for at least one or more DSM IV/ CIDI (composite international diagnostic interview) disorders. (Kessler et al, 2005, cited in Stein et al 2008), they are still notably high. This is consistent with earlier studies on South African populations. In a prevalence study of psychiatric morbidity in a rural coloured village, Rumble et al (1996) found a prevalence of 27.1%, with the majority of cases diagnosed as depressive or anxiety disorder. Carey et al (2003) did a prevalence study in a township primary healthcare clinic and found that depression (37%), PTSD (20%) and somatisation disorder (18%) were the most common diagnoses. While these studies may be criticized for applying the DSM classification system to non-Western countries (in the case of the Rumble et al and Carey et al studies), as well as the usage of a tool that has not previously been validated in non-western countries (the use of the composite international diagnostic interview – CIDI - in the Stein et al study), there is general acceptance that psychiatric disorders, as classified by the DSM IV TR and diagnosed by instruments such as the CIDI, are accompanied by significant social and occupational impairment.

2.7 RISK FACTORS FOR THE DEVELOPMENT OF PTSD

Not everyone exposed to a traumatic event will develop PTSD. It is thought that about a quarter of people experiencing one or more traumas will develop the disorder (Yehuda, 2006). Factors that have been found to confer a greater risk for the development of the disorder are the following:

Gender: women are at higher risk for PTSD than are men, despite being less frequently exposed to traumatic situations (Helzer et al, 1987, Davidson et al, 1991, Breslau et al, 1998). In general, women are at higher risk for any mood or anxiety disorder. Factors such as hormonal differences as well as sociocultural factors may play a role. In PTSD, interpersonal violence such as sexual assault is more frequent amongst females than males. In addition, women are more likely to be report rape than men are (although in general there is underreporting of sexual assault by both genders).

Personality and previous psychiatric history: PTSD has been found to be associated with a variety of other psychiatric disorders. A study by Davidson et al (1991) showed that experiencing abuse as a child increased the possibility of developing PTSD. The condition was also shown to have a higher prevalence of disorders such as somatization disorder, schizophrenia/schizophreniform disorder, panic disorder and social phobia. A major limitation of this study is that the age of onset of PTSD was not mentioned, making it difficult to establish which disorder came first. Helzer et al (1987) studied behavioural problems in children as a predictor of future PTSD. They found that PTSD could be predicted by a history of behavioural problems before the age of 15 years (e.g. lying, stealing, truancy, and vandalism) and that the rate of PTSD increased with the number of behavioural problems.

With regard to personality traits and PTSD, Breslau et al (1991) showed that traits such as neuroticism and preexisting anxiety and depression increased the odds ratio of developing PTSD after trauma exposure. A previous history of affective and/or anxiety disorders has also been shown to be a significant predictor of PTSD (Bromet et al, 1998).

Previous exposure to trauma: This has been found to be associated with an increased risk of developing PTSD, and may have something to do with biological responses that are sensitized following initial trauma (Yehuda, 2004). In PTSD there is inadequate processing of trauma memories. This together with as negative cognitive appraisals at the time of the trauma may lead to non integration and encapsulating of the memories. With repeated exposure to traumatic events, these memories are stimulated and may lead to recurrent symptoms of PTSD (Phelps et al, 2008).

Family psychiatric history: In the Davidson et al study (1991) patients with PTSD were 2.8 times more likely to have family histories of psychiatric disorders. Breslau et al (1991) reported that a family history of anxiety and antisocial behaviour increased the risk of PTSD (odds ratio =2.9 and 2.05 respectively). Other important studies have also borne this out, notably the National co morbidity study (NCS) by Bromet et al (1998). They found that parental mental disorder was a risk factor for PTSD in both men and women (OR = 1.9)

Nature and severity of the trauma: In combat related PTSD, the intensity of symptoms have been found to be correlated with PTSD symptom severity (Buydens-Branchey et al, cited in Kanter et al; 2001). Kessler et al (1995) noted that traumatic events such as rape and combat exposure were associated with higher rates of PTSD. However, the

severity of a traumatic experience is generally defined by subjective emotional response and varies between individuals based on perception (Yehuda, 2004)

In a Meta analysis undertaken by Brewin (2000), the moderating effects of various sample and study characteristics on 14 separate risk factors for PTSD were studied. Three categories of risk emerged: 1) factors such as gender, age at trauma and race that predicted PTSD in some populations but not others; 2) factors such as education, previous trauma, and general childhood adversity that predicted PTSD more consistently but to a varying extent depending on the methods used; and 3) factors such as psychiatric history, reported childhood abuse and family histories which had more uniform predictive effects.

Individually, the effect size of all the risk factors was modest, but factors occurring immediately before and during the trauma such as severity of the trauma, lack of social support, and other life stress, appeared to have stronger effects than pretrauma effects.

2.8 DYSREGULATION OF THE HPA AXIS AND PSYCHOPATHOLOGY

It has been suggested that dysregulation of the HPA axis may be the basis for a link between trauma exposure and subsequent psychiatric disorder (Yehuda, 2006; Heim et al, 2000; Plotsky et al, 1998; Yehuda et al, 1996,)

Both clinical and experimental evidence demonstrates that early life experiences influence health and may sensitise the young to stressors; elevating the risk for stress induced psychopathology. However, the precise mechanisms by which these occur are not clear. Prolonged or exaggerated response to stress through the repeated, severe activations of the HPA system has profound effects on physiological and cognitive

functions e.g. glucocorticoids act on the hippocampus and amygdala to disrupt episodic memory. Studies have found a reduction in hippocampal volume following combat trauma or childhood abuse, suggesting stress induced hippocampal damage from these traumas (Francis et al, 1999). Proper function of both the activation and "shut off" mechanisms of the HPA loop during development is crucial to permit coping with acute stress, but also to allow for normal growth and maturational processes, which may be adversely affected by high levels of glucocorticoids (Heuser, 2003). Early maternal separation or handling of neonatal rats can result in widespread and lifelong changes in various transmitter systems that regulate the stress systems. It is hypothesized that humans may also be at risk for clinical conditions many years after experiencing childhood traumatic events, such as abuse and separation, due to changes in transmitter systems that occur during crucial developmental stages (Francis et al, 1999).

2.9 CORTISOL RESPONSES AND PTSD

Typically, cortisol and catecholamines increase in a dose dependent fashion in response to acute stress; higher cortisol levels occur with higher levels of stress (Selye, 1976). Increased basal cortisol levels are consistently found in patients with major depressive disorder (Kanter et al, 2001).

Paradoxically, many studies have shown decreased basal cortisol in individuals with PTSD (Yehuda et al, 1993; Yehuda, 2000; Rasmusson et al, 2003). The tendency for somewhat reduced levels of cortisol appears to be maintained during the life course of trauma survivors with PTSD. The mechanism by which this occurs is not clear, and some studies have proposed enhanced negative feedback inhibition (Yehuda et al 1996; Yehuda, 1997). The study by Kanter et al (2001) sought to investigate alternative

mechanisms for the decreased baseline cortisol found in PTSD. They measured glucocorticoid feedback sensitivity and adrenocortical responsiveness in Vietnam combat trauma-exposed subjects who met DSM-IV criteria for PTSD, and compared these parameters in a control group (community volunteers). Although sample sizes were small (13 trauma-exposed versus 16 control subjects), they effectively confirmed that baseline cortisol levels were significantly lower in PTSD subjects than in controls. Secondly, there was no evidence of increased sensitivity of glucocorticoid negative feedback observed. Additional findings were 1) increased concentrations of cortisol binding globulin (CBG) in subjects with PTSD and 2) decreased concentrations of DHEA in subjects with combat exposure.

Clearly, the mechanisms underlying the findings of low cortisol levels in PTSD are complex. As combat exposure represents an extreme form of trauma, it is unclear whether these findings may be generalized to other trauma-exposed populations that develop PTSD. Another limitation of such studies is that they represent chronic forms of PTSD, making conclusions regarding the onset of altered neuroendocrine levels difficult. To address the first issue, Young and Breslau (2004) undertook to examine urinary cortisol levels (as well as catecholamines) in individuals with PTSD in a community sample. The sample of young adults was randomly selected from a large health maintenance organization. Results indicate that mean cortisol levels did not differ among groups (persons exposed to trauma in the preceding 5 years, other individuals who met PTSD criteria, and a random preselected sub sample). Women with PTSD and co morbid major depressive disorder (MDD) had higher cortisol levels.

Research to address the issue of timing of neuroendocrine responses has been undertaken by Resnick et al (1995), as well as Delahanty et al (2000). Both studies measured initial cortisol levels (blood, in the Resnick et al study, and 15-hour urinary cortisol levels in the Delahanty et al study) during the acute phase of responding to traumatic events. The first study found that initial cortisol levels in rape victims, whose plasma cortisol levels were measured within 51 hours after a rape, did not predict PTSD at follow up. Plasma cortisol levels provide an approximation of cortisol levels over an hour or two (Baum and Grunberg, 1995; cited in Delahanty et al 2000), whereas urine samples average hormone levels across a longer time frame and may provide a better measure of hormone levels throughout the acute phase of responding to an event (Delahanty et al, 2000). Delahanty and his colleagues thus measured 15-hour urine samples for cortisol in motor vehicle accidents victims beginning upon admission to the trauma unit. The patients were followed up after a month. Results suggest that initial (lower) hormone levels in the immediate aftermath of an accident may be associated with the development of symptoms of posttraumatic stress disorder – notably intrusive thoughts.

Cumulative stress and the effect on the HPA axis have not been easy to study, particularly in a controlled prospective design. In a relatively small study, Weik and Deinzer (2010) measured the effect of enduring stress on post awakening cortisol levels. They assessed12 medical students undertaking a major examination, and measured saliva cortisol 0, 30, 45 and 60 minutes post awakening. These were compared with 12 students not undertaking the examination. Their findings supported the notion that chronic stress induces increases of overall postawakening cortisol. They found no effect however, on the cortisol awakening response (CAR) which denotes the difference between cortisol on awakening and the concentration 30 minutes after awakening.

All these studies thus provide evidence that is conflicting in terms of whether cortisol levels are lower in PTSD, whether this finding only occurs in patients with co morbid MDD, and whether the severity of the trauma dictates the direction of the response. Importantly, factors preceding the traumatic event may be important in determining the magnitude of the HPA axis response in PTSD. Due to the difficulties in methodology as well as ethical issues, it is virtually impossible to determine baseline cortisol levels in the apparent absence of any stress, prior to trauma exposure, and measuring cortisol responses in the aftermath of trauma. One way of getting around this issue would be to study certain populations who, by virtue of their occupations/or daily stress exposure, may offer a pre- and post-trauma exposure cortisol profile.

2.10 SPECIAL OCCUPATIONS AND TRAUMATIC STRESS

Certain populations are, by virtue of their occupation at increased risk for trauma exposure. These include emergency workers, firemen, and policemen. In a study exploring the influence of individual factors and social support on traumatic reactions in firefighters exposed to tragic events in the line of duty, Regehr et al (2000) found that individuals with feelings of insecurity, lack of personal control, and alienation from others were more likely to experience higher levels of depression and posttraumatic stress symptoms subsequent to exposure to traumatic events on the job. A study done by Seedat (2003) on stress and resilience in SA firefighters, found that resilience conferred a positive outcome in terms of psychopathology in SA firefighters.

2.10.1 **Cortisol secretion in Special populations**

Data suggest that lower cortisol levels in both adult female sexual assault victims (Resnick et al., 1995) and combat veterans (Yehuda et al., 1995) may be due to exposure to events predating these adulthood experiences and may in fact constitute risk factors for PTSD. In other populations, a study in the military done by Clow et al (2006) investigated salivary concentrations post awakening in a sample of 12 healthy army recruits. This was done at the beginning, middle and end of an 11 week intensive physical training course. Their findings suggest post awakening cortisol levels are sensitive to stressful challenge over a period of weeks. Although this was a very small sample size, with a high attrition rate (20 participants originally participated, only 12 completed) and the exposure was physical and in no way traumatic, it does provide value in that it used a longitudinal, repeated measures design and examined cortisol in healthy new recruits. The authors allude to the fact that cortisol levels in this critical period after awakening represent a discrete aspect of the circadian pattern and it is clear that it is a major part of neuroendocrine activity. They recommend that further studies with other populations be done, and that other stressors are warranted, such as those involving significant impact with reasonable duration.

2.11 **THE INFLAMMATORY RESPONSE TO STRESS**

2.11.1 **Brief Overview of the Immune System**

The immune system refers to the molecules, cells, tissues, and organs that collectively function to provide immunity, or protection against foreign organisms. Inflammation is

that complex reaction of the immune system in vascularised tissues that involves the accumulation and activation of leukocytes and plasma proteins at a site of infection, toxin exposure, or cell injury. Inflammation is initiated by changes in blood vessels that promote leukocyte recruitment. Local adaptive responses can promote inflammation. Although inflammation serves a protective function in controlling infections and promoting tissue repair, it can also cause tissue damage and disease. (Abbas and Lichtman, 2006)

2.11.2 **Complement**

The complement system is a group of proteins, found in body fluids or on cell membranes, which are capable of specific, sequential interactions leading to a myriad of physiologic effects. Although disruption of the cell walls appears to be an evolutionary mainstay of this system, complement also plays a major role in the mediation of inflammation, in regulation of phagocytic activity, and in metabolism of immune complexes. When directed against inappropriate targets, e.g. apparently normal body cells or cellular elements, it may function as an integral component of the pathophysiology of disease. (Miller et al, 1991)

2.11.3 **Cytokines**

Cytokines are proteins produced by many different cell types that mediate inflammatory and immune reactions. They are principal mediators of communication between cells of the immune system. Cytokines are synthesized in response to inflammatory or antigenic stimuli and usually act locally by binding to high-affinity receptors on target cells. Interleukin – (IL-) 1, IL-2, IL-6, and tumour necrosis factor alpha (TNF-~) are the most relevant activating cytokines known to act on the CNS. (Muller and Ackenheil, 1998)

2.11.4 **Interleukins**

Interleukin (IL) is another name for a cytokine. It was originally used to describe a cytokine made by leukocytes that act on leukocytes. The term is now generally used with a numerical suffix (IL-1 to IL-12) to designate a structurally defined cytokine regardless of its source or target (Abbas and Lichtman, 2006)

a) **IL-1**

IL-1 is a cytokine produced mainly by activated mononuclear phagocytes whose principal function is to mediate host inflammatory responses in innate immunity.

b) **IL-6**

IL-6 is produced by many cell types, including activated mononuclear phagocytes, endothelial cells, and fibroblasts that functions in both innate and adaptive immunity. IL-6 stimulates the synthesis of acute phase proteins by hepatocytes as well as the growth of antibody-producing B lymphocytes.

Like IL-1, IL-6 is known to strongly interact with the HPA axis too, and as well as being a pro-inflammatory cytokine, has also been described as an anti-inflammatory cytokine. (Abbas and Lichtman, 2006)

c) **C reactive protein (CRP)**

A member of the pentraxin family of plasma proteins involved in innate immune responses to bacterial infections, CRP is an acute phase reactant, and it binds to the capsule of pneumococcal bacteria. CRP also binds to Clq, which is a subunit of C1, the first component to be activated in the classical complement pathway and may thereby activate complement (Abbas and Lichtman, 2006).

d) **Tumour necrosis factor (TNF)**

TNF is a cytokine produced mainly by activated mononuclear phagocytes that functions to stimulate the recruitment of neutrophils and monocytes to sites of infection and to activate these cells to eradicate microbes. It acts synergistically with several other cytokines and has strong toxic effects.

2.11.5 **Why measure cytokines in traumatic stress research?**

The bidirectional communication between the immune system and the CNS is complex. Cytokines may activate the HPA axis either directly through their effects on CRF, or indirectly through cytokine induced glucocorticoid receptor resistance, which may lead to HPA hyperactivity by impairing feedback inhibition. The HPA axis/CRF hyperactivity, in turn, may contribute to mood and behavioural disturbances. In a review on the psychoneuroimmunology of PTSD, Pace and Heim (2011) emphasise that glucocorticoids, and catecholamines exert powerful effects on the immune system raising the probability of immune changes occur in PTSD. The authors also propose that since patients with PTSD have been found to have higher rates of comorbidity with medical conditions that involve immune and inflammatory systems, this also implicates immune changes in PTSD. They suggest a psychoneuroimmunological model of PTSD whereby psychosocial risk factors (such as early life adversity and previous trauma exposure) synergise with biological risk factors for PTSD. Immune changes associated with PTSD are hypothesised to increase the risk for the development of medical illnesses (Pace and Heim, 2011).

Vidovic et al investigated the differences in selected endocrine and immune related variables between PTSD patients (39 Croatian war veterans) and control subjects (25

healthy civilians) and whether these differences persist over time. Their findings suggest that observed endocrine and immune related changes in PTSD over time may depend on the duration of the allostatic load posed by the disorder and its impact on interactions between the endocrine and immune systems involved in stress response. (Vidovic et al, 2011).

The effects of cytokines on neurotransmitters, especially of the catecholamine system, are thought to play a pivotal role in psychiatric disorders (Muller and Ackenfeil, 1998). Studies show that cytokines act specifically not only on certain CNS structures but also on certain CNS structure/neurotransmitter interactions. (Zaleman et al, cited in Muller and Ackenfeil, 1998).

Disturbance of the Hypothalamic-pituitary-adrenal axis (HPA), as manifested by changes in cortisol level and catecholamines have been the focus of previous studies aimed at eliciting the neurobiology of PTSD (Mason et al, 1986; Yehuda et al, 1993). While it has been shown that these changes may be useful in differentiating PTSD from major depressive disorder, it is unclear whether they have any predictive value on its own (Miller et al, 2000). Immune function is modulated by both the HPA axis and the sympathodrenomedullary system. It is possible therefore that the immune system may also be dysregulated in individuals with PTSD.

Maes et al (1999) examined the inflammatory response system in patients with PTSD through measurements of serum IL-6, the soluble receptor of IL-6 (sIL6r), sgpl30 (the signal transducing protein), sIL-1r antagonist (sIL-1ra; an endogenous IL-1 receptor antagonist), CC16 (an endogenous anticytokine), and sCD8 (the T suppressor cytotoxic antigen). Their results indicated that sIL-6 and sIL-6R, but not sgp 130, sIL-ra, CC16, or

sCD8, concentrations were higher in PTSD patients with concurrent major depression than in PTSD patients without major depression and normal volunteers.

There were no significant relationships between serum IL-6 or sIL-6r and severity measures of PTSD. They concluded that PTSD is associated with increased IL-6 signaling and hypothesise that stress induced secretion of proinflammatory cytokines is involved in the catecholaminergic modulation of anxiety reactions. Other studies (Sutherland AG, et al, 2003, Baker et al, 2001) have also found increases in the proinflammatory cytokines in response to trauma. In the study by Sutherland et al, CRP, IL-6, sIL-6r, and TNF-alpha were found to be increased in certain instances.

The study by Baker et al compared combat veterans with PTSD with matched controls. Cerebrospinal fluid (CSF) was assayed for IL-6, Corticotrophic releasing hormone (CRH) and noradrenaline (CSF) and blood for IL-6, adrenocorticotrophic hormone (ACTH), cortisol and noradrenaline. Mean and median CSF IL-6 concentrations were found to be higher in PTSD than in controls, whilst plasma IL-6 concentrations were not different between the groups. Plasma IL-6 and noradrenaline were positively correlated in the PTSD group, but not in the normal group. This may be explained by the fact that in PTSD there is lowered glucocorticoid suppression of IL-6 secretion, which leads to lowered cortisol. sIL-6R forms a ligand-receptor complex with IL-6 that is capable of stimulating a variety of cellular responses including proliferation, differentiation and activation of inflammatory processes.

When thinking about the inflammatory capability of IL-6, it is essential to consider not only the action of IL-6 itself, but also the effect sIL-6R may have on cellular processes.

Serum interleukin 1-B (IL-1B) and soluble interleukin-2 receptor (sIL-2R) have also been studied with reference to PTSD. Spivak et al (1997) assessed 19 male patients with

combat related PTSD (untreated) in comparison to 19 age and sex-matched controls. Serum IL-1B levels (but not sIL-2R) were significantly higher ($p<0.001$) in the PTSD patients than in controls. IL-1B levels did not correlate with cortisol levels, severity of PTSD, anxiety, depressive symptoms, or alexithymia score. However, they did correlate significantly ($r= 0.54$, $p< 0.005$) with the duration of PTSD symptoms. The authors conclude that there is a possibility that chronic PTSD patients' desensitization of the hypothalamic-pituitary-adrenal axis counteracts the stimulatory effect of IL-1B on cortisol secretion.

Altemus et al (2003) examined delayed-type hypersensitivity skin test responses in 16 women with PTSD due to childhood sexual or physical abuse, other trauma, or psychiatric disorders. The control group consisted of 15 women who did not have a history of abuse, other trauma, or psychiatric disorders. HPA axis activity was assessed by examination of circadian salivary cortisol levels and a single time point measurement of plasma cortisol. Results showed that cortisol measures did not differ between PTSD and healthy controls; but delayed-type hypersensitivity was enhanced in women with PTSD. These results suggest that cell mediated inflammatory reactions are greater in individuals with PTSD.

In a pilot study by Miller et al (2001), CRP and sIL-6r was measured in 15 patients with established PTSD and in a control group of eight patients with musculoskeletal injuries at least three months after their index trauma. All completed revised impact of event scales (IES-R), Davidson's trauma scale (DTS) and the general health questionnaire (GHQ). Positive relationships were found between CRP and DTS intrusion scores ($p=0.016$), GHQ depression ($p-0.028$), and RIES intrusion ($p=0.044$) in the case group, but not in the controls.

2.11.6 **Cytokines in Depression**

Relationships have been found between IL-6 activity, acute phase proteins, and the hypothalamic-pituitary-adrenal axis. In a review by Muller and Ackenheil (1997), the role of IL-6 and sIL-6R is highlighted. It is suggested that IL6 and sIL6-R form a complex which enhances the biological activity of IL-6 via a signal transducing protein (Maes et al, 1995 cited in Muller and Ackenheil).

IL-6 has a stimulatory effect on the HPA axis, and high levels of IL-6 correspond with high levels of cortisol in plasma. In a study by Maes et al (1993) measurements of IL-6 production in culture supernatants of mitogen stimulated peripheral leukocytes and plasma levels of haptogens, transferrin, and post-dexamethasone cortisol revealed that IL-6 levels were significantly higher in melancholic subjects than in healthy controls and in patients with minor depression or non-melancholic major depression.

IL-6 production was positively correlated with haptogen levels and negatively correlated with transferrin levels. There were significant and positive correlations between IL-6 activity and postdexamethasone cortisol values. These findings add weight to the argument that severe depression is related to hypotransferrin, hyperhaptoglobulinaemia, and hyperactivity of the HPA axis. Gill and colleagues, in an attempt to investigate differences between PTSD and PTSD with depression found that elevated levels of overnight serum IL6 and insensitivity to hydrocortisone is more likely to be associated with PTSD than with PTSD and co morbid depression (Gill et al. 2010). Increased CD4 + cells and an increased CD4+/CD8+ ratio have been described in depression. (Muller et al, 1993c; Syvalathi et al, 1985; cited in Muller and Ackenheil, 1997) .

Other psychiatric disorders such as schizophrenia have also been noted to involve IL-6. Ganguli et al, (1994; cited in Muller and Ackenheil, 1997) noted a significant correlation

of IL-6 and the duration of the disease. These findings suggest that IL-6 may not be the only cytokine that plays a role in depression, and that depression is not the only psychiatric condition that manifests with alterations in IL-S.

In summary, the literature on the inflammatory response to traumatic stress implicates the cell mediated immune system, with involvement of the cytokines IL2, IL6 and its soluble receptor, TNF, and CRP. Depression has also been shown to be associated with IL6 activity and acute phase protein responses, which seem to interact with the HPA system. The studies cited in the literature are limited by the small sample sizes for all of the studies (both PTSD and depression).

Allostatic load (AL) is the term used to describe cumulative physiological wear and tear due to repeated attempts to adapt to stressors over time (McEwen, 2003). The AL model emphasises multi-system dysregulation, combining multiple biological risk factors into a composite score to assess risk for a variety of stress related diseases in individuals prior to signs and symptoms of clinical disease. Individual risk factors used to form the composite score vary across studies, but include both measures of cortisol and inflammatory markers in addition to clinical risk indicators such as systolic and diastolic blood pressure, and waist/hip ratio (Glover et al, 2006). Due to the involvement of the HPA axis implicating cortisol and cytokines in stress and traumatic stress, it may be important to consider the model of AL when conceptualising physiological responses to the traumatic stress response.

2.12 **POLICE OFFICERS AND TRAUMATIC STRESS/PTSD**

Certain populations, by virtue of the work they do may be at greater risk for the development of traumatic stress symptoms and PTSD. Emergency services personnel such as firefighters and police officers fall into this category. Police officers are an important population for the study of traumatic stress since they are routinely at risk of exposure to critical incident stressors, such as being injured or witnessing death or injuries to others. In addition, in the trauma literature, they are understudied with respect to other groups such as combat veterans and victims of sexual assault (Liberman et al, 2002).

Studies of police officers may broaden our understanding of the biology of stress response systems, including PTSD, as they are for the most part, medically healthy young people.

In addition to the high rate of traumatic stressors (as defined in the DSM IV criterion A for PTSD), police officers experience a high degree of routine, non-traumatic work environment stressors (Liberman et al., 2002). Police officers face pressures from their supervisors, attorneys, judges, the media, and the public. These stressors can lead to stress related symptoms as well. This may be a limiting factor in the study of traumatic stress. Because multiple traumatic experiences are likely to occur over the course of police work, this group affords the opportunity to examine whether symptoms and biological changes such as hypo or hyper-secretion of cortisol are correlated with cumulative history of trauma exposure.

2.12.1 Epidemiology of PTSD in police population

Mcfarlane and Papay (1992) found a PTSD prevalence rate of 16% in volunteer firefighters shortly after exposure, with a 10% prevalence rate of chronic PTSD at 42 months. In the police population, reports suggest that approximately one third of police officers experience significant posttraumatic stress symptoms (flashbacks, sleep disturbances, guilt feelings) more than a month after duty related incidents (Martin et al., 1986; Stratton et al., 1984 cited in Pole et al, 2001). Studies undertaken in various parts of the world (Carlier et al, 1997; Pole et al, 2001; Maia et al, 2007) are comparable in terms of assessing prevalence rates of post-traumatic stress symptoms in policemen. Carlier et al (1997) in a sample of Dutch police officers, reported a 7% prevalence of PTSD, whereas 34% had partial or sub threshold PTSD. In the study by Pole et al (2001) in which a large sample (655) of urban police officers were studied to assess ethnic and gender differences in duty related symptoms replicated previous findings of greater PTSD among Hispanic-American military personnel. The study failed to replicate the well established finding (Stein et al, 2000, Breslau et al 1997, 1998, Kessler et al 1995) of greater PTSD symptoms among civilian women. A strength of this study is the fact that social desirability was measured and its effects controlled for. This is important because there is reason to believe that the culture of police work, with its ongoing life-threatening challenges, may create a context that encourages underreporting of negative psychological consequences of critical incident exposure. The conclusions are however, limited by the fact that this was a voluntary study based on invitations sent out by the police commissioner. Steps were not taken to establish whether officers who responded to the survey were any different from the officers who did not. The results may therefore not be representative of the urban police departments as a whole. Although the study by Maia et al (2007) is limited by a relatively small sample size

(n=157), and made use of a screening tool instead of a semi-structured interview, as well as the fact that it was of a cross sectional design (making it difficult to draw conclusions about cause and effect relationships), it does confirm a PTSD prevalence rate of 8.9% (full PTSD) and 16% (partial PTSD) in an elite unit of Brazilian police officers. This result is comparable to those reported in North American and Dutch policemen (Carlier et al, 1997; Pole et al, 2001).

2.12.2 Risk Factors for Psychopathology in the Police Population

As is the case with civilians, experience of trauma is necessary but insufficient in itself to explain the development of post trauma reactions in police officers. Kroes (cited in Saathof and Buckman, 1990) believes that personality characteristics such as rigidity, increased personal restriction and cynicism develop in police officers as a "survival personality". Symonds (cited in the same article) defined personality styles that are considered particularly vulnerable to the stresses of police work- "somatising, paranoid, histrionic, passive-aggressive, and obsessive-compulsive." The study by Saathof and Buckman reported on the psychiatric diagnoses of 26 state police officers referred by their department or self referred to a University Psychiatry department. The most common primary diagnosis was adjustment disorder, followed by substance abuse and personality disorders. Two received diagnoses of "acute PTSD" and only one was diagnosed with PTSD, chronic and delayed. Due to the sampling methodology, the data provide no information on officers who had unrecognized psychiatric illness or who refer themselves to private providers for treatment.

These early studies laid the foundation for later studies on psychiatric morbidity in the police population, which appears to be an interaction between the event and individual

characteristics. According to Mcfarlane and Papey (1988), and Carlier et al (1997), research with emergency services personnel has identified several pretrauma, peritrauma and post trauma risk factors in this population. Pretrauma individual risk factors include various personality dimensions like neuroticism and, to a lesser extent introversion, as well as previous psychiatric history. Peritrauma factors include the severity of the trauma that the individual is exposed to, as well as the presence of dissociation at the time of the event. The study by Carlier et al (1997), which examined internal and external risk factors for posttraumatic stress symptoms in 262 traumatized police officers, was a longitudinal study with measures at 3 and 12 months post trauma. They found that severity of trauma was the only predictor of posttraumatic stress symptoms identified at both 3 months and 12 months. At 3 months post trauma, symptoms were further predicted by introversion, difficulty in expressing feelings, emotional exhaustion at the time of the trauma; insufficient time allowed by the employer to come to terms with the trauma, dissatisfaction with organizational support, and insecure job future. At 12 months post trauma, further predictors were lack of hobbies, acute hyper-arousal, subsequent traumatic events, job dissatisfaction, brooding over work, and lack of social support in the private sphere. Evidently, a combination of intrapersonal factors as well as factors related to the organization was strong predictors of posttraumatic stress symptoms.

Lack of support and its influence on PTSD symptoms is the focus of a study by Hodgins et al (2001). They undertook a longitudinal study to investigate risk factors for the development of post trauma reactions in trainee police officers. The sample consisted of 223 junior police officers. They were assessed during training and again 12 months later using a self-report methodology. The research found that risk factors for general psychological ill health at 12 months were found to be mostly stable, preexisting

characteristics such as personality style (as measured by the NEO five factor inventory (NEO-FFI), gender (females) and trait dissociation. Specific traumatic stress symptoms were more heavily influenced by experiences in the intervening 12 months, such as severity of incident exposure and peritraumatic dissociation. The authors discuss the differential interventions that may be useful in settings such as these. With respect to traumatic stress symptoms and general psychological well-being, the results suggest that steps should be taken at recruitment to assess personality and tendencies towards dissociation to actively select low risk individuals. With regards to specific traumatic stress reactions, targeted acute interventions may assist in mitigating the negative psychological effects of such exposure. While this study's strength is its longitudinal nature as well as the fact that both general psychological ill health and traumatic symptoms related to specific events are investigated, it is limited by the fact that the first data collection occurred after the commencement of the police careers – in some cases as late as 20 months. In addition, due to the possibility that police culture may promote non-disclosure of trauma symptoms, self-report measures may be a limitation. Finally, it may have been useful to control for other variables such as organizational issues that may contribute to the development of psychological ill health.

Factors such as family history of mental disorders and substance abuse are suggested to be other pre-existing vulnerability factors for PTSD in research undertaken by Bryant et al (2007). Part of a larger study examining risk factors for PTSD in police and firefighters, this arm of the study examined 180 newly recruited police officers. They were interviewed on familial and personal mental disorders, prior trauma exposure and completed questionnaires on distress and alcohol use while in training. Familial substance-related disorders were associated with greater 12-month PTSD symptoms, even after controlling for prior trauma exposure, general psychiatric distress during

academy training and critical incident exposure. They also found a relationship between familial mood and anxiety disorders and PTSD – but this finding was no longer significant when psychiatric distress during academy training was controlled.

Another reason why certain people develop PTSD post trauma exposure and others do not could simply be that individuals perceive the traumatic event differently. In police work, it is common for two officers to experience the same critical incident e.g. a shooting incident, after which only one of them develops PTSD (Carlier et al., 1996, 1997; Gersons et al., 2000). This could well be because such events have different meanings for different individuals (Carlier et al, 2000). In the "Critical incidents in Police work Project", a longitudinal study on the prevention and treatment of PTSD in Dutch police officers undertaken by Carlier et al (1997), the authors report on the multidimensional structure of traumatic events as perceived by police officers and investigate individual differences in the scaling of such perceptions. They compared 42 police officers with PTSD (diagnosed by the structured interview, Dutch version) with 40 police officers without PTSD and asked them to in rate these in terms of certain domains. The objectives were to identify basic cognitive dimensions of psychological trauma that police officers use in discriminating between common critical incidents and to test whether officers with PTSD and officers without PTSD apply such dimensions differently when interpreting critical incidents. The dimensions identified were 1) emotional reactivity, 2) vulnerability and physical integrity, and 3) moral responsibility. The results showed that significant differences were found between the PTSD and non-PTSD groups in terms of the second dimension: In the PTSD group vulnerability and physical integrity were significantly associated with full PTSD and with the PTSD symptom clusters of re experiencing and hyper-arousal, but not with the avoidance cluster. A major limitation of this study was the fact that it relied on retrospective

accounts of traumatic experiences, such that reporting bias may be an issue, as well as the fact that the sample size was small. Of note is that disaster rescue work was absent in the wide array of critical incidents assessed in addition to other critical incidents. Nevertheless, it provides some evidence for the dimensionality of trauma as experienced by policemen and lends support to the notion that even in this special population, the experience of traumatic events is highly individual and subject to cognitive perceptions.

Routine work environment stress and its impact on traumatic stress symptoms is the focus of a study by Bryant et al (2007). Using a prospective study design, they evaluated 180 newly recruited police officers at baseline, while in the process of training at the academy and one year later. The other variables studied were gender and ethnicity, prior trauma, exposure to critical incidents, and negative life events. Their findings were that routine work stress is most strongly correlated with PTSD symptoms, and mediated the relationship between critical incident exposure and PTSD symptoms and negative life events and PTSD symptoms. Gender, ethnicity and prior trauma were not significantly associated with routine environment stress. The authors suggest that the findings have important implications for preventive strategies.

2.13 THE SOUTH AFRICAN SITUATION ON TRAUMATIC STRESS WITHIN THE POLICE FORCE

According to a 2008/2009 police report, 323 policemen were declared medically unfit due to ailments related to health or medical conditions, including stress and depression (The Star, Thursday February 18 2010). Clearly, police work in SA is particularly

stressful. This is due to a variety of reasons, including the high crime rate, the socioeconomic and political turmoil of the past 30 years under apartheid rule and the major political changes since its abolition (Pienaar and Rothman, 2007). Post 1994 most state departments and state funded organizations, including the police, have undergone major transformation. These changes, involving employment equity policies as well as organizational restructuring, together with the high crime rate have contributed to a less than optimal mental health status amongst the police.

In assessing risk factors for the development of PTSD in SA policemen, Friedman and Higson-Smith (2002) coined the phrase “negative resilience” to describe the syndrome of numbness and emotional distancing that Gauteng policemen expressed following trauma experienced in their line of duty. Their study employed a cross sectional design to investigate the subjective feelings experienced by policemen and to determine resilience factors among this population. These authors were able to recommend that stricter selection criteria be employed and that additional measures, beyond that which is already taking place, be put in place to address the psychological issues that arise out of police work.

Using a much larger sample size (n= 1794) Pienaar and Rothman investigated routine occupational stress and suicide in South African policemen from eight South African provinces (2007). The number of suicides in the South African police service is more than five times that elsewhere in the world. The suicide rate is also much higher than the average rate (which is up to 19 per 100 000 of the general population) in SA (Pienaar and Rothman, 2007).

Many stressors may contribute to suicide ideation among police officers, including stressors in the work situation, and personality dimensions, as well as the interaction

between these variables (Roussouw, 1998; Schmidtke et al 1999 cited in Pienaar and Rothman, 2007). In the Pienaar and Rothman study, the objective was to determine whether suicide ideation among uniformed SA police officers could be predicted on the basis of occupational stress, personality traits, and coping strategies . The authors used the adult suicide questionnaire, the police stress inventory, the personality characteristics inventory, and the coping orientation to problems experienced in a cross-sectional survey design. The sample population was a stratified random sample of 1 794 policemen from eight SA provinces. The study showed that low scores on consciousness, emotional stability, approach coping, and turning to religion as well as high scores on avoidance coping were associated with more suicide ideation.

Research attempting to find associations between personality traits, cortisol secretion and immune function is quite limited. Some research suggests impaired immune function and cytokine release in anxious women (Arranz, Guayerbas and De La Fuente, 2007). Kahl et al (2006) found that depressed patients with comorbid borderline personality disorder (BPD) displayed endocrine and immune alterations similar to those observed in cases of melancholic Major depressive disorder without BPD. It is suggested that elevated concentrations of serum cortisol, cortisol/DHEA ratios, and proinflammatory cytokines might indicate a state marker in these patients that might contribute to long term metabolic alterations that have also been associated with MDD. (Kahl et al, 2006). Coping strategies, is inherent to personality structure. It has been postulated that coping strategies that alter cognitive appraisals and emotional responses may improve long term health outcomes; and that these may predict cortisol and immune responses (Denson, Spanovic and Miller, 2009). It therefore becomes important to integrate these variables, particularly in traumatic stress studies.

To date, no study has attempted to integrate biological variables such as cortisol secretion, the inflammatory response and personality variables in the study of any emergency service personnel such as the police.

2.14 **CONCLUSION**

The literature review indicates the importance of the study of traumatic stress, with respect to biological markers such as cortisol and cytokine responses, in certain populations that are exposed to trauma regularly in their occupations. In addition, coping styles and personality variables are of particular importance, as it is well known that not all people exposed to trauma will develop psychopathology such as PTSD and/or depression. A population such as the police work force provides a good opportunity to examine the effects of duty and non-duty related traumas on biological variables, as well as how personality style may affect this. Cortisol levels prior to any exposure to duty related trauma may also be accurately measured in subjects that are newly recruited into the work force and followed up at regular intervals.

Chapter 3

The Study

3.1 AIMS AND OBJECTIVES

The primary objectives of this study were:

1) To describe the personality profiles of new recruits at the Johannesburg Metro Police Department, and determine whether certain personality types are more likely to develop PTSD following exposure to trauma.

Hypothesis: Certain personality traits are found in subjects who develop PTSD.

2) To investigate the response to traumatic stress of metro policemen in terms of cortisol secretion

Hypothesis: Cortisol secretion is unchanged with traumatic stress.

3) To investigate the inflammatory response to traumatic stress

Hypothesis: An inflammatory response occurs in response to traumatic stress.

4) To investigate correlations between personality style, cortisol secretion and the inflammatory response to traumatic stress.

Hypothesis: Correlations exist between personality style, cortisol secretion and the inflammatory response to traumatic stress.

Secondary Objectives

1) To determine which measure of cortisol, that is either 24-hr urine, blood or saliva cortisol, is the most predictive marker in this population.

2) To use information derived from this study to suggest changes for the selection process of the Johannesburg and Tshwane Metro Police Departments.

3) To investigate the need for psychological services at the police academy of the Johannesburg and Tshwane Metro Police Departments.

3.2 METHODOLOGY

3.2.1 Study Design

This was a longitudinal study of a cohort of Metro police trainees at the Johannesburg and Tshwane Metro police academies. The intention was to assess over a period of time (1 year) whether changes in the physiological state occurred on exposure to repeated exposure to stress, and whether these changes correlated with psychological variables such a personality style. Permission was obtained from the chief of Metro Police, as well as the head of the academy of both the Tshwane and Johannesburg Metro Police academies. The protocol was granted approval by the University of the Witwatersrand's Human Research and Ethics Committee (HREC) (see appendix A). The period of the study was from January 2005 to July 2007. All new cadets (a total of four hundred) were invited to participate in the research. Recruitment was done in the first week of commencement of their course.

3.2.2 **Methods**

The researcher was allowed to brief the entire recruitment of students on the second day of class. This was done in small groups. The groups were given information on the research study and asked to volunteer for the project. All volunteers gave written, informed consent. Each group (January 2005, July 2005, January 2006 and July 2006) was followed up for one year.

At baseline, they filled in a brief questionnaire, aimed at eliciting a demographic profile of the subjects. The 17 item Hamilton rating scale for Depression (HAM-D) was administered at this point to have a baseline assessment of the presence or absence of depressive symptoms. The HAM-D is an objective rating scale that assesses depressive symptoms. According to Bech (1996), the standardisation of the HAM-D in relationship to depression is: "no depression" (0-7), "minor depression" (8-12), "less than major depression" (13-17), "major depression" (18-29), and more than major depression (30-52).

To assess personality variables, the Millon Clinical Mutiaxial Inventory (MCMI) III was administered. The inventory consists of 150 statements to which true/false answers are required, and is used to establish personality traits and profiles as well as clinical syndromes that fit into DSM IV TR categories. It is particularly useful to pick up peronality disorders and is based on norms from a psychiatric population.(Millon and Davis, 1997).

Three methods of cortisol sampling were employed. Early morning (08h00) saliva and blood for cortisol were collected. Subjects had previously been informed not to smoke, or drink caffeine-containing drinks at least half an hour prior to the collection of samples. Blood was also sampled for cytokines (IL-6 and TNFα). Subjects were given a 2-liter

sterile container for the collection of a 24-hour sample of urine, as well as verbal and written instructions on how to collect the 24-hour sample of urine.

The subjects were sampled for early morning saliva and blood for cortisol, and cytokines and a 24 hour urine sample for cortisol again at three, six, nine and twelve months after the initial visit (visits 2, 3, 4 and 5). At these visits, the presence or absence of Post Traumatic Stress Disorder (PTSD) as measured by the clinician-administered scale for posttraumatic stress (CAPS scale) and the revised version of the Impact of Events Scale (IES-R) were administered. Considered the "gold standard" for the evaluation and monitoring of PTSD, the CAPS is a structured clinical interview dedicated to PTSD and assesses both lifetime and current PTSD. The CAPS taps into all three of the symptom clusters of PTSD, and quantifies both frequency and intensity of PTSD symptoms as structured by the DSM-IV TR. The CAPS was not administered at visit one, as it was felt that due to the theoretical nature of the first 6 months of the training, life time and current non-duty related trauma exposure would be appropriately assessed at visit 2. The IES-R is a useful tool that assesses the *subjective* experience of traumatic events, in terms of intrusive, reexperiencing and avoidance symptoms. It is arguably the oldest and the most widely used self-report rating scale of trauma related symptoms. The IES quantifies 22 current (past week) symptoms, each on a severity rating of 0 to 5, and is sensitive to changes in symptoms between two time points. (Shalev A, 2000)

The detection of depressive symptoms was again screened for by using the HAM-D at each visit.

Participants who met criteria for major depression or PTSD and warranted treatment were referred to the nearest community psychiatric clinic.

The samples (blood and saliva) were centrifuged at 4 degrees Celsius for 10 minutes at 3000 rpm. Aliquots of the plasma were stored frozen until analysis (at -70 degrees C for cytokines, and -20 degrees C for cortisol). Saliva aliquots were also stored at -20 degrees C until analysis.

The 24 hr urine sample was dispatched to the National health laboratory services (NHLS) laboratory at the Charlotte Maxexe Johannesburg Academic hospital for analysis. Volumes were recorded, and those < 500ml were excluded on the basis of insufficiency. To ensure that urine volumes > 900 ml did not represent diluted samples (i.e. "topped up") the 24 hour urine creatinine outputs were also determined, taking into account the slightly different ranges for males and females.

Laboratory Analysis

Cortisol

24 hr Urine Cortisol samples

Urine cortisol was measured in non-extracted urine using a competitive chemiluminescent immunoassay on the Siemens Centaur XP platform (Siemens Healthcare Diagnostics Inc., Tarrytown, NY 10591-5097 USA). In this automated assay a luminol-bound antibody attaches to the free cortisol. Once separated from unbound antibody, the amount of chemiluminescence present is compared to that of known standards. The analytical range of the assay is 5.5 – 2069 nmol/L. The coefficient of variation (CV) was 6.3% at 272 nmol/L and 7.1% at 897 nmol/L.

Urine Creatinine:

Urine creatinine was measured with an IDMS-standardized compensated kinetic Jaffe method on the Siemens Advia 1800 platform (Siemens Healthcare Diagnostics Inc.,

Tarrytown, NY 10591-5097 USA). The analytical range of the assay is 0.3 – 26.5 mmol/L. The coefficient of variation (CV) was 12% at 5.5 mmol/L and 10.3% at 11.2 mmol/L.

Saliva and Plasma Cortisol

Cortisol in saliva and plasma was assayed using a cortisol antibody-coated tube radioimmunoassay kit (PITKCO-6; Siemens Medical Solutions Diagnostics, CA,USA) with reported analytical sensitivity of 5.5 nmol/L. For saliva, the cortisol assay was modified by increasing the sample volume from 100 microlitres to 200 microlitres. Samples were diluted (x2-4) with the zero calibrator and re-assayed if the initial result was beyond the calibration range. Cortisol was assayed using a solid-phase radio-immono assay technique using exogenous cortisol bound to I^{125}. Assay tubes were supplied coated with a monoclonal antibody to cortisol. Standards in the range 0 – 10 pg/ml and samples are pipetted into the wells. Any cortisol present is bound by the immobilized antibody. After washing away any unbound substances, an enzyme linked polyclonal antibody specific for cortisol was added to the wells. Following a wash to remove any unbound antibody-enzyme reagent, a substrate solution was added to the wells. After an incubation period, an amplifier solution was added to the wells and the colour developed in proportion to the amount of cortisol bound in the initial step. Tubes were counted in a gamma counter. Percentage ^{125} bound is proportionate to the concentration of endogenous cortisol in the sample.

Cytokines

The cytokines IL6 and TNFα were assayed using the Quantikine® High Sensitivity ELISA kits (HS600B and HSTA00C respectively; R&D Systems, Oxon, UK) with reported

sensitivities of 0.039 pg/ml and 0.12 pg/ml respectively. Samples were diluted with the assay diluents and re-assayed if the initial result was beyond the calibration range.

The cytokine assays employed the quantitative sandwich enzyme technique. Microplates were supplied coated with a monoclonal antibody specific for either IL-6 or TNF. Standards (in the range 0 – 10 pg/ml for IL6 and 0-32 pg/ml for TNF) and samples are pipetted into the wells. Any IL-6/TNF present is bound by the immobilized antibody. After washing away any unbound substances, an enzyme linked polyclonal antibody specific for IL-6/TNF was added to the wells. Following a wash to remove any unbound antibody-enzyme reagent, a substrate solution was added to the wells. After an incubation period, an amplifier solution was added to the wells and the colour developed in proportion to the amount of IL-6/TNF bound in the initial step. The colour development was stopped after 20 minutes and the intensity of the colour was measured on a microplate spectrophotometer.

Personality Analysis

An analysis of the MCMI III was done using the software programme for the inventory. A psychologist (VH) well versed in the MCMI III assisted with the interpretation of the personality profiles.

3.2.3 **Statistical analysis**

Data were analyzed using the SAS version 9.1 statistical program (SAS, Cary, NC, USA). Results are expressed as mean and standard deviation or median [range] for scores or non-normal distribution or frequencies and percentages for categorical

variables. To assess differences by gender and alcohol consumption in indicators of personality traits (Hamilton, CAPS) and cortisol secretion, at each visit the Mann-Whitney Wilcoxon test for scores or continuous non- normal distributed variables was used. ANOVA test for repeated measurements of continuous variables was performed to analyze differences within visits (1 to 5 or 2 to 5). For multiple 2 by 2 comparisons between visits the Bonferroni correction was applied. To determine associations between personality variables and CAPS, IES-R and HAM-D scores, the Wilcoxon-Mann-Whitney was used. Spearman correlation coefficients were used to determine correlation between cortisol secretion, IL6, TNF cytokines and personality profiles, and cortisol vs Hamilton scores. Significance was assumed at a both-sided value of $p < 0.05$.

Chapter 4

Results

Of 400 new recruits, one hundred and forty five (145) volunteered to participate in the research study. The subjects were recruited in January 2005 (27), July 2005 (40), January 2006 (32) and July 2006 (46). The flow chart represents the number of subjects assessed at each visit.

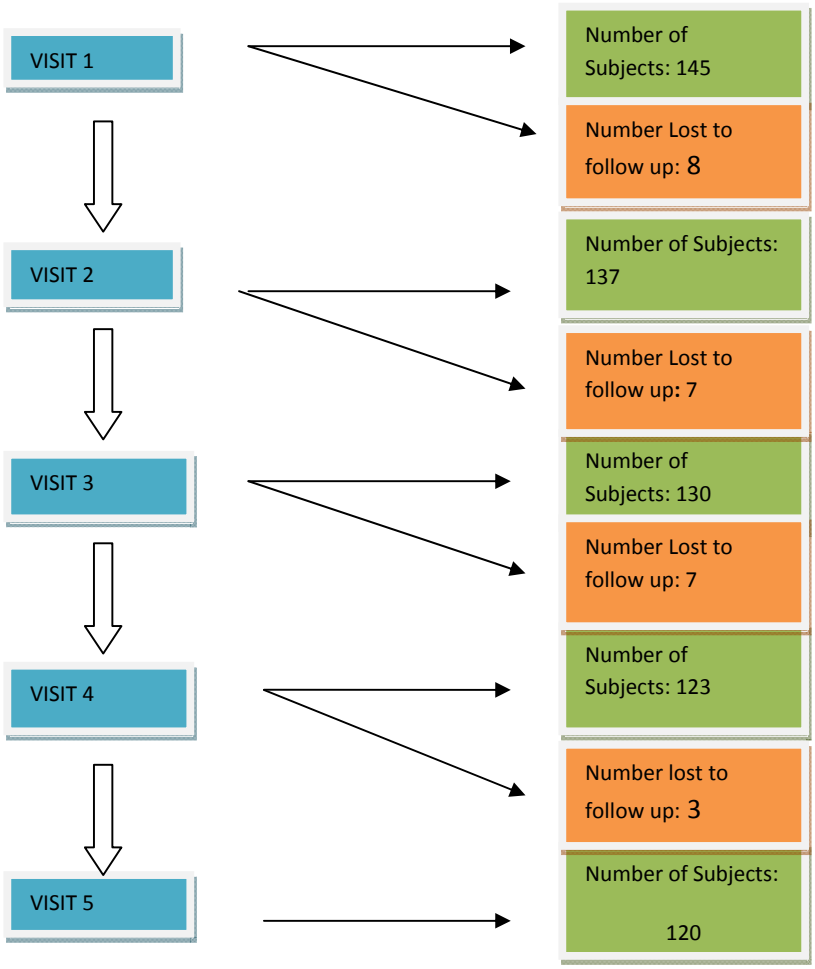

Figure 2: Flow chart showing numbers of subjects per visit

The attrition (17.3%) was due to voluntary withdrawal from the study, or being lost to follow up. The demographic data and personality profiles of all 145 subjects were ascertained. However, 139 subjects were used in the analysis, as six subjects did not complete anything other than demographic data and the personality profiles. 120 subjects (86%) completed all five visits. One subject who was lost to follow up at visit 2, returned to the study at visit 4, while one subject who was lost to follow up at visit 3 returned to the study at visit 5. The total number of subjects lost to follow up was 25.

4.1 **DESCRIPTIVE ANALYSIS OF THE SAMPLE POPULATION.**

4.1.1 **Demographics**

Of the 145, 70 (48.3%) were male, 75 (51.7%) were female. The mean age was 29.5 ± 6.35 years. 114 (78.6%) of the sample was black, 16 (11.1%) were white and 15 (10.3%) were coloured. The group was generally well educated, with 74 (51.7%) having attained grade 12, and 70 (48.3%) achieving some formal education beyond grade 12 (diploma, degree etc). Only one person had not attained grade 12. With regards to previous employment, 107 (73.8%) had some form of previous employment, whereas 37 (26.2%) had never been employed. Figure 2 and Table 2 illustrates the demographic profile of the volunteers.

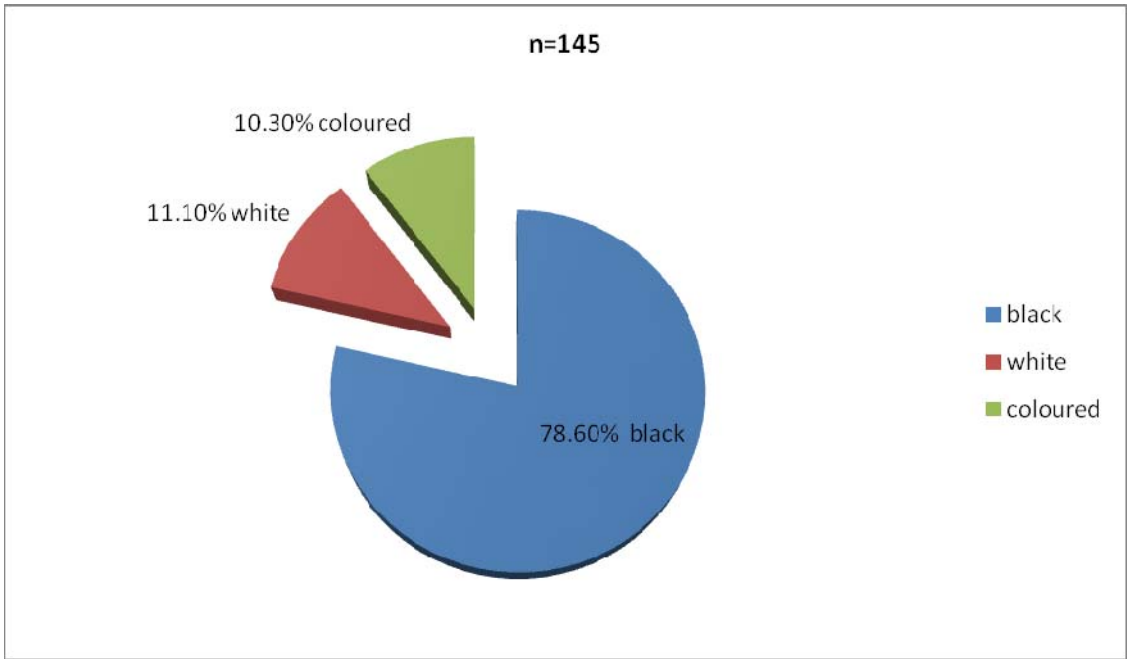

Figure 3: Pie chart showing racial breakdown of the sample population

Table1: Demographic profile of the subjects

N	145
Age (mean ± SD)	29.5 ± 6.35
Gender [n (%)]	Females 75 (51.7)
	Males 70 (48.3)
Race [n (%)]	Black 114 (78.6)
	White 16 (11.1)
	Coloured 15 (10.3)
Level of Education [n (%)]	<Grade 12: 1 (0.7)
	Grade 12: 74 (51)
	>Grade 12: 70 (48.3)
Previously Employed [n(%)]	107 (73)

4.1.2 **Habits**

An enquiry into their habits revealed that 80.1% (n=117) were smokers, 19.9% (n=28) were non-smokers. 51% (n=75) admitted to alcohol use, 49% (n=71) denied any alcohol use. 98.6% (n=143) denied drug use, 1.4% (n=2) admitted to drug use. (Figure 4)

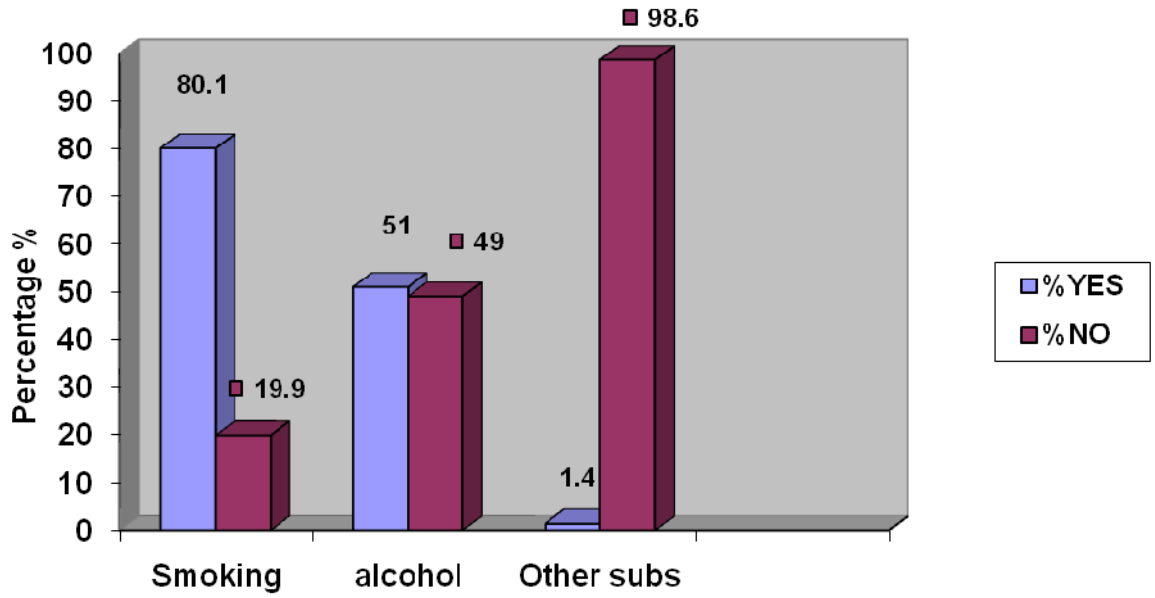

Fig 4 Distribution of habits in the sample population

4.1.3 **Family History**

Family histories revealed a history of psychiatric problems was present in 3.4% (n=5) of the study population. There was a history of suicide in the family in 6.9% (n=10) and a family history of alcoholism in 18.6% (n=27).

Previous contact with psychological services was seen in 10.3% (n=15) of the sample population (Figure 5).

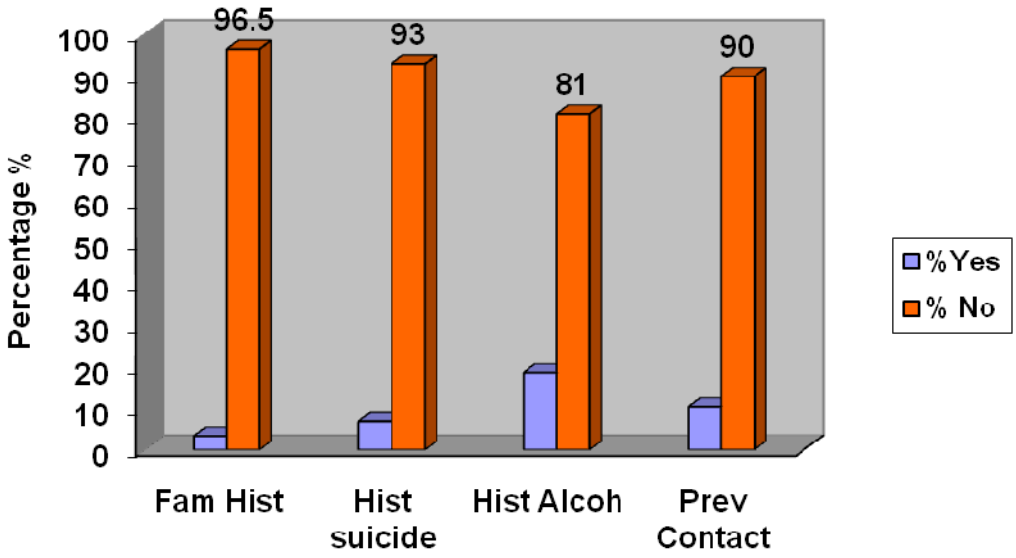

Fig 5 Distribution of family history and previous contact with Psychological services

4.2. **MCMI III Results**

The MCMI III was administered at visit one. Tables 3 and 4 represent the personality profiles of the 145 subjects, and is categorized as per the inventory in terms of rates of disclosure, debasement and desirability scales; clinical patterns, severe personality pathology, clinical syndromes and severe syndromes (DSM codes). Only base rates of 75 and above, indicative of possible pathology are reflected in the tables. Six profiles were invalid. Table 3 represents the disclosure (X), debasement (Y) and desirability (Z) scales. These are modifier scales, constructed to identify distorting tendencies, which characterize subjects and their responses (Millon and Davis, 1997). The disclosure scale was designed to identify people who might be unusually self-revealing of information of a personally sensitive nature or who are particularly reticent, withholding and secretive in this regard. A base rate greater than 75 reflects an unusually open and

self-revealing attitude. Base rates of between 75 and 84 were present for the X scale in 35 subjects. An elevation of the Y scale (Desirability) elevation (BR over 75) indicates an attempt to place oneself in a pleasing, favourable light. This was present in 24 subjects. The Z scale (debasement) reveals the extent to which the results have been influenced by the person's attempts to appear more troubled by emotional and interpersonal problems than might have been objectively evaluated. This was present in 16 subjects. Base rates of 85 and more were present for these scales in 27 subjects for X, 12 subjects for Y and in 10 subjects for Z.

Table 2: Base rates according to disclosure, desirability and debasement scales

Scale	**X (Disclosure)**	**Y (Desirability)**	**Z (Debasement)**
No of subjects with base rates >74 and < 85 [n (%)]	35 (24%)	24 (16.5%)	16 (11%)
No of subjects with base rates >/= 85 [n (%)]	27 (18.6%)	12 (8.3%)	10 (6.9%)

Table 3: Distribution of MCMI III Clinical Patterns

Clinical Pattern	No of Recruits BR >75 [n (%)]	No of Recruits BR >85 [n (%)]
Narcissistic	47 (32.4%)	29 (20%)
Depressive	50 (34.5%)	16 (11%)
Dependent	43 (29.7%)	7 (4.8%)
Avoidant	34 (23.4%)	7 (4.8%)
Passive Aggressive	46 (31.7%)	7 (4.8%)
Schizoid	43 (29.7%)	5 (3.4%)
Aggressive	17 (11.7%)	4 (2.8%)
Self Defeating	47 (32.4%)	2 (1.4%)
Antisocial	4 (2.9%)	0 (0%)

BR= base rate

The commonest high base rates for severe pathology (base rates ≥ 85) were for the paranoid category [18 subjects (12.4 %)]. The clinical syndromes most commonly

present (base rates ≥ 85) were for the anxiety category [(32 subjects (22%)]. Severe syndromes were present in 26 subjects of which 9 (6.2%) had major depression; 13 (9%) had delusional disorder; and 4 (2.8 %) had thought disorder.

Table 4: Distribution of sample according to severe pathology

Severe Pathology	**BR >75 [n (%)]**	**BR > 85 [n (%)]**
Paranoid	48 (33.1%)	18 (12.4%)
Schizoid	1 (0.7%)	0 (0%)
Schizotypal	15 (10.3%)	7 (4.8%)
Borderline	23 (15.9%)	7 (4.8%)
Dysthymia	2 (1.4%)	0 (0%)

BR= base rate

Table 5: Prevalence of MCMI III clinical syndromes

Clinical Syndrome	**BR>75 [n (%)]**	**BR>85 [n (%)]**
Anxiety	94 (64.8%)	32 (22.2%)
Dysthymia	36 (24.8%)	9 (6.2%)
PTSD	12 (8.3%)	9(6.2%)
Somatoform	9 (6.2%)	6 (4.1%)
Bipolar	22 (15.2%)	9 (6.2%)
Alcohol Dependence	8 (5.5%)	1 (0.7%)
Delusional	6 (4.1%)	4 (2.8%)

Table 6: Prevalence of Severe Syndromes

Severe Syndromes	**BR>75 [n (%)]**	**BR > 85 [n (%)]**
Delusional	25 (17.2%)	13 (9%)
Major Depression	15 (10.3%)	9 (6.2%)
Thought Disorder	6 (4.1%)	4 (2.8%)

Of the personality variables, only narcissistic clinical pattern was significantly associated with IES-R scores at visit 3 (p =0.0443) Thought disorder was the only severe syndrome personality variable found to be statistically significant in terms of its association with the HAM-D score at visit 1 (95% CI, 2.97-4.11 ; p=0.0005).

4.3 **TRAUMATIC EVENTS EXPERIENCED**

The traumatic events were categorized as duty related and non-duty related events. The non-duty related traumatic events were events that were not experienced during working hours. The initial screening for traumatic events exposure was done at visit 2, with the administration of the CAPS rating scale. Hence, 139 of the original 145 recruits were included in the analysis. The majority of the subjects, 138 (99%) had experienced at least one traumatic event in their lifetime. Only one event was experienced by 55

(39.9%) subjects, meaning that a greater number of subjects i.e. 83 (61.1%) had experienced two or more events.

The non-duty related traumatic events were categorised as reflected in table 7 for visits 2 to 5. At visit 2, the commonest traumatic event was experiencing the unexpected death of a loved one. (n=65, 47.1%), followed by experiencing a motor vehicle accident (MVA). (n=36, 25.9%)

Table 7 Non duty related traumatic Events V2 to V5

Trauma	V2	V3	V4	V5
Witnessed someone being injured or killed	7	2	1	2
Crime victim: assault	10	0	0	0
Crime victim: partner violence	5	0	0	0
Crime victim: rape	9	0	0	0
Crime victim: other sexual assault	1	0	0	0
Political trauma: combat	3	1	0	0
Political trauma: civilian in war	4	0	0	0
Disaster: Natural disaster	3	0	0	0
Disaster: manmade disaster	2	1	0	0
Unexpected death of loved one	65	4	4	0
Loved one with life threatening illness or injury	10	3	4	2
Traumatic Event experienced by close other	9	5	1	2
Life threatening Illness	4	0	2	2
MVA: witnessed	6	3	0	0
MVA: experienced	36	2	0	2

Table 8 depicts traumatic events experienced whilst on duty (done at visits 3 to 5, since this was the period that the officers had practical exposure to police work). Motor vehicle accidents were the most commonly reported traumatic event for all the visits. There were more motor vehicle accidents reported at visits 4 (n=24, 19.5%) and 5 (n=23, 19.2%) than visit 3 (n=12, 9.2%).

The category “traumatic event experienced by a close other” refers to those traumatic events experienced by others to whom one is close, other than a life threatening illness or injury.

Table 8: Number of Duty related traumatic events experienced for Visits three (V3), four (V4) and five (V5)

Traumatic Event	V3	V4	V5
MVAs	12	24	23
Domestic violence cases	4	12	10
Shooting incidents	2	2	14
Assault	3	14	10
Rape	1	10	5
Suicides	0	4	0
Armed robberies	0	3	0
Murder	1	5	2
Guarding dead bodies	1	5	1
Death of colleagues	0	3	4
Hijacking	1	2	0
Housebreaking	0	3	0
Mortuary exposure	0	1	0

NB: figures represent number of times these traumatic events were mentioned at V3, V4, and V5

At visit 3, after 3 months exposure to police work, the commonest traumatic events experienced were MVA's (mentioned 12 times). Dealing with cases of domestic violence and assault were the next most commonly mentioned events that were found to be traumatic (mentioned 4 and 3 times respectively).

This pattern was seen at visits 4 and 5 as well.

4.4 HAMILTON DEPRESSION RATING SCALE (HAM-D) RESULTS

The HAM-D scores ranged from 0 to 18 at baseline, with a mean of 3.57 ± 3.37. At visit 2, the range was 0 to 14, with a mean of 3.83 ± 3.59. At visit 3, the range was 0 to 18, and the mean was 2.28 ± 2.7. At visit 4, the range was 0 to 14 (mean of 2.3 ± 3.2) and at the last visit the range was 0 to 17 (mean of 2.6 ± 3.2).

The majority of subjects scored in the "no depression" range across all visits. The highest percentage of minor depression (10.21%) occurred at visit 2 (at the end of three months). The highest percentage of less than major depression (3.7%) also occurred at visit 2. Two subjects scored 18, indicating major (clinical) depression. These scores occurred at baseline (visit 1) and at visit 3. (Table 9)

Repeated measures analysis of variance (ANOVA) showed that the mean scores for the HAM-D at some visits were significantly different across time (overall p value within visits= 0.0012). (Table 10)

Table 9: HAM-D Scores over time

Category	**HAM –D Scores**	**Visit 1n=145**	**Visit 2 n=137**	**Visit 3 n=130**	**Visit 4 n=123**	**Visit 5 n=120**
No depression [n (%)]	0-7	122 (87.8)	118 (86.1)	122 (94.6)	114 (95)	114 (94.2)
Minor depression [n (%)]	8-12	13 (9.4)	14 (10.2)	1 (0.7)	2 (1.7)	5 (4.1)
Less than major depression [n (%)]	13-17	2 (1.4)	5 (3.7)	4 (3.1)	4 (3.3)	2 (1.7)
Major depression [n (%)]	18-29	1 (0.7)	0 (0)	1 (1.6)	0 (0)	0 (0)

Table 10: HAM-D scores within visits

	Mean ±SD	**Median (range)**	**HAM-D V2**	**HAM-D V3**	**HAM-D V4**	**HAM-D V5**
HAM-D V1	3.57 ±3.37	3 (0-18)	p=0.4939	p=0.0009*	p=0.0018*	p=0.00298*
HAM-D V2	3.83±3.59	3 (0-16)		p=0.0002*	p=0.0008*	p=0.121
HAM-D V3	2.28±2.70	2 (0-18)			p=0.6759	p=0.3181
HAM-D V4	2.3±3.23	1 (0-16)				p=0.5173
HAM-D V5	2.60±3.29	2 (0-17)				

p values for all 2x2 comparisons were adjusted according to the Bonferroni correction.

S*ignificant level considered at α<0.005 for visits = 5 applying multiple comparisons using Bonferroni corrections.*

When classified according to gender, there was a significant difference between females and males and the median HAM-D score at baseline [males 2 (0-11), females 3 (0-18) p= 0.0226], and visit 2 [males 2 (0-16), females 4 (0-14), p= 0.0005], but not at visits 3, 4 and 5. (Table 11)

Table 11: Median HAM-D scores per visit – Males versus females

HAM-D Visit	Males	Females	p value
1	2 (0-11)	3 (0-18)	0.0226*
2	2 (0-16)	4 (0-14)	0.0005*
3	2 (0-18)	1.5 (0-10)	0.78
4	1 (0-14)	1 (0-16)	0.45
5	1 (0-17)	2 (0-11)	0.97

4.4.1 **HAM-D versus Sociodemographics**

There were no significant associations in scores for any of the sociodemographic factors versus HAM-D scores.

4.4.2 **HAM-D versus Personality.**

The severe pathology scale of the MCM III (thought disorder) for which 4 people had significantly high rates- was the only personality variable found to be statistically significant in terms of its association with the HAM-D score at visit 1 (95% CI, 2.97-4.11; p=0.0005).4.5

4.5 **CLINICIAN ADMINISTERED RATING SCALE FOR PTSD (CAPS)**

This instrument was administered from visit 2 (after 3 months) to visit 5 (at 12 months). Lifetime scores (indicating the presence of the disorder in the subjects at some point in their lifetime) are depicted in Table 12, and current scores (indicating the presence of the disorder in the current month) are depicted in Table 13. PTSD was recorded if scores for the CAPS were ≥40.

The percentage that had PTSD was also higher for lifetime compared with current PTSD at each visit.

4.5.1 **CAPS lifetime**

Table 12: Lifetime CAPS scores for each visit, by gender

		Scores (median, range)			
Visit	**Mean ± SD**	**All**	**Males**	**Females**	**P value**
2	20.3 ± 21.4	14 (0-91)	12.5 (0-60)	16 (0-91)	0.41
3	19.2 ±19.9	14 (0-87)	12 (0-60)	16 (0-87)	0.25
4	19.8 ± 20.7	14 (0-90)	12 (0-60)	17 (0-90)	0,35
5	19.4 ± 20.6	13 (0-89)	10 (0-59)	17 (0-89)	0.32

Table 13: Current month CAPS scores for each visit by gender

		Scores (median, range)			
Visit	**Mean ± SD**	**All**	**Males**	**Females**	**P value**
2	8.8 ± 10.9	5 (0-56)	4.5 (0-37)	5 (0-56)	0.87
3	4.48 ± 6.4	0 (0-28)	2.5 (0-28)	0 (0-25)	0.53
4	5.24 ± 8.5	2 (0-50)	2 (0-50)	2 (0-25)	0.96
5	5.24 ± 9.9	0 (0-67)	0 (0-67)	2 (0-30)	0.88

There were no significant differences in the CAPS lifetime score over time (p = 0.86).

For each visit, the percentage of subjects satisfying criteria for PTSD is depicted in figure 6.

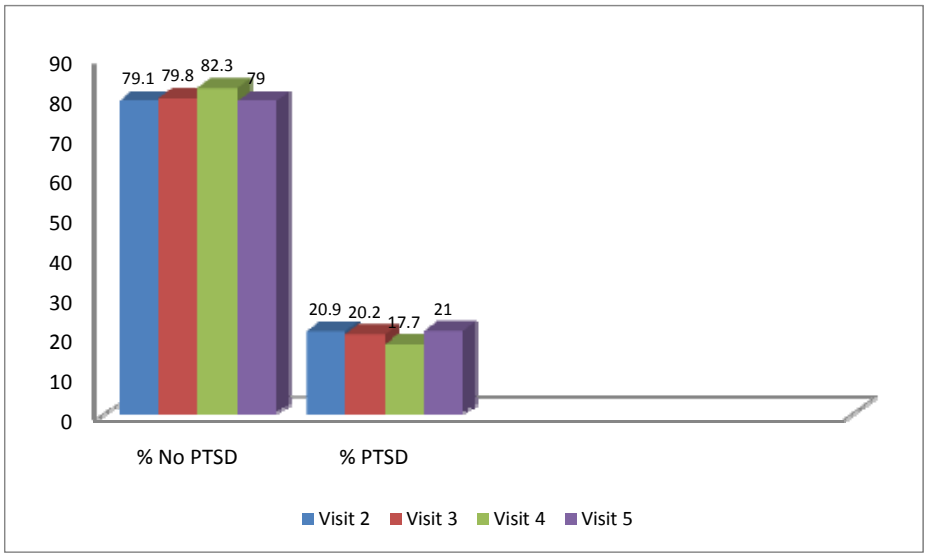

Figure 6: Lifetime PTSD: percentage with and without at each visit

4.5.2 **Current CAPS Scores**

For current (past month) CAPS scores, significantly lower scores were seen at visit 3 compared to visit 2 ($p<0.0001$), visit 4 compared to visit 2 ($p=0.0018$), and visit 5 versus visit 2 ($p=0.0041$). Scores were not significantly lower between visit 3 and visit 4 ($p=0.47$), visit 3 and visit 5 ($p=0.624$) and between visit 4 and 5 ($p=0.94$). (*Significance level considered at $\alpha<0.0071$ for visits = 4 applying multiple comparisons using Bonferroni corrections).*

4.5.2.1 **Within subjects current (week) CAPS Scores over time**

The current (past week) CAPS scores were significantly lower across the five visits ($p<0.001$). Specifically, significantly lower scores were seen between visit 2 and visits 3 ($p< 0.0001$), visit 2 and visit 4 ($p= 0.0015$) and visit 2 and visit 5 ($p=0.0014$). Scores were not significantly lower between visit 3 and visit 4 ($p=0.33$), visit 3 and visit 5 ($p=0.63$) and between visit 4 and visit 5 ($p=0.68$). *(Significance level considered at $\alpha<0.0071$ for visits = 4 applying multiple comparisons using Bonferroni corrections).*

Table 14: Current week CAPS Scores by gender and overall

	Scores (median, range)				
Visit	**Mean ±SD**	**All**	**Males**	**Females**	**P Value**
2	7.53 ± 9.6	4 (0-51)	5 (0-34)	4 (0-51)	0.79
3	3.67 ± 5.6	0 (0-30)	1 (0-30)	0 (0-25)	0.50
4	4.54 ± 7.9	1 (0-49)	2 (0-49)	0 (0-25)	0.57
5	4.2 ± 8.0	0 (0-58)	0 (0-58)	0 (0-20)	0.52

The percentage of subjects who fulfilled criteria for PTSD (current) per visit is shown in figure 7.

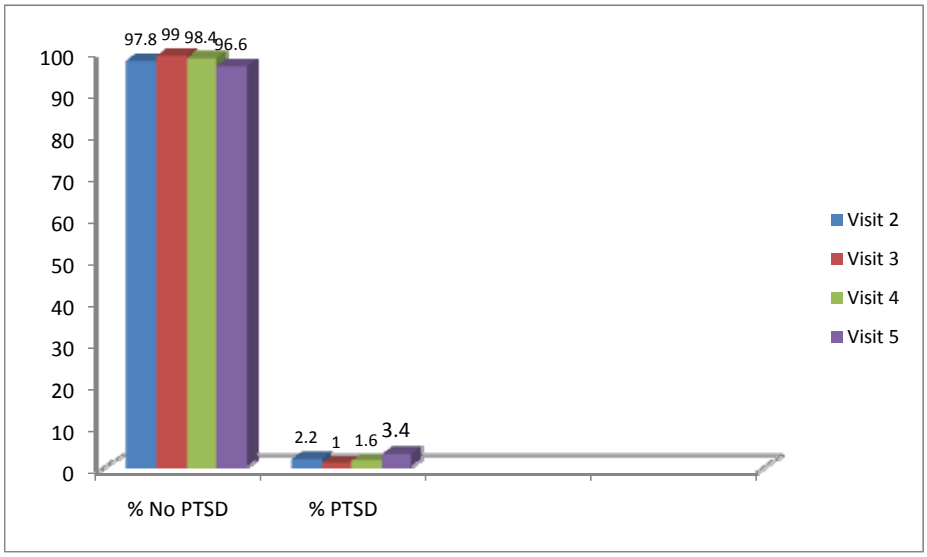

Figure 7: Current PTSD: Percentage of subjects with and without at each visit

4.5.3 **Personality variables and CAPS scores**

A) Current CAPS scores

The following personality variables were found to have a statistically significant association with current CAPS scores (i.e. these personality variables were significantly associated with lower current CAPS scores)

Aggressive: (p =0.0341 at V5) i.e. those with base rates of ≥75 for the variable aggressive (21 subjects, 17.5%) were associated with lower current CAPS scores at visit 5 (range 0-42, mean 9.2 ±14.4, median 1). For those who did not have BR for the clinical pattern aggressive ≥ 75 (99 subjects, 83.5%) the CAPS scores had a median= 0, range 0-67; mean 4.9±9.4)

Antisocial: p = 0.0273 at V5 i.e. those with base rates ≥75 for the variable antisocial were associated with lower current CAPS scores at V5 (n=4 only, 2.7%), (median=14 range=6-29 mean =16.3±11.7. The variable narcissistic (n=45, 31%) was found to be borderline significant with current CAPS score at V2 (range 0-60, mean 15.7± 16.6; median 12, p=0.0572), and the variable schizoid (n=33, 22.8%) was found to be borderline significant with the CAPS score at V5 (range 0-42 mean 6.3±9.6, median=3 p= 0.0513).

B) Lifetime CAPS scores

For lifetime PTSD, the personality variable schizoid (n=33, 22.8%) was significantly associated with CAPS scores at V5 (range =0-89, mean 19.7±20.6, median =13, p=0.0405) i.e. schizoid personality style was associated with lower CAPS scores. At V2 (n=41), the p value was borderline significant (median=16, range 0-91, mean = 24.9± 26.0 p= 0.0533)

4.6 IMPACT OF EVENT SCALE- REVISED VERSION (IES-R)

This instrument was also administered from visit 2 to visit 5. It is a self-report measure and as such gives an impression of the subjective distress experienced on exposure to a traumatic event/s. The subjects selected the "event", and its impact evaluated accordingly. The events ranged from personal traumas such as childhood sexual abuse to witnessing MVA's as part of their duties. Scores across all visits were notably low, suggesting minimal clinical impact.

4.6.1 **IES-R scores within subjects over time**

The IES scores were significantly lower across the five visits, with significant differences at visit 2 versus visits 3, 4, and 5; and visit 3 versus visits 4 and 5. (Tables 15 and 16)

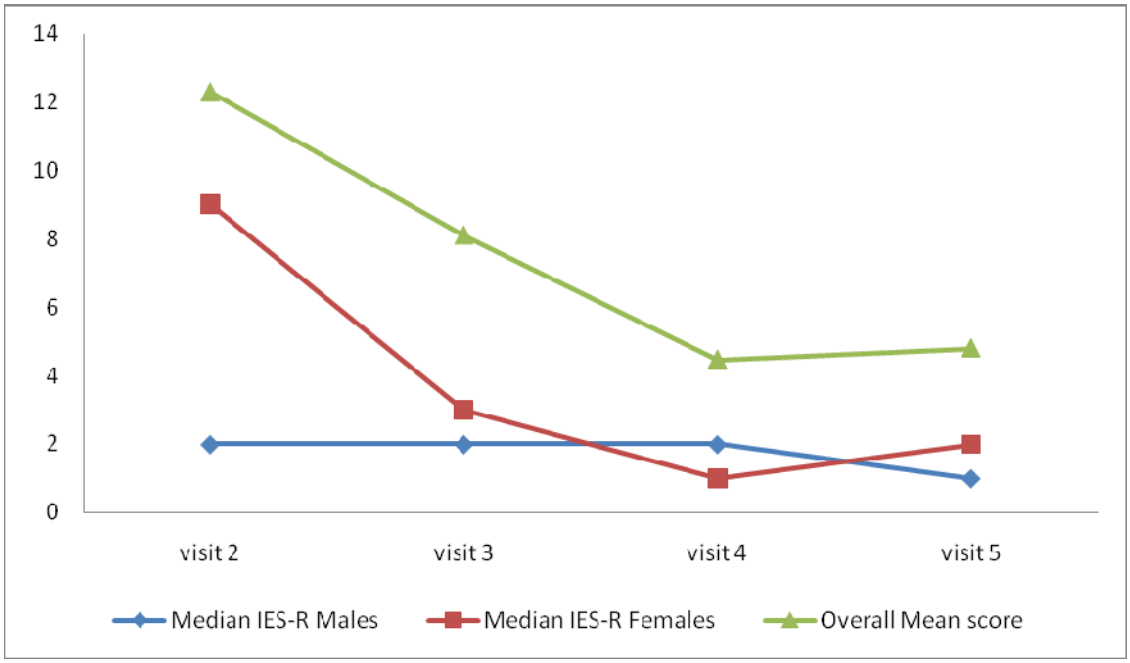

Figure 8: IES-R scores: Means, medians for males and females across time

Table 15: IES-R scores over time

	IES-R 3	**IES-R 4**	**IES-R 5**
IES-R 2 vs	p=0.0094*	p=< 0.001*	p=<0.001*
IES-R 3 vs		p=0.0008*	p=0.0047*
IES-R 4 vs			p=0.808

Significant level considered at α<0.0071 for visits = 4 applying multiple comparisons using Bonferroni corrections.

There was a significant difference between males and females for the IES-R scores at visit 2 (p=0.014) but not at visits 3, 4, or 5.

4.6.2 **IES-R versus Personality across time**

Of the personality variables, only narcissistic clinical pattern was significantly associated with IES-R scores at visit 3 (p = 0.0443).

4.7 **TRAUMATIC EVENTS VERSUS HAM-D, IES-R AND CAPS**

The impact of duty related traumatic events (T11-T18) on the outcome variable of depressive symptoms (represented by the change in HAM-D scores from baseline to V5) was analysed in a stepwise regression analysis. Similarly, post-traumatic stress

symptoms as measured by the CAPS and IES scores were also measured as outcome variables and related to T11-T18. From baseline (time of recruitment as a metro police officer) it was considered that HAM-D scores would be affected by a number of inputs (T11-T18) together with the pretraumatic factors. The significant inputs were found to be the baseline HAM score, life total score, T13 and T17. The coefficient of multiple correlation was R^2=0.50, p =0.0005. There is a suggestion then that the change in HAM-D scores is explained by exposure to these traumas (T13-shooting incidents, armed robbery, murder and attempted murder; T17- guarding dead bodies and mortuary exposure) in 50% of cases. The scatter plot shows that the higher the initial (baseline) HAM-D score, the bigger the change was i.e. the greater the improvement in scores. The negative relationship between the baseline HAM-D and change from VI to V5 raises interesting questions. It is possible that factors beyond the actual trauma contribute to a relative improvement in HAM-D scores over time (sensitisation to the job experience, the sense of belonging and police work offers the group the concept of negative resilience).

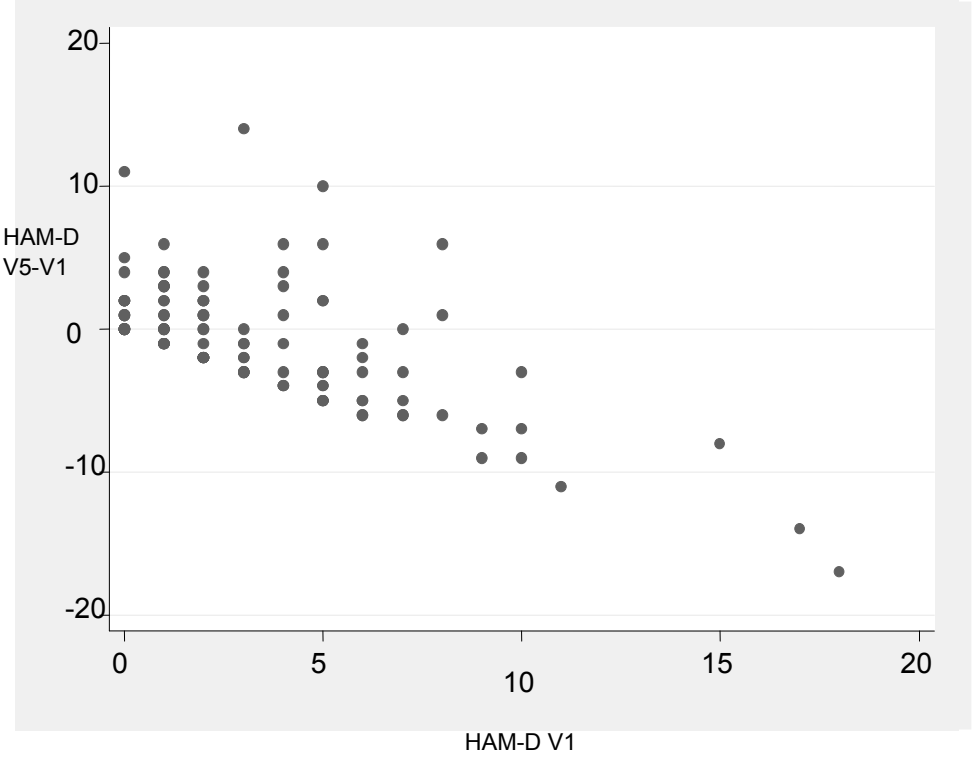

Figure 9: Change in total HAM-D scores versus baseline scores

Stepwise regression of the IES scores with respect to duty related traumatic events reveal that the change from baseline to V5 is strongly associated with pretraumatic factors, and the scores tend to decrease with time. i.e. the higher the initial score, the greater the change in scores from V2 to V5. IES-R 2 is affected by baseline IES and also life total. (R^2 = 79%). The scatter plot of IES at V2 versus IES at V5 again shows a negative correlation, with scores decreasing over time, and greater changes correlating with higher V2 scores.

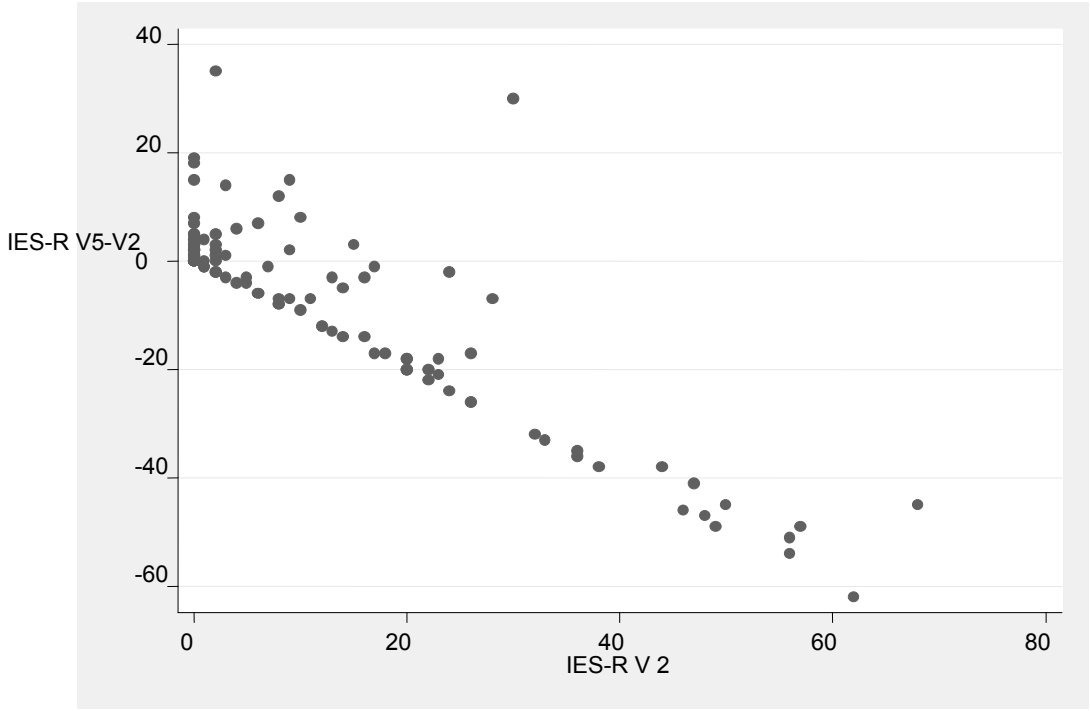

Figure 10: Change in total IES-R scores versus V2 scores

With regard to the CAPS scores, there is no relationship between the baseline lifetime CAPS scores and the change in score over time. However, as the scatter plot shows, for current CAPS scores, T15 (rape cases) and T18 (death of colleagues) are significant here as having an effect on the change in CAPS scores from the baseline to endpoint (R^2=0.6). The current CAPS scores are affected by its baseline value, its life total (score at V5) and T14 (housebreaking, assault cases and smash and grab incidents). The scatterplot again shows a negative correlation.

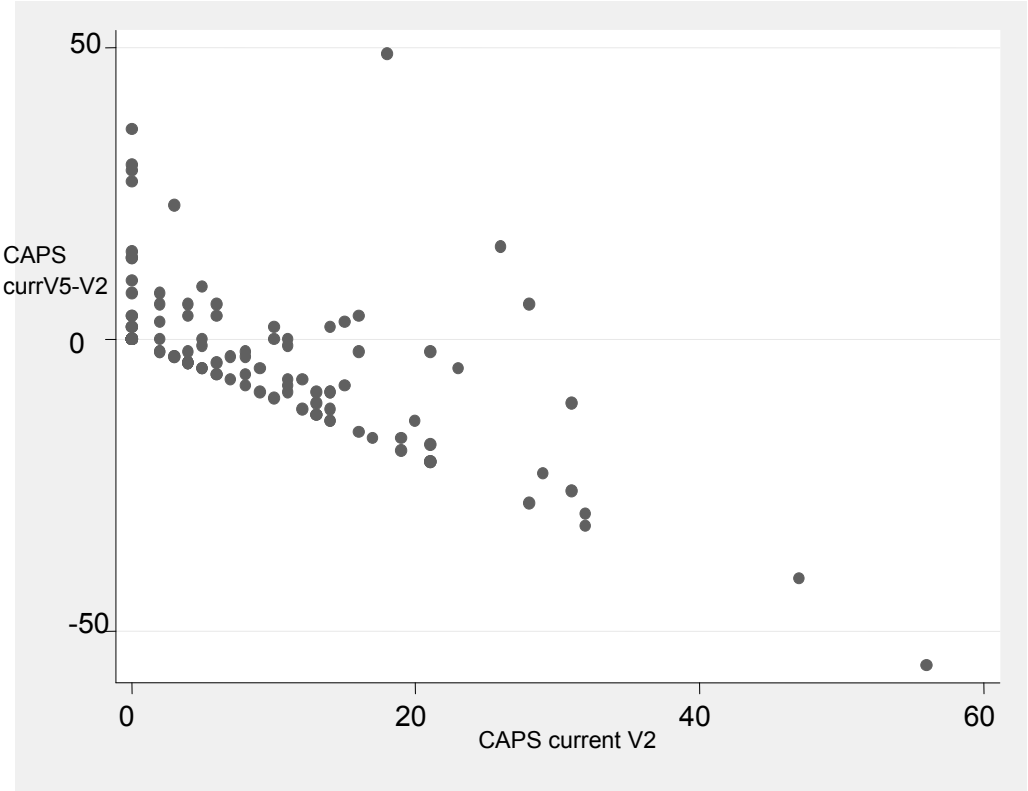

Figure 11: Change in total current CAPS scores over time versus total current CAPS scores at baseline

4.8 **PRIMARY ANALYSIS OF CORTISOL**

In the plots below, the boxes represent the limits of the upper (75%) and lower quartile (25%) respectively. The horizontal line within each box shows the median, while the upper and lower whiskers show the 5% and 95% inclusion limits respectively.

4.8.1 **Plasma (Blood)**

Figure 12 below depicts plasma cortisol concentration measured at each visit. Plasma cortisol decreased between visit 1 and visit 3, but then showed significant increases over the following two visits.

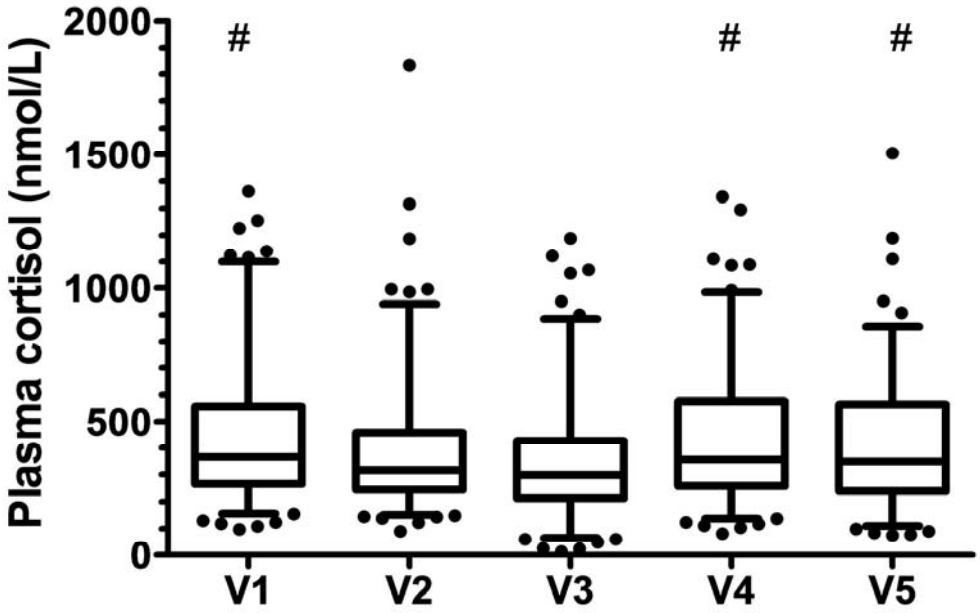

Figure 12: Plasma cortisol versus time.

 # Significantly different to V3 (p<0.005).

4.8.2 **Saliva**

Figure 13 below depicts saliva cortisol concentration measured at each visit. The overall trend was for saliva cortisol to decline with each successive visit.

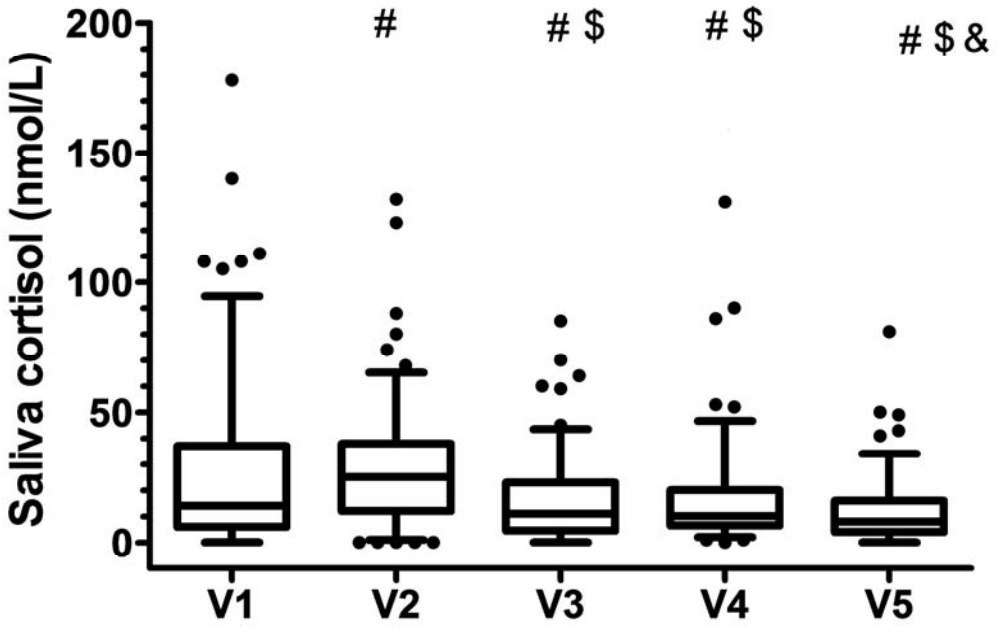

Figure 13: Saliva cortisol versus visit.

 # Significantly different to V1 (p<0.005)

$ Significantly different to V2 (p<0.002)

& Significantly differently to V4 (p<0.002)

4.8.3 **24-hour urine**

Figure 14 depicts the mean 24-hour urine concentration measured at each visit. These results are limited by the many invalid 24-hour urine samples. After correcting for volume and creatinine for males and females at each visit, approximately two thirds of the samples were invalid (table 16). However, the results still indicate a clear increase in 24-hour cortisol excretion over time.

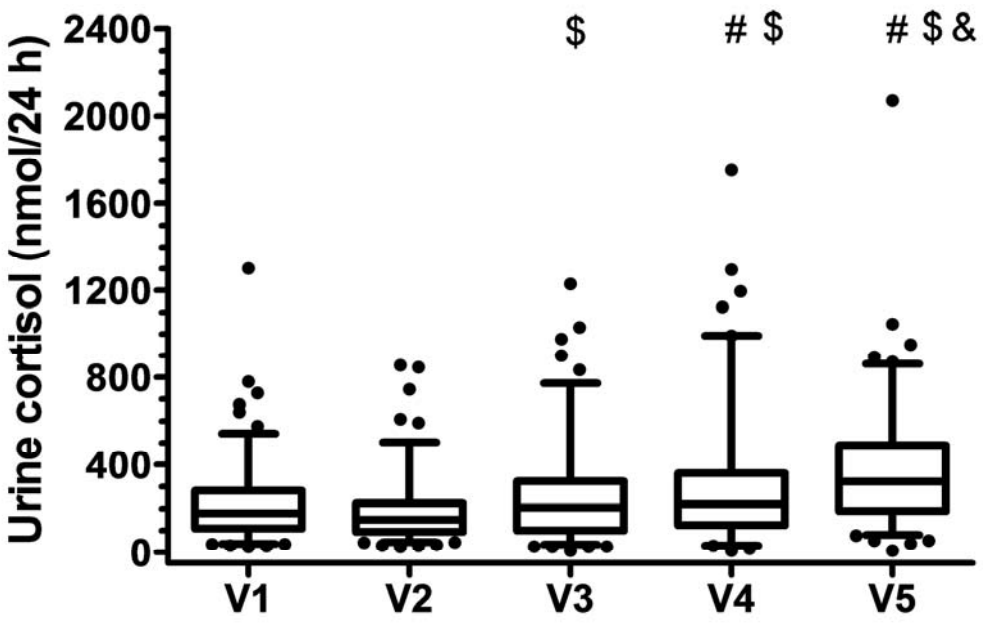

Figure 14: 24 Hour Urine cortisol versus visit.

 # Significantly different to V1 (p<0.005)

$ Significantly different to V2 (p<0.003)

& Significantly different to V4 (p< 0.003)

Table 16: Numbers of subjects who handed in valid urine cortisol samples at each visit, means and standard deviations in nanomols/litre

		Overall		Median, range		
Visit	**(n)**	**Mean**	**SD**	**Males**	**Females**	**P value**
1	58 (30F)	226	134.212	184 (28-642)	196 (31-1302)	0.57
2	51 (31F)	194	120.335	155 (29-745)	143 (25-855)	0.85
3	45 (29F)	267	154.578	212.5 (24-230)	187 (8-1030)	0.63
4	38 (20F)	378	273.666	222.5 (29-124)	219 (7-1751)	0.99
5	47 (25 F)	340	193.762	341 (40-2069)	320 (8-1045)	0.67

4.9 ANALYSES OF CORTISOL VERSUS HAM-D, CAPS and IES-R

4.9.1 **24-hour urine cortisol versus HAM-D Scores, CAPS- Scores and IES-R Scores**

There were no significant changes in the cortisol versus HAM-D scores, CAPS scores and IES-R scores over time.

Figure 15 and table 17 reflect the mean blood, saliva and urine cortisol scores over time. For plasma cortisol over time, repeated measures analysis of variance showed there were significant differences (lower levels) between visit 1 and visit 3 (p=0.023). For saliva, significant differences (lower levels of cortisol) were found between visit 1 and

visit 3 (p=0007), visit 1 and visit 4 (p=0.0002), and visit 1 and visit 5 (p<0.0001). For urine cortisol significantly lower scores were obtained at visit 2 compared with visit 1(p=0.021), and significantly higher scores were found at visit 4 compared with visit 1(p=0.028), and at visit 5 compared with visit 2 (p=0.0006).

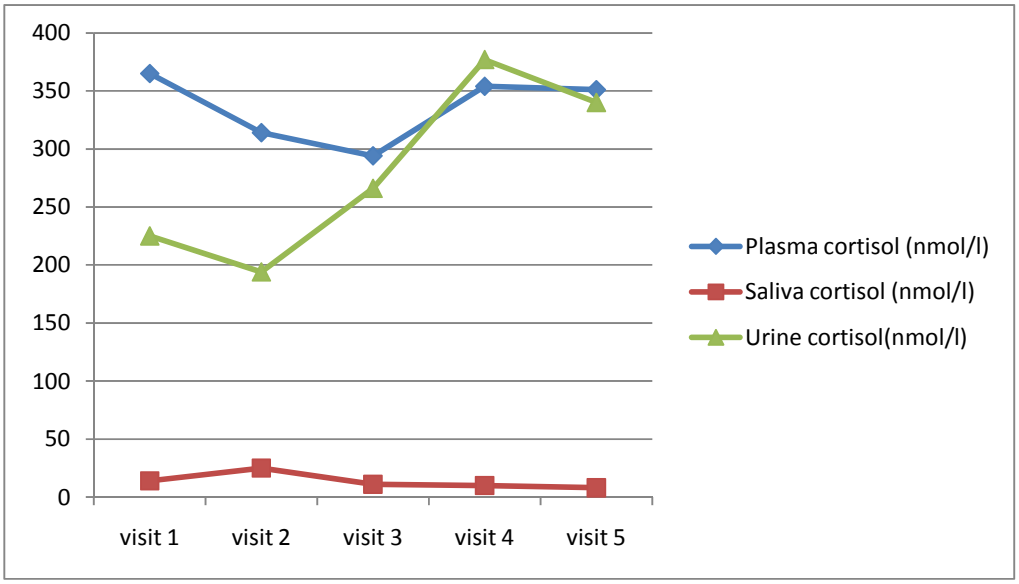

Figure 15: Mean plasma, saliva and urine cortisol versus time

Table 17: Blood, saliva and 24-hour urine cortisol over time (mean ± SD).

Visit	**Blood cortisol (ng/ml)**	**Saliva cortisol (ng/ml)**	**24-hr Urine cortisol (nmol/l)**
1	365 ± 254	16 ± 21	225 ± 134
2	314 ± 219	25 ± 21	194 ± 120
3	294 ± 233	11 ± 15	266 ±154
4	354 ± 254	10 ± 18	377 ± 273
5	351 ± 233	8 ± 12	340 ±1 93

4.9.2 **Plasma cortisol versus HAM-D, CAPS and IES-R Scores**

There were no significant correlations between plasma cortisol and HAM-D scores at any of the visits, nor were there any significant correlations between plasma cortisol and lifetime CAPS scores. For CAPS current scores, there were significant (inverse) correlations for both current month and current week scores at the following visits:

Current month: V4 ($p=0.0395$, $r_s= 0,189$) and V5 ($p=0.0159$, $r_s=0.222$)

Current week: V2 ($p=0.025$, $r_s=-0.194$) and V4 ($p=0.028$, $r_s=-0.201$)

For IES-R, there was a significant correlation with plasma cortisol at V3 (p=0.0028, r_s=-0.202)

4.9.3 **Saliva cortisol versus HAM-D, CAPS and IES-R scores**

Apart from a significant correlation between saliva cortisol and the current (month) CAPS score at visit 2 (p = 0.0301), there were no other significant correlations with any of the other scores (HAM-D, CAPS lifetime and IES-R), at all of the visits. Lower saliva cortisol levels were correlated with lower current month CAPS scores at visit 2. There was however, a borderline significant correlation between the current (week) CAPS and saliva cortisol at visit 2 (p=0.06), also in a directly proportionate manner (lower levels correlating with lower scores).

4.9.4 **Personality Variables and Cortisol**

4.9.4.1 **Urine**

The following personality variables were found to be significantly correlated with the 24-hour urine cortisol:

Dysthymia at visit 1 (p=0.038) and at visit 4 (p=0.009).

Delusional at visit 5 (p=0.004).

Major depression at visit 4 (p=0.032).

Borderline at visit 3 (p=0.04).

Depressive at visit 4 (p=0.02).

4.9.4.2 **Saliva**

For saliva cortisol, the following variables were significant:

Delusional at visit 2 (p=0.04).

Depressive at visit 4 (p=0.0008).

Dependent at visit 2 (p=0.005).

Table 18 Significant associations between Personality variables and cortisol

Visit	**24 hour urine**	**Saliva**
1	Dysthymia (p=0.038)	
2		Delusional (p=0.04) Dependent (p=0.005)
3	Borderline (p=0.04)	
4	Dysthymia (p=0.009) Major depression (p=0.032) Depressive (p=0.02)	Depressive (p=0.0008)
5	Delusional (p=0.004)	

4.9.4.3. **Plasma**

Plasma cortisol was not significantly associated with any of the personality variables.

4.10 **CYTOKINES**

4.10.1 **TNF**

Within subjects, over time, TNF showed significant differences between visit 1 and visit 4 (p=0.0006); visit 1 and visit 5 (p=0.0373) (Figure 16). This shows a decreasing trend over time.

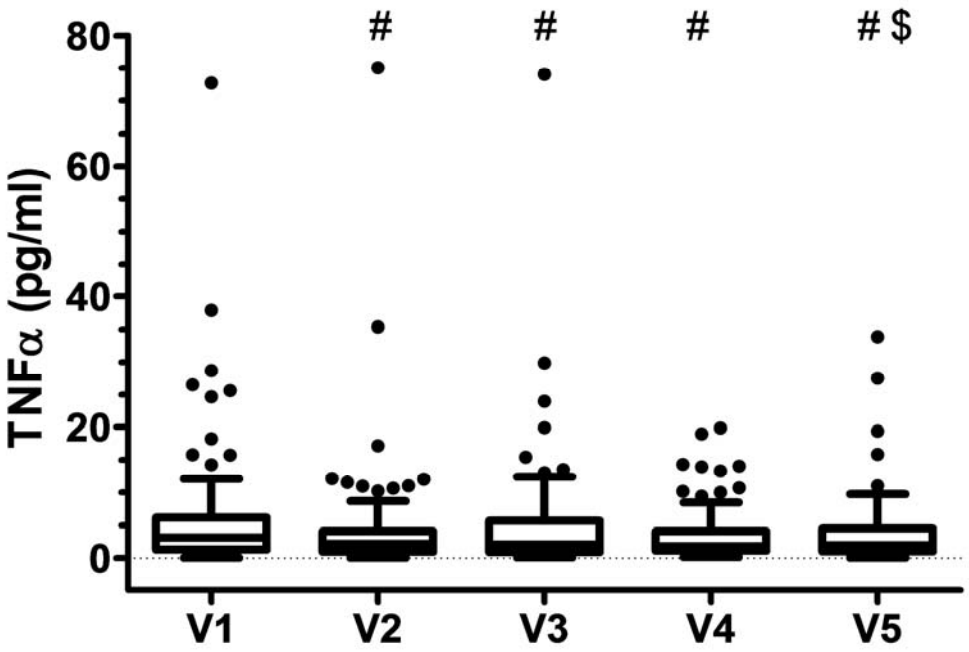

Figure 16: TNF versus time.

 # Significantly different to V1 (p<0.05)

$ Significantly different to V3 (p<0.03)

4.10.1.1 **TNF versus cortisol**

With regards to correlations with cortisol, there were significant associations with *saliva* cortisol at V1 (p=0.0024), but not with *blood* cortisol. There was also an inverse association with 24 hour urine cortisol versus TNF at visit 1 (p=0.0056). There were no significant associations with blood, saliva and urine at visits 2, 3, 4 and 5.

There were no significant correlations between TNF and HAM-D scores over time.

4.10.1.2 **TNF versus IES-R scores**

There were no significant correlations between TNF scores and IES-R scores at any of the four visits.

4.10.1.3 **TNF versus CAPS Scores**

There were no significant correlations between TNF and the CAPS scores (both current and lifetime), at any of the four visits

4.11 **IL6**

Figure 17 and table 19 reflect the medians of the IL6 results.

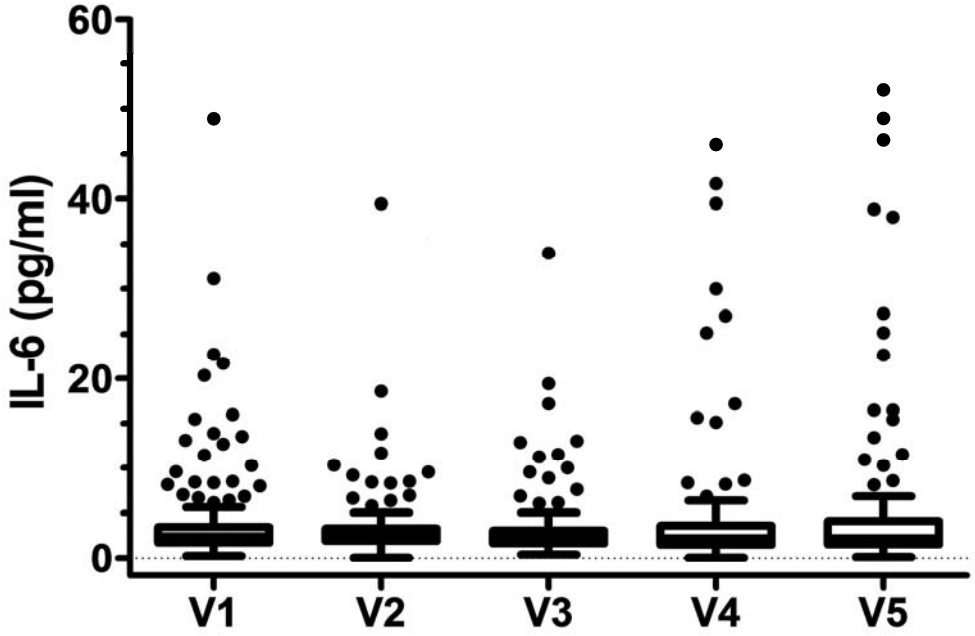

Figure 17 IL-6 versus visit. Box plots show the 25% to 75% quartiles with the line in the box representing the median. The whiskers show the 5% and 95% inclusion limits.

Table 19: IL6 Median Scores

Visit	Median	Range
1	2.37	0.25-31.11
2	2.35	0.058-39.47
3	2.13	0.38-34
4	2.19	0.058-46.06
5	2.19	0.10-48.94

Statistical analysis using log transformation of the data showed that there were no significant differences over time for IL6. There were also no significant associations between the HAM-D scores at each visit and IL6 levels. Similarly, the IES-R scores and IL6 levels were not significantly correlated at any of the visits.

With the exception of visit 4, where current (week) CAPS scores showed a borderline significance with IL6 levels *(p= 0.07*), neither current nor lifetime CAPS scores showed any significant associations with IL6 at any of the visits.

Table 20: Correlations between IL6 and TNF

Visit	**Correlation (r_s)**	**p value**
1	0.44	<0.0001
2	0.26	0.002
3	0.44	<0.0001
4	0.45	<0.0001
5	0.15	0.13

4.12 ASSOCIATIONS BETWEEN IL6 AND URINE, BLOOD AND SALIVA CORTISOL

There was a significant positive correlation between IL6 and saliva cortisol at visit 1 *(p=0.0002).* For urine, there was a significant correlation with IL6 at visit 1 *(p=0.0113),* and at visit 5 *(p=0.0372)*

There were no significant correlations between IL6 and blood cortisol over time.

4.13. SECONDARY ANALYSIS : ANALYSIS OF DIFFERENCES BETWEEN UPPER AND LOWER QUARTILE MEASURES OF CORTISOL

Given the considerable variation evident in the graphs above, an exploratory analysis was further undertaken on some of the cortisol measures. The box and whisker plots highlight the fact that the data are not normally distributed (see figures 13 and 14) and that there are even a number of outliers below and above the 5% and 95% percentiles respectively. Since I have proposed that dysregulation of HPA activity is associated with the development of PTSD, a further analysis of the blood and urine cortisol data was therefore undertaken to explore the highest and lowest data recorded for each visit These two variables of cortisol measure different aspects of HPA axis activity, as explained previously .

The data in the lower quartile (bottom 25%) and upper quartile (top 25%) are those not enclosed by the box in each plot, and represent the highest and lowest responders at each time point. These data were grouped as LOW or HIGH respectively and analysed separately. Product moment correlations were established for the blood and urine cortisol concentrations against all the personality measures and physiological variables. An outline of the relevant correlations, in terms of the study design, appears below. (Table 21)

Visit 1

1. LOW plasma cortisol

Subjects with low plasma cortisol show significant negative correlation with the scores for the borderline (p=0.037) and compulsive (p=0.019) personality traits. Passive aggressive traits on the other hand had a significant positive correlation with plasma cortisol (p=0.016) i.e the higher the passive aggressive trait, the higher the plasma cortisol.

2. HIGH plasma cortisol

The only statistically significant non-spurious association between subjects among the top 25% of blood cortisol and the measured variables was the PTSD measure on the personality scale (p=0.034). Amongst this group, the higher the plasma cortisol the lower the PTSD scores.

3. LOW 24 hour urine cortisol

Subjects with a low 24 h cortisol production displayed significant correlations with the personality traits of dysthymia and passive aggressiveness.

4. HIGH 24-hour urine cortisol

There were no significant correlations with any of the variables studied

Visit 2

1. LOW plasma cortisol

There were no significant correlations with any of the variables studied at this visit

2. HIGH plasma cortisol

There was a significant (p=0.041) negative association with the avoidant scale of the MCMI III i.e. the more avoidant personality types are less likely to have high blood cortisol concentrations

3. LOW 24 hour urine cortisol

Subjects with the passive aggressive personality trait had a significant negative correlation with 24-hour urine cortisol. *(p= 0.035)*

4. HIGH 24-hour urine cortisol

There were no significant associations with any of the variables studied at this visit.

Visit 3

1. LOW plasma cortisol

Subjects with the clinical personality trait of delusional had a significant *(p=.0.10)* negative correlation with plasma. The scores for depression (HAM-D) at visit 2 had a significant positive correlation with plasma cortisol (*p=0.010).* This association is not spurious since, in this longitudinal study, it signifies the impact of depression recorded at

visit 2 as reflected in the blood cortisol response at visit 3 i.e. the more depressed the subject, the more likely they are to respond with a low blood cortisol at visit 3. Likewise, the impact of the subject's PTSD rating scale (IES-R) at visit 2 also had a positive correlation with low blood cortisol at visit 3 (*p = 0.037)* – the higher the scores for IES-R, the higher the tendency to present with low blood cortisol. IL6 at visit 3 showed a negative correlation with low cortisol responders (*p= 0.012*)

2. HIGH plasma cortisol

There were no significant correlations with any of the variables studied.

3. LOW 24 urine cortisol

There were no significant correlations with any of the variables studied.

4. HIGH 24-hour urine cortisol

There were no significant correlations with any of the variables studied.

Visit 4

1. LOW plasma cortisol

The HAM-D at visits 1 and visit 2 had a significant positive correlation with plasma cortisol (HAM-D visit 1 *p=0.033,* HAM-D visit 2 *p=0.035)*. This indicates that those with high scores for depression on the HAM-D at baseline and at visit 2 had an impact on the plasma cortisol at visit 4 for low responders. The IES-R at visit 2 also had a significant positive correlation with plasma cortisol at this visit (*p= 0.021,* indicating that the higher

the score the greater the likelihood of having a low response at visit 4. This suggests that the effect of PTSD scores at visit 2 produce a physiological outcome by visit 4

2. HIGH plasma cortisol

IL6 scores had a significant positive correlation here, indicative of the probable inflammatory response to trauma at this visit. (*p= 0.049)*

3. LOW 24 hour urine cortisol

Schizoid personality style was positively correlated with the 24 hour urine cortisol (*p=0.011).* The CAPS current scores (both week and month at visit 3 was positively correlated with the 24 hour urine at this visit (current week *p= 0.037,* current month *p= 0.038).* At this visit only, saliva cortisol showed a positive correlation with the 24-hour urine cortisol.

4. HIGH 24-hour urine cortisol

Dysthymia was positively correlated with the 24 hour urine cortisol (*p=0.046*. The IES-R at visit 3 was negatively correlated with urine cortisol, suggesting that the subjective PTSD experience at visit 3 had an impact on the urine cortisol recorded at the next visit. (*p= 0.046).* The greater the IES-R score, the less likely the response to cortisol in this group. The CAPS (current month) at visit 3 also had a negative correlation with the 24 hour urine cortisol (*p= 0.098).* The greater the PTSD score at visit 3, the less likely there would be the high response at visit 4.

Visit 5

1. LOW plasma cortisol

Personality traits of anxiety and depression appear to promote the low cortisol response in this group. (For anxiety *p=0.025, for depression p=0.012)*

2. HIGH plasma cortisol

Dysthymia as a personality trait had a significant negative correlation with plasma cortisol in this group (*p=0.012*).

The HAM-D at visit 4 had a significant positive correlation with plasma cortisol (*p=0.011)*

3. LOW 24 hour urine cortisol

Of the personality variables, PTSD and depression were positively associated with 24-hour urine at this last visit. (PTSD *p=0.013,* depression: *p= 0.037*) IES –R scores at visit 2 were also negatively correlated with urine cortisol at this visit. (*p=0.005)*

4. HIGH 24-hour urine cortisol

IL6 at visit 3 was the only variable significantly correlated with the 24-hour urine at visit 5. This showed a positive correlation (*p= 0.034, correlation = 0.408*) indicating the proinflammatory response at visit 3 having an impact on the 24 hour urine cortisol later, at visit 5.

Table 21: Further (subgroup) analysis of Cortisol in terms of low and high responders.

Visit 1			**Visit 2**			**Visit 3**			**Visit 4**			**Visit 5**		
Variable	p	rs	Variable	p	rs	Variable	p	rs	Variable	p	rs	Variable	p	rs
Low Blood cort														
Borderline	0.037	-0.359				*Delusional*	0.003	-0.508	*HAM-D 1*	0.033	0.391	*Anxiety*	0.025	0.414
Compulsive	0.019	-0.4				*HAM-D 2*	0.01	0.45	*HAM-D 2*	0.035	0.386	*Depression*	0.012	0.458
Pass. Aggr.	0.016	0.41				*IES-R 2*	0.037	0.369	*IES -R 2*	0.021	0.42			
						IL6 3	0.012	-0.432						
Urine cort														
Dysthymia	0.014	-0.425	*Pass. aggr.*	0.035	-0.362	*PTSD*	0.045	-0.374	*Schizoid*	0.011	0.51	*PTSD*	0.013	-0.482
Pass. Aggr.	0.007	-0.461				*CAPS 2(c.w.)*	0.004	0.516	*CAPS 3(c.w.)*	0.037	0.428	*Depression*	0.037	-0.411
						CAPS 2(c.m.)	0.038	0.387	*CAPS 3(c.m.)*	0.038	0.488	*IES-R 2*	0.005	-0.53
High Blood Cort														
PTSD	0.034	-0.359	*Avoidant*	0.041	-0.358							*Dysthymia*	0.012	-0.458
												HAM-D4	0.011	0.466
Urine Cort									*Dysthymia*	0.046	0.0402			
									IES-R 3	0.046	-0.411			
									CAPS 3(c.m.)	0.098	-0.354			

cort = cortisol, Pass.Aggr. = Passive Agressive;

Chapter 5

Discussion

INTRODUCTION

In this prospective study, biological correlates of the stress response (cortisol secretion and the inflammatory response, measured by the cytokines IL-6 and TNF) were investigated in a cohort of newly recruited metro police officers as they were exposed to their jobs that involved events that were potentially traumatic in nature. The CAPS rating scale as well as the revised version of the Impact of Events Scale (IES-R) captured measures of traumatic stress. The HAM-D rating scale was used to measure depressive symptoms. In addition to sociodemographic factors, personality profiles were ascertained by means of the MCMI III at baseline.

Although only 145 recruits enrolled for the study – out of a potential 400 subjects – this is to be expected in voluntary studies requiring repeated measures follow up, with urine and blood sampling. It is notable that, despite these factors, 82.8 % of the subjects that were followed up over a year completed all five visits.

Key findings were:

1) The remarkably high trauma exposure at baseline.

2) There was evidence for the influence of prior trauma on responses to current traumatic events.

3) Certain traumas were associated with greater changes in scores for PTSD and depression in relation to baseline.

4) 24 hour urine cortisol tended to initially decrease, and then increase with time.

5) Saliva and blood cortisol, which were more reliably measured, tended to decrease with time.

6) Scores for depression and post traumatic stress disorder were generally low in response to duty related traumatic events, and tended to decrease over time. However, the prevalence of lifetime PTSD as measured by the CAPS was high.

7) There was a strong linear correlation between TNF and IL6, and a suggestion of a proinflammatory response, particularly with regard to IL6.

8) There were no significant correlations between blood cortisol and HAM-D and between blood cortisol and CAPS (lifetime).

9) There was an inverse relationship between CAPS (current scores) and blood cortisol.

10) For saliva, there were no significant associations with any of the variables for PTSD and depression.

11) For personality styles, aggressive and antisocial clinical patterns were associated with lower current CAPS scores, while schizoid clinical pattern and the severe syndrome scale of thought disorder showed an association with lower lifetime CAPS score. For the IES-R, only narcissistic clinical pattern was associated with lower scores.

12) Lowered cortisol levels with chronic trauma exposure did not correlate with sufficiently high scores for PTSD as measured by the CAPS. Similarly, proinflammatory cytokine increases are evident with trauma exposure, but not with scores for PTSD and depression.

13) There were more variables significantly associated with the low cortisol responders than the high cortisol responders; with a suggestion of cumulative trauma exposure correlating with low cortisol response and a corresponding pro inflammatory response in terms of IL6. A detailed discussion of the component findings follows.

5.1 DESCRIPTIVE ANALYSIS

5.1.1 Demographics

The sample was almost equally distributed in terms of gender, with the majority being female. This was somewhat surprising given that males typically dominate police services; however, there could be several reasons for this. Firstly, this was the metro police services, not the general police services; hence females may have been more drawn to this police force as it deals with a specific area of policing. The study took place at a time when South Africa was preparing for the Federation of International Football Association (FIFA) world cup to be held in 2010 and there was a strong drive to employ as many people as possible to fulfill security needs. Thirdly, it may be a reflection of the unemployment rate in South Africa, with many women undertaking on the job training, where they may be assured of benefits and a possible career, as opposed to just a job.

Of course, it may simply be that in this research study more females chose to volunteer than males. The gender ratio for new recruits during the study period is unknown; therefore the female preponderance could have been simply due to sampling bias.

The mean age of the sample was relatively old, perhaps simply reflecting the fact that this was not the first job for many – the number of previously employed subjects was

73%. Apart from being previously employed, 99.3% had obtained at least a matric level of education, with 48.3% having attained some sort of post matric education. All of this imparts life experience and hence exposure to traumatic events in a society that has documented high levels of crime and violence. Again, the evidence from the trauma history exposure at visit 2 with the administration of the CAPS confirms this.

It is important to note these demographic findings may not be representative of the SA Metro police force as only 145 out of a potential 400 new cadets volunteered for the study.

5.1.2 **Habits**

Of their habits, the concerning factor was the number of subjects who admitted to regular alcohol use (51%). Likewise, many (49%) denied any alcohol use at all. The reliability of this is questionable as many who used alcohol may have chosen to deny it. For those who did admit to regular alcohol use, this may have had implications for their coping style in the face of trauma exposure and may have contributed to the masking of symptoms as well, since despite continuous trauma exposure, scores for CAPS (particularly current) and IES, as well as HAM-D were remarkably low over the five visits.

The high number of smokers may have implications for cortisol levels. Although the subjects were instructed not to smoke within half an hour before sampling, reliability of abstention could not be guaranteed.

5.1.3 **Family History**

Other important sociodemographic variables such as family psychiatric histories, including alcoholism and suicides, as well as prior contact with psychological services are risk factors noted in the literature for the development of both depression and PTSD. (Yehuda, 2004, Breslau, 1991, Davidson, 1991). The present study was too small to allow direct comment on these factors, but was noted to be present in 5 people (family psychiatric history), 10 people (family history of suicides) and 27 people (family history of alcoholism). The fact that 15 people had previous contact with psychological services raises the question of previous trauma exposure and sensitization of the HPA axis. This could have lead to hypocortisolaemia in the face of PTSD later on in life on exposure to trauma as found by Yehuda and others.

5.2 **PERSONALITY STYLES (MCMI III RESULTS)**

According to Millon, the MCMI III is not a general personality instrument to be used for normal populations. However, it may be used for diagnostic screening (Millon, 1997). The instrument is likely to overpathologise and tends to produce false positives when it is used in non-clinical populations. Results should therefore be interpreted with caution. The profile that typifies the defended normal respondent includes spurious elevations of narcissistic, histrionic and compulsive scales. The results indicate that most of the officers answered the questions honestly, with only six profiles being invalid. The fact that the clinical syndrome of anxiety was the most commonly present in 64.8% (BR>75) of subjects raises the question of whether this was a spuriously anxious group or whether the clinical picture was due trauma already experienced, or due to the impending course and expected trauma exposure. However, the PTSD clinical

syndrome scale was raised (>75 BR) in only 12 subjects. This is not in keeping with the CAPS lifetime rating for PTSD at visit 2 (almost 20%). As the CAPS is a structured tool known for its reliability in picking up clinical PTSD, it is likely that this is more valid than the MCMI III. Alcohol dependence was also picked up in one subject, whereas from the questionnaire 51% admitted to alcohol use. While this could be due to under reporting, it must be remembered that the questionnaire simply screened for alcohol use (by asking), not frank dependence. Still, these discrepancies highlight the challenges of using the MCMI III in this population. In as much as the MCMI III correlates with the DSM, it is after all a personality inventory, and hence may be deficient in assessing DSM Axis I pathology such as an anxiety disorder such as PTSD and alcohol abuse and dependence. As its original use was intended for a "sick" population, perhaps specific measures of coping styles would have been more appropriate to use. However, the researcher would argue that personality style was a main objective of the study, and pathology was sought in this population, and as stated earlier, the MCMI III may be used for diagnostic screening.

Schommer et al (1999) investigated personality traits and cortisol responses. They found no association with personality traits and circadian cortisol rhythm or a single cortisol stress response (Schommer et al, 1999). In this research study, the personality trait narcissism may have conferred a protection against the development of traumatic stress symptoms at visit 3, as this was the only style significantly associated (inverse relationship) with the IES-R at this time. Thought disorder on the other hand and its association with significantly raised scores on the HAM-D at visit 1 is a difficult concept to analyse, as clinically none of the subjects were psychotic.

5.3 **TRAUMATIC EVENTS EXPERIENCED**

Exposure to trauma is common - with 39% to 90% of the population being exposed to at least one lifetime trauma. Rates of PTSD in the general United States population range from 1%-9.2%, and up to 14% in women (Meltzer, Brody et al; 2000). In the National Comorbidity survey Kessler et al found the lifetime prevalence of PTSD to be around 7.8%, and in primary care populations, the rate of PTSD is reported to be between 7% and 10% (Walker et al, 2003). South Africa is particularly burdened with traumatic events due to high levels of crime. This study concurred with the literature that trauma exposure is common- at visit 2 when documentation of trauma exposure first occurred, 99% of the subjects had been exposed to at least one traumatic event in their lifetimes. Of note is the number of subjects who had been exposed to more than one traumatic event (61.1%). For police officers, the exposure to traumatic stressors is greater than in the rest of the population, and like other emergency personnel, they are not immune to developing PTSD when exposed to trauma (Carlier et al, 2007). MVA's – either personally experienced or witnessed prior to entry into the metro police programme; or having to deal with as part of their normal duties emerged as the commonest type of trauma experienced by the subjects. The unexpected death of a loved one as a traumatic experience was the only category experienced by more subjects at visit 2 than MVA's. Personal life stressors and their impact on job performance is an area where intervention may be sought in this population. MVA's are particularly notorious on SA roads and since metro police officers spend a lot of their time on the road, the finding of MVAs as being the most common traumatic event that they found stressful is not surprising

5.4 SCORES FOR DEPRESSION (HAM-D SCORES)

Despite the (expected) high rate of trauma exposure, scores for the HAM-D, CAPS and IES were not generally high. The highest scores for the HAM-D occurred at visit 2, with 10.21% of the subjects having scores in the "less than minor depression" range (score between 8 and 12). This was not clinically significant. In fact scores were higher – though not significantly so – earlier on in the study rather than later. This suggests either an adaptation to their job routines, or a "false" higher score earlier on due to stressors of the theoretical aspects of the course. Two subjects had scores that fell into the "major depression" category. This occurred at visit 1 and visit 3. Conclusions cannot be drawn because the scores were borderline high (18 in both cases), and the sample size was small. The finding of a significant difference between males and females at baseline and visit 2 (females scored higher for depression) is not surprising, given that in general females tend to have higher rates of depression than men do. However, the fact that this difference is not sustained at subsequent visits raises the question of whether women are no different to men when it comes to adaptation to police work. The small sample size and the scope of this study did not warrant further study thereof. The finding of the association with the severe pathology scale of thought disorder at baseline is intriguing and probably of no clinical relevance.

5.5 CAPS SCORES

With regard to PTSD prevalence in this sample, CAPS scores of 40 and more are were recorded as high and indicative of PTSD, and low if the scores were between 20 and 40. PTSD was present for Lifetime scores at a rate of 20.86% (visit 2) to 21.01% at visit 5, with a mean of 19.96%. This figure is notably high, and is generally higher than current

CAPS scores throughout the five visits. The current CAPS scores were indicative of PTSD symptoms related to traumatic events experienced during the past week and month. The high lifetime scores is testimony to the high trauma exposure prior to any police work, and the fact that this trend continued throughout the five visits, suggests the impact of previous trauma on current functioning. It is notable that prior traumas seemed not to confer added stress on current exposure, as scores for the current CAPS were not significantly increased due to prior trauma exposure. This is in keeping with the findings of Brewin (2000) who suggested that factors other than prior trauma may play a role in the development of PTSD, such as those related to the event itself, as well as victim support

The fact that the lifetime scores were high at visit 2 (taken as the baseline for CAPS rating scale) with the mean over five visits reaching almost 20%, is in keeping with other African studies in various settings (Karunakara and Neuner, 2004; Roberts et al, 2009; Njenga et al, 2006; Srinivasa and Lakshminaraya, 2006; Van Zyl et al, 2008; Ayinmode and Tunde-Ayinmode, 2008; Willliams et al, 2007).

However, compared with other studies in police populations the prevalence rate is somewhat higher. Carlier et al (1997), in a sample of Dutch police officers, reported a 7% prevalence of PTSD, whereas 34% had partial or sub threshold PTSD. Maia et al (2007) confirmed a PTSD prevalence rate of 8.9% (full PTSD) and 16% (partial PTSD) in an elite unit of Brazilian police officers. This may be due to the higher rates of violent crime exposure being experienced by South Africans, and the prior (non-duty related) traumas experienced before entry into the metro police services. The effect of additional life stressors as a risk factor for PTSD has been noted by Brewin (2000) and may be at play in this study.

The interestingly low rates of PTSD related to current events raises important questions. Literature has suggested a cumulative effect of stress due to prior trauma for current exposure. The findings in this study are then surprising given that one would expect higher scores related to more (and cumulative) trauma exposure.

Adaptation, due to resilience and personality factors, may be at work here or the fact that the "events" are experienced as simply part of their "normal duties."

Firstly, they could have adapted well to their work situation. Alternatively, the police officers could be exhibiting the phenomenon of "*negative resilience*" a term coined by Friedman and Higson Smith (2002). This is a term originally derived from the "twin peaks " model (Friedman, 2000) and is used to denote the period in between initial exposure – during which time there is some sort of traumatic stress response and the eventual development of PTSD. It is charactersised by dissociation, numbing, and denial, and deemed "negative" as the concerns around denial and numbing selectively tend to become part of the personality often termed "tough cop." There may also be a tendency to resort to the use of substances in order to keep the resilience in the face of multiple traumas. According to Friedman and Higson-Smith (2002), denial and numbing often leads to a "don't care" attitude, corruption may be the very easy next step; and finally because this type of resilience does not last forever and is likely to result in the second peak or burnout/PTSD. In military populations, the period of negative resilience has been touted to last up to 16 years, whereas in the SAPS, 3-4 years has been the suggested number of years (Friedman and Higson- Smith, 2002). Since the current study period was 1 year, it is possible then that it may be early days, the time when "negative resilience" is in full swing, too early to pick up PTSD. The findings of the personality variables (aggression and antisocial) that were significantly associated with lower current CAPS scores as well as schizoid personality style that was significantly

associated with lifetime CAPS scores at visit 5 may suggest that these personality styles may confer protection against the development of PTSD. However, the earlier criticisms of over pathologising a non-clinical population must be borne in mind, and the findings may again have no clinical relevance.

5.6 IES –R SCORES

Scores on the IES-R, which is a subjective rating scale, were also not particularly high with a range from 0 to 68. The IES-R is not generally used as a categorical measure, and cut-off's for PTSD are not noted in the literature. Some researchers, e.g. Roe-Berning state that "Given a possible range of 0 to 88, a meaningful score on the IES-R is considered to be 24 and above" (Roe-Berning, 2009). Creamer et al (2003) suggest that scores of 33 and over are representative of significant post-traumatic stress with PTSD a clinical concern (Creamer et al; 2003).

The highest scores occurred at visit 2, which did not concur with the CAPS scores (both current and lifetime). When assessing traumatic stress symptoms rather than PTSD, the subjectivity of the IES may play a significant role and may be a more reliable indicator of the impact of events rather than the objectively rated CAPS. The fact that the mean HAM-D was also highest at visit 2, suggests that "stress" was 'felt' more at this visit by the subjects, even though it was not picked up by the CAPS. The entity of subsyndromal/subthreshold PTSD must be considered – whilst not full-blown PTSD, according to DSM IV-R, traumatic stress symptoms were picked up which may warrant attention. This brings to mind the criticisms of the nomenclature and strict criteria by which the diagnosis of PTSD is made in the DSM IV.

In as much as PTSD may be over diagnosed, particularly in a population that lends itself to numerous traumatic stressors, the under recognition of symptoms that do not meet full criteria for a disorder may lead to continued psychopathology, decreased work performance and absenteeism warrants attention. Interventions that consider this would possibly improve work performance. This could take the form of support and counseling following traumas that have been noted to have an impact on the police officers, as well as regular follow up and supervision by trained staff.

5.7 THE IMPACT OF TRAUMA EXPOSURE ON IES-R AND CAPS SCORES.

5.7.1 The Impact of trauma exposure on the HAM-D.

MVA's and cases of domestic violence, which are the most common duty related traumas, were not the events that resulted in changes in depressive scores.
From the stepwise regression, it can be seen that the change in HAM-D scores is explained by exposure to the traumas of shooting incidents, armed robbery, murder and attempted murder, guarding dead bodies and mortuary exposure in 50% of cases. This raises issues of appropriate interventions that can be offered to the police officers. Whilst not much else can be done about the pretraumatic factors, after exposure to these particular traumas (shooting incidents, armed robbery, murder and attempted murder; guarding dead bodies and mortuary exposure) it may be useful to offer support and counselling. The more frequently experienced duty related traumas such as motor vehicle accidents and domestic violence cases were not associated with significant changes in HAM-D scoresThe negative relationship between the baseline HAM-D and deterioration from visit I to visit 5 raises interesting questions. It is possible that factors beyond the actual trauma contribute to a relative improvement in HAM-D scores over

time. Apart from a genuine adaptation to the trauma over time, factors such as sensitisation to the job experience, the sense of belonging policework offers the group or the concept of negative resilience may also be at play.

5.7.2 **The Impact of trauma exposure on IES-R and CAPS scores.**

This study showed that the higher the initial IES-R score, the greater the changes in IES-R scores. This could indicate that, over time, these officers were less affected by the traumas they experienced on duty. This is not surprising for new recruits, and also from the point of view that the follow up period was only one year. One can only speculate as to whether longer-term cumulative traumatic events lead to full blown PTSD. For the objectively rated CAPS, traumas such as rape and death of colleagues emerged as having a significant impact on changes in scores. While there is no relationship between the baseline lifetime CAPS scores and the change in score over time, the current CAPS scores are affected by its baseline value, its value at end point, as well as duty related traumas such as housebreaking, assault cases and smash and grab incidents. In this study, despite the high exposure to MVA's, this was not associated with PTSD. Edwards (2005) notes that PTSD is a common consequence of motor vehicle accidents. These are a serious problem throughout Africa, where limited resources in terms of policing mean that driving without a licence, driving under the influence of alcohol, and breaches of the basic safety rules of driving are all too common. South Africa is no exception. Bradshaw *et al.* (2003) observe that figures for total annual MVA fatalities in South Africa vary, possibly because some figures reflect deaths at the scene, and others include deaths that occur subsequently. They estimated that there were 18 446 MVA fatalities in 2000 while figures from the ArriveAlive (2005) website range from 11 000 to 12 300 for

2001 to 2003 with fatalities in 2003 involving 3 356 drivers, 3 728 passengers and 5 269 pedestrians.

The scatterplot again shows a negative correlation. Pretraumatic factors may have played a role in the sensitising of policemen to trauma, as well as in the learning to process trauma, suggesting that the higher the baseline CAPS scores, the better the subjects tend to do.

Ordinary job stress and stress related to the organization, while not frequently mentioned, was noted in the interviews with the subjects. This is in keeping with the literature related to organizational stress and police officers in the workplace – both internationally (Weiman, 1977, Carlier et al, 2007) and nationally (Friedman M and Higson Smith C, 2002, Pienaar and Rothman, 2007). Post apartheid, many organizations in public sectors underwent radical changes to accommodate new management structures. This has led to numerous frustrations and job stress (Rothman and Pienaar, 2007). Everyday life stressors (relationship problems, financial worries, etc) were also noted and may have contributed to mood and anxiety symptoms expressed. The South African Stress and Health (SASH) study, also found strong associations between common mental disorders and a number of both recent and early life stressors (Seedat et al, 2009). While the current study did not focus on life stressors as such, the fact that scores for traumatic stress as rated by the CAPS and IES-R scales were generally low, and that many subjects rated their personal life stressors as particularly difficult, again suggests that a focus for intervention at the metro police departments should perhaps concentrate on social support for the officers in addition to interventions aimed at management of traumatic stress.

5.8 CORTISOL AND TRAUMA

The literature indicates that while many studies report an association between PTSD and lower cortisol levels, this has not been a consistent finding (Yehuda, 2002; Rasmusson et al 2003). The influence of previous trauma exposure, leading to sensitization of the HPA axis, suggests that baseline cortisol, prior to trauma exposure, must be examined. This study provided that opportunity, in that cortisol responses were investigated in subjects who were naïve to "duty related trauma" and who then experienced exposure to this type of trauma. Although it may be suggested that cortisol responses may be directly related to these trauma exposures the impact of non-duty related traumas, everyday, non-traumatic stressors, as well as job related stressors such as the organizational structure, supervisory problems, and work schedules cannot be ignored and is a limitation in terms of interpreting the laboratory results.

5.8.1 Plasma and Saliva Cortisol Secretion

As a group, blood (plasma) cortisol in this population showed significant decreases at visit 3 compared with visit 1. Saliva cortisol also indicated significant decreases from visit 1 to visit 3, and again at visit 4 and 5. Trauma exposure, in terms of being stationed at the police station as opposed to the theoretical part of the training programme, is significant here in terms of the timing of cortisol sampling, and may indicate that greater trauma exposure correlates with lowered cortisol levels. These results then disprove the hypothesis that cortisol remains unchanged with trauma exposure in this population and is in keeping with literature on lowered cortisol levels with higher levels of trauma. Although corresponding measures for PTSD were not high on interview (apart from the

lifetime PTSD), it is postulated that biological measures of the stress response (an objective measure) may be more reflective of traumatic stress responses.

Studies examining the circadian cortisol rhythm in saliva have similarly shown inconsistent results. Adult PTSD patients demonstrated a reduced cortisol increase 30-60 minutes after awakening (Wessel et al, 2006), while other studies (Young and Breslau, 2004) reported elevated evening saliva cortisol levels in PTSD patients compared to non PTSD and control subjects and increased salivary cortisol values in women with lifetime PTSD (Inslicht et al, 2006). The direction of HPA activity as evidenced by peripheral cortisol measures may depend on age, gender, type and chronicity of stressor, co-morbid depression or other psychopathology, alcohol use and time since the traumatic experience. In this study, unreliability was minimized since the researcher collected the saliva and blood samples. There were only a few samples that were contaminated with coffee and colourants. However, subjects were not screened for oral health, so that blood or lesions in the mouth may have contaminated the recorded data – again making it unreliable for this group of subjects.

The sampling method provided point samples of cortisol; and whilst this was consistent across the groups and across all five visits, they were not taken 30 minutes post awakening- which is when cortisol levels peak and provide an accurate measure of cortisol excretion and would have minimized the diurnal variation and variability within subjects.

Despite low actual scores on the CAPS, there is a significant inverse relationship between current CAPS scores and lowered plasma cortisol at visits 2, 4 and 5 again. This is in keeping with literature supporting the link between low blood cortisol and traumatic stress responses in terms of anxiety.

5.8.2 **Urinary Cortisol Secretion**

Measuring cortisol in urine has been noted to be a reliable indicator of urinary excretion over time and 15 hour samples (Delahunty et al, 2000) and 24 hour sampling (Pitman and Orr, 1990; Yehuda et al 1991, 1995; Yehuda 2001) methods have been employed to study cortisol excretion. Studies have shown contradictory results for this peripheral measurement - low urinary 24 hr free cortisol in the majority of studies (Pitman and Orr, 1990; Yehuda et al 1991, 1995; Yehuda 2001), low or normal plasma cortisol levels (Boscarino 1996; Yehuda 2001) or even high cortisol levels (Lemieux and Coe 1995, Maes et al 1998). The current study had a high number of invalid samples – approximately one third of the samples were invalid; either due to low volumes, or diluted samples ("topped up" with water or other liquids). This is due to the fact that the researcher was reliant upon the subjects to hand in valid 24 hour samples. Nevertheless, for the remaining samples, the results did indicate that scores were within the normal range across all five visits. Significant differences were noted between the visits (2 compared with visit 1- where scores were significantly lower), and at visit 4 compared with visit 1 (significantly higher scores), and again at visit 5 compared with visit 2 (significantly higher scores). These changes indicate initial decreases and subsequent increases in cortisol secretion over time. Levels of traumatic stress increased at visit 3 (the time when police work was undertaken at police stations, with the theoretical training completed) and could hence account for increases in cortisol excretion. However, there were no correlating increases in scores for HAM-D, CAPS or IES-R. Given the limitations of urine sampling alluded to above it is likely that saliva may be more reliable indicators of the patterns of cortisol responses.

5.9 **THE INFLAMMATORY RESPONSE**

Research has also focused on proinflammatory cytokines such as interleukin -6 and TNF α as indicators of the inflammatory response to physical and emotional stress and disruption of the HPA axis (Chrousos 1995; von Kanel et al, 2007). These cytokines interact with the HPA axis at the hypothalamic pituitary and adrenal levels and their concentrations may represent a biomarker of distress. In adults with PTSD, the majority of studies reported increased levels of circulating or CSF proinflammatory cytokines (Maes et al 1999; Baker et al, 2001; Rohleder et al 2004).

The current study, which investigated both IL-6 and TNF found a strong correlation between IL6 and TNF for the first four visits. For TNF, there were significant differences between visit 1 (baseline) and visit 5 (at the end of the study), and between visit 1 and visit 4. For IL6, there were no significant differences over time between visits. As a group, the results suggest a proinflammatory response to trauma exposure for TNF. There were no significant associations between TNF and any of the measures for psychopathology. Studies have shown an inverse relationship between plasma cortisol and cytokines in mild psychological stress (Kunz-Ebrecht et al, 2003). This study found no significant associations between TNF and blood cortisol, but did find an inverse correlation with saliva cortisol at visit 1. For IL6, while there were also no significant associations with any of the measures for psychopathology at any of the visits, there were significant correlations with both urine and saliva cortisol at visit 1, and with urine cortisol at visit 5. It is possible that during the first 3 months (correlating with visits 1 and 2) the subjects may have experienced as mild psychological stress as they were still being exposed to the theoretical aspects of their training and were involved in writing exams rather than working at the police stations where stressors were more traumatic in

nature. However, non-duty related traumas continued to occur, and this must be taken into account. Overall, the results support the hypothesis of an inflammatory response to traumatic stress.

5.10 SUBGROUP (EXPLORATORY) ANALYSIS

The conflicting findings of the group as a whole, as well as the large variances noted in the data, led the investigator to analyze the data further by separating the subjects into groups that responded with “low” cortisol and “high” cortisol. A visit-by-visit analysis reveals several important issues: (table 20)

Firstly, the presence of the personality variable PTSD at baseline (V1) in the subjects with high cortisol responses is significant, as it is indicative of possible PTSD relating to prior trauma exposure. The other personality variables (borderline, compulsive passive aggressive and dysthymia) were associated with low blood cortisol. This could be indicative of certain personality types responding with low cortisol at baseline. Although no duty related trauma expose had occurred, and indeed very little exposure to theoretical aspects of the training, one could postulate that these responses could be in keeping with mild psychological distress, or anticipatory anxiety. At visit 2, passive aggressive traits are again associated with low urine cortisol. Passive aggression (as opposed to overt aggression) may be construed as having greater threshold for stress (at visit 2, the subjects were involved in many tests as part of their assessment process), and hence lower output of cortisol. At visit 3, the effects of the measures for depression and PTSD (HAM-D, IES-R and CAPS) at the previous visits are seen. The HAM-D at visit 2 and the IES-R 2 are associated with low blood cortisol, whereas the CAPS at visit 2 (both current week and current month) is associated with low urine cortisol. The

personality variable PTSD also emerges here as being associated with low urine cortisol. Both these findings are in keeping with the early literature that showed decreased 24-hour urine cortisol in PTSD (Mason et al, 1986; Yehuda et al, 1990; Yehuda et al 1993; Yehuda et al 1995). It is likely that depression is related to blood cortisol at that time, while PTSD is associated with the urine cortisol (reflecting HPA axis function). Likewise, at visit 4, the impact of what is felt at prior visits are significantly associated with cortisol output. Here HAM-D from both visits 1 and 2 has an impact on low blood cortisol, together with IES-R from visit 2. Interestingly, the subjective measure for PTSD is associated with blood cortisol, whereas the objective measure, the CAPS is associated with urine cortisol. This pattern is sustained for the CAPS at all visits, but the IES-R at visit 3 is associated with high urine cortisol. Again, point sampling of cortisol reflects the measure at that time, whereas 24-hour urine output reflects HPA function and impact on cortisol output. At visit 5, several personality variables are significantly associated with low cortisol particularly, but also with high blood cortisol (dysthymia). Importantly, these personality variables are clinical variables associated with mood and anxiety (anxiety, depression, PTSD and dysthymia). This suggests the clinical impact of these personality types on cortisol output (predominantly low). For the first time, the HAM-D at visit 4 is associated with high blood cortisol at this visit. Once again, depression may be best assessed from blood cortisol values and PTSD with urine cortisol excretion. No less than nine personality variables had significant associations with low cortisol at different visits – some for both urine and blood. The hypothesis that certain personality styles are prevalent in those that develop PTSD cannot be proven in this study, However, this subgroup analysis hints at a correlation between personality style and cortisol secretion for certain personality types (with the association with low cortisol), when the MCMII III is used. The findings at visits 3, 4, and 5 suggest the impact of cumulative trauma; and secondly the impact of previous scores for depression and PTSD having an impact. Visit

3 was particularly important in that this was the first exposure to the police stations (with more severe trauma exposure). With regards to the cytokines, an impact is noted from visit 3 only, with IL6 at visit 3 having a significant positive association, indicating activation of the inflammatory response at this visit. At visit 4, the effects of depression and PTSD from visit 1, 2 and 3 are seen, again signifying the cumulative effects of trauma leading to lowered cortisol. Likewise, at visit 5 previous scores for PTSD and depression as well as previous IL6 responses have an effect on low cortisol.

The fact that there were many more variables related with subjects in the low cortisol responder group suggests the HPA dysregulation and its association with low cortisol response in the face of trauma as indicated in the literature. Likewise, the inflammatory response is in keeping with a cortisol response to increased IL6. IL6 stimulates the HPA axis. Usually, this effect is dampened with longer duration, and the HPA axis is negatively down regulated, leading to lowered cortisol. It may be that the duration of this study did not allow these findings to manifest. Alternatively, it could be a valid reflection of sensitisation of the HPA axis.

5.11 **LIMITATIONS OF THE STUDY**

There are several limitations of this study. Firstly, the relatively small sample size, together with the attrition rate of the subjects must be commented upon, as it limits the validity and the application of the results. Since only 145 out of a potential 400 police officers volunteered for the study, findings may not be generalisable to the entire metro police force. The numbers of invalid urine samples handed in does not allow one to comment on reliability of 24-hour urine cortisol measures as an indicator of the traumatic stress response. The other laboratory measures may also have some limitations.

Physiologically, point morning samples of cortisol were assayed, not peak samples (30 minutes post awakening). The variables that could potentially affect cortisol secretion, particularly salivary cortisol such as sleep deprivation, shift work, caffeine, alcohol, meal intake, female menstrual cycle and use of the oral contraceptive pill were not always assessed or accounted for.

The tool used for personality style is geared towards picking up personality pathology in a clinical population, not the normal population. Whilst one could argue that personality pathology was sought in this population, essentially the cohort of police officers should be regarded as a non-clinical population and perhaps a scale more appropriate to this population, particularly with a focus on coping style, should have been used. The difficulty of being able to comment on personality pathology is made even greater by the fact that structured clinical interviews were not done with each subject. Constructs such as social support and resilience were also not assessed in this study. Cloninger's Temperament and Character Inventory (TCI) should be considered as an alternative tool in future studies of this nature, as it captures risk taking, spirituality and other interesting personality dimensions (Cloninger, 2000)

The effect of other routine work stressors such as administrative issues, difficulties with supervisors, shift work and other non-duty related everyday stressors such as financial problem and relationship problems were not directly measured as well. This could have affected both physiological and non-physiological variables.

The relatively lower number of subjects that had completed every visit also limits the results of the cortisol and inflammatory markers. This, together with the much lower number of invalid urine samples handed in made it difficult to ascertain a true reflection of cortisol and cytokine responses over time. By subdividing the group into high and low

cortisol responders, an attempt was made to comment more directly on these responses.

The ability to generalize these results to the SAPS is also an issue, as the results may have implications for the metro police officers only. There may also have been a sampling bias in that subjects who had not volunteered for the research study may have had less or more trauma exposure with a different pattern of baseline cortisols and personality variables. The duration of the study was only one year, half of which was spent in the classroom. In addition to the limitations of assessing exam stress and other everyday routine stressors in addition to traumatic stress, a period of study does not allow for adjustment to the police force and the nature of the job.

5.12 **CONCLUSIONS**

Despite the limitations, some important conclusions can be drawn:

Trauma exposure is common in SA, especially among police officers. Metro police officers, whose work is primarly on the road, are no exception. In fact even prior to entry into the metro police force, the majority of subjects entering the programme will have been exposed to at least one major traumatic event in their lifetimes. Traumas experienced on duty are typically MVA's and other duty related traumas. However, many police officers experience non-duty related traumatic events during their training and work that impact on their functioning in a meaningful way. Despite this, PTSD is not a natural consequence. In general, Metro police officers are not prepared for the trauma exposure. This is indicated by the subjective experience as told to the investigator.

Duty related traumatic events are not associated with high rates of PTSD i.e. rates for current PTSD according to the CAPS were strikingly low. Certain traumas may play a role in determining responses in terms of depression and PTSD. The more severe traumatic events such as rape and murder tend to lead to more severe pathology, concurring with the literature. As a group, pretraumatic factors are important in that prior exposure may contribute to responses at the end of one year. This has implications for interventions that could be put in place at the metro police force, firstly in the application process, and secondly upon exposure to certain traumas whilst on duty. The more traumatised individuals are at the beginning of their training, the better their outcome after one year. This may be due to sensitising of the HPA axis implicating the role of biological factors contributing to PTSD. Factors such as the use of alcohol may contribute to the masking of symptoms, hence low scores for current PTSD.

Personality factors do not play a major role in predicting response to trauma i.e. there is no single personality style that correlates with the development of PTSD. However, certain personality types may have significant associations with (low) cortisol responses

Cortisol secretion as measured by urine, blood and saliva showed inconsistent results in that blood, saliva and 24 hour urine cortisol did not correlate with each other. Saliva cortisol was the least sensitive indicator of cortisol response. HPA dysregulation and its association with low cortisol response in the face of trauma may be implied by the results of the further analysis of high and low cortisol groups.

The inflammatory response as shown by the positive correlation between IL6 and cortisol at visit 4 is indicative of the effect of IL6 on the HPA axis leading to increased

cortisol in a linear fashion. This was also at a time of greater trauma exposure in the training period. TNF did not emerge as a significant physiological variable in terms of its sensitivity to the traumatic stress response.

The type of trauma (both duty related and non-duty related) emerged as a factor determining difficulties with coping. Particularly during exposure to SAPS work, once theoretical aspects of the training have been completed, there is a higher incidence of psychopathology, especially when confronted with MVA's, domestic violence cases and assault. The key finding of pre-trauma factors (rather than peritrauma and post trauma factors) emerging as an important determinant of outcome has relevance for the screening of new recruits, as well as for interventions during the operation of duties.

Applicability to the larger South African police services, and indeed police services internationally, should also be investigated, since the metro police force and SAPS share common duties and traumatic stress exposure in the SAPS may be similar.

Chapter 6

Recommendations

6.1 INTRODUCTION

This research study integrating physiological and non-physiological variables pertaining to the neurobiology of the traumatic stress response in SA metro police officers has certain merits. In keeping with the objectives of the study, recommendations for the SA Metro police department are discussed. Next, some important recommendations drawn from the conclusions as well as recommendations to improve our knowledge on this subject are discussed.

6.2 RECOMMENDATIONS FOR THE METRO POLICE DEPARTMENT

It is recommended that the interviewing process for entry into the metro police force be more structured, with a focus on personality style and particular reference to coping strategies in the face of stress. If possible, screening for substance use, particularly alcohol, should be implemented. The current Intake process does not make use of any tool to assess personality. Management should consider questions around coping style and resilience in the face of trauma, as well as current social support during the recruitment interview.

Throughout the training period, attention should be given to critical periods of stress exposure, for example during placement at the police stations. Management and supervisors should be attentive to absenteeism and alcohol use at these times, as these

may signify trauma related difficulties and coping mechanisms. They should also consider qualitatively checking for substances of abuse by random urine/blood sampling (toxicological screening), as is done with many high risk occupations such as train drivers and pilots as part of an extended occupational medicine service.

In this research study, no single personality profile determined the response to trauma exposure. Rather, the type of trauma (duty related and non-duty related) emerged as a factor determining difficulties with coping. Management should also consider mediating factors within the work force that lead to mood and stress symptoms, as not all trauma exposure will lead to PTSD and/or depression. This could be linked with stress within the organization, problems with supervisors, salary issues and shift work.

It is further recommended that programmes that are geared to pick up traumatic stress symptoms by trained personnel be implemented, and that trained personnel such as trauma health professionals be employed to assist in the management of trauma linked as well as social problems. This could take the form of either individual or group therapy. Trauma counseling beyond debriefing after trauma exposure should be the norm.

The link between stress and the inflammatory response has been borne out in this research study and with the association with cardiovascular and metabolic effects in later life, it is vital that effective employment assistant programmes should include modules on healthy lifestyles, with an emphasis on both physical and emotional well being.

6.3 RECOMMENDATIONS FOR LABORATORY ANALYSIS

24-hour urine testing for cortisol is reliant in the subject handing in a valid urine sample and hence often unreliable. In this research study there was an inordinately high

number of invalid urine samples. In addition, 24 hour urine sampling is costly. While saliva testing is a very practical, non-intrusive method of sampling for cortisol, this study did not find it a sensitive indicator for cortisol responses, particularly when the sample was divided into high and low cortisol responders. Hence it is cannot be recommended that salivary cortisol be used in future research studies. With regards to plasma sampling, to account for day-to-day fluctuations, it would be preferable to use the cortisol awakening response rather than point sampling as used in this study. Plasma sampling was found to be particularly sensitive to measures for depression and subjective distress, whilst 24 hour urine sampling was a better indicator of objective posttraumatic stress disorder measures. Therefore, depending on the research study, one should be very selective which cortisol measure to use. It is further recommended that researchers increase reliability and validity of each of these measures by minimising limiting factors.

6.4 RECOMMENDATIONS FOR FURTHER RESEARCH

The current study, whilst robust in its prospective design, only followed up on subjects for one year. A longer follow up period is recommended for various reasons:
Firstly, it would be interesting to ascertain whether scores for depression and PTSD would change with further experience and cumulative trauma exposure. Secondly, the effects of the inflammatory response to trauma and the future development of cardiovascular and metabolic syndromes must be studied. Thirdly, the physiological responses at the end of 1 year may be different after 5 years. Lastly, it would be beneficial to investigate other measures of allostatic load in this population. These are simple to do, for example, blood pressure and waist/ hip ratio measurement. A follow up study for this study population is hence recommended, as well as initiation of further

research studies employing longer term follow up. Implicit to these recommendations would be to increase the sample size to account for the attrition rate that often goes with longitudinal studies, and to comment critically on results.

If one were to use the MCMI III in a population like this, it is recommended that structured clinical interviews be done in conjunction with the self-report measure such that correlations can be made with the MCMI III. However, it is recommended that measures of both coping style and resilience be used.

Future research should also encompass the interaction between trauma exposure, the neuroendocrine system, the immune system and their impact on medical problems in populations such as police officers. In addition to TNF and IL6, inflammatory markers such as CRP and serum amyloid A should be prioritized in similar investigations of PTSD outcomes.

Gender differences in traumatic stress studies in the police force is another area that warrants further exploration as this study found some differences between males and females in terms of the non physiological measures. It would be interesting to see whether gender differences are present in the physiological measures as well, and how they correlate with PTSD and depression.

It is further recommended that a similar study be undertaken at the SAPS, as the current findings may not be applicable to all police officers. Interventional studies correlating with biological markers have not been conducted in police officers in SA and are recommended e.g. pre- and post-trauma counselling or cognitive behavioural therapy

with repeat measures of correlating cortisol and inflammatory marker/s sampling. This would be useful for all personnel exposed to trauma and violence.

Chapter 7

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APPENDIX A: ETHICS CLEARANCE CERTIFICATE

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Subramaney

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER M050103**
PROJECT	Personality Style, Cortisol Secretion & the Inflammatory Response to Trauma Exposure in a cohort of SA Metro Police Cadets: A....
INVESTIGATORS	Dr U Subramaney
DEPARTMENT	Psychiatry/Clinical Medicine
DATE CONSIDERED	05.01.28
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 05.07.11 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable

cc: Supervisor : Prof M Vorster

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Questionnaire

APPENDIX B

Unique ID no ☐

Age: 18-25 ☐ 26-35 ☐ 36-45 ☐

Gender: M ☐ F ☐

Race: B ☐ W ☐ A ☐ C ☐

Int/Ext recruit Int ☐ Ext ☐

Level of Education

matric ☐ Matric + ☐ < matric ☐

Previous employment Yes ☐ No ☐

Do you smoke? Yes ☐ No ☐

Do you drink alcohol? Yes ☐ No ☐

If yes, what is the extent of your drinking?

1 drink per day ☐
2 drinks per day ☐
3 drinks per day ☐
>3 drinks per day ☐

Do you take any drugs Yes ☐ No ☐

Family history of Psychiatric Illness Yes ☐ No ☐

Family history of suicide Yes ☐ No ☐

Family history of alcoholism Yes ☐ No ☐

Have you had contact with psychological services in the past?

Yes ☐ No ☐

APPENDIX C: MCMI III RESULTS OF THE SUBJECTS

	ID Number	Age	Gender	Disclosure/ Debasement/ Desirability	Clinical Patterns	Severe Pathology	Clinical Syndromes	Severe Syndromes
1	1	24	M	Dis 87 Deb 87	Aggr 96 Depr 86		Anx 95	
2	2	19	M	Dis 81	Dep 80 Schizoid 78		Anx 76 Dysthymia 76	
3	3	35	M		Narc 104 Schizoid 81	Paranoid 82		
4	4	29	M	Des 80	Avoid 80 Pass – agg79 Depr 78		Anx 88 PTSD 79 Dysthymia 76	
5	5	24	M		Hist 81			
6	6	21	F	Dis 100	Dep 84 Self def 83	Schizotypal 82	Bipolar 94 Anx 81 Delusional 84	
7	7	24	M		Anti 80 Self def 77 Dep 75		Anx 75	
8	8	19	F	Dis 100	Aggr 87 Schizoid 81 Dep 77	Paranoid 82 Borderline 80	Bipolar 104 Delusional 104	
9	9	27	M	Des 80	Avoid 81 Schizoid 77 Pass aggr 77 Self def 76		Anx 75	
10	10	25	M		Depr 83		Anx 78	
11	11	21	F	Dis 90	Self def 83 Pass-agg 81	Paranoid 84 Borderline 82	Bipolar 97 Anx 81 d Delusional 77	
12	12	29	M	Deb 77	Depr 83 Pass-agg 82 Schizoid 77	Dysthymia 80		
13	13	24	M		Avoid 77 Schizoid 75 Dep 75	Schizotypal 80	Anx 80	
14	14	21	M	Des 84			Anx 88	
15	15	21	M	Des 100	Narc 108 Compul 75	Paranoid 82		
16	16	28	M		Schizoid 83 Avoid 80 Depr 79		Anx 75	

17	17	21	M	Dis 75	Avoid 93 Pass agg 84 Schizoid 80			
18	18	40	F	Dis 96	Aggr 79 Self def 76 Dep 76	Paranoid 88		
19	19	20	M		Narc 81 Avoid 81 82		Anx 85	
20	20	21	M		Dep 88 Pass-agg Narc 77		Anx 94 PTSD 85 Bipolar Delusional 95	
21	21	33	M	Dis 98	Self def 92 Dep 77	Paranoid 100	Anx 77 b Bipolar 75	
22	22	27	F		Narc 85			
23	23	29	F		Narc 98 Self def 77		Anx 75	
24	24	31	M	Des 89	Self def 77		Anx 75	
25	25	24	MF	Des 80	Compul 86	Borderline 80	Bipolar 89 Anx 79 Delusional 99	
27	27	24	M	Dis 79 Des 89	Narc 103 Dep 77 Depr 76 Pass aggr 76		Anx 89 Dysthymia 77	
28	28	31	M	Des 80	Dep 77 Aggr 77 Pass aggr 75	Paranoid 88	Anx 99	
29	29	25	M	Dis 85	Pass agg 76 Self def 80 Narc 80	Paranoid 100	Anx 92 PTSD 77	
30	30	32	M		Dep 81 schizoid 79 Avoid 78	Paranoid 75		
31	31	33	M	Dis 80	Pass agg 82 Schizoid 90 Depr 78		Anx 87 PTSD 76 d Delusional 91	
32	32	35	M	Dis 79	Depr 100 Dep 82	Paranoid 94	Anx 79 Dysthymia 77 Bipolar 75	
33	33	32	F	Des 84	Self def 88 Narc 82 Pass aggr 79			
34	34	31	F		Narc 98			
35	35	41	F	Des 84	Aggr 77			
36	36	29	F	Des 94	Narc 106	Paranoid 77		Delu 95

37	37	33	F		Self def 82 Aggr 76	Dysthymia 81	Anx 75	
38	39	33	F	Invalid Profile				
39	38	24	M	Dis 86	Pass agg 84	Borderline 75		
40	40	24	F	Dis 82	Depr 95 Avoid 92 Self def 82	Paranoid75		
41	41	26	M		Narc 89		Anx 88	
42	42	23	F		Compul 94		Bipolar 92 Anx76	
43	43	23	M	Dis 85	Narc 90 Schizoid 75	Paranoid 80		
44	44	40	F				Anx 75	
45	45	42	f	Des 100	Narc 115 Compul 80	Paranoid 81	Anx 80	
46	46	56	M		Schizoid 83 Dependent 80		Anx 100 Somatoform 75	
47	47	29	M	Des 84	Narc 112 Depr 79		Dysthymia 76	
48	48	31	M	Des 89	Narc 83			
49	49	33	F		Anti 77		Anx 78	
50	50	32	F	Dis 79	Schizoid 94 Avoidant 93 Self def 83 Depr 78	Paranoid 80	Bipolar 82	
51	51	32	F	Dis 79 Deb 80	Schiz 96 Pass aggr 89 Self def 83 Depr 78	Borderline 81 Paranoid 78	Dysthymia 80 Anx 75	Maj depr 82
52	52	29	M	Des 84	Narc 100	Paranoid 78	Anx 75	
53	53	32	M	Dis 100 Deb 83	Aggr 88 Depr 87 Dep 85	Paranoid 104 Schizotypal 78	PTSD 104 Anx 101 d Dysthymia 92 Alc dep 81	Delu 82
54	54	35	M	Des 84	Depr 81 Pass aggr 81 Self def 76		Dysthymia 78 Anx 75 Alc dep 77	
55	55	24	F	Des 80	Narc 96 Compul 86			
56	56	25	F	Dis 75	Narc 115 Schiz 83 Pass aggr 83	Paranoid 108	Anx 82	Delu 85
57	57	36	F	Dis 75 Deb 78	Depr 96 Schizoid 82 Narc 81	Borderline 77	Anx 82 Bipolar 79 Dysthymia 76	

58	58	25	M		Avoid 78 Schiz 77 Depr 82 Dep 75	Paranoid 75		
59	59	21	M	Des 84	Narc 93 Schiz 81 Pass agg 77		Anx 75	
60	60	27	M	Dis 80 Deb 75	Depr 75 Dep 80 Ant soc 75 Pas-aggr 80 Self def 75	Schizotypal 75	Anx 95 Bipolar 90 Alco dep 80	
61	61	40	M	Dis 79 Deb 76	Pass aggr 85	Borderline 84	Dysthym 112 Anx 79 Alco dep 85	
62	62	32	M	Des 85	Histr 75			
63	63	31	M	Des 89				
64	64	30	M	Dis 100 Deb 89	Depr 88 Pass agg 87 Dep 88	Paranoid 98 Schizotypal 87 Borderline77	Anx 99 PTSD 94 Dysthymia 86	Delu 104 Major dep 84
65	65	33	M	Dis 80		Schizotypal 78	Anx 98 Somatoform 75	
66	66	32	F	Dis 86 Deb 76	Narc 112 Pass agg 80	Paranoid 79	Anx 83	Delu 109
67	67	31	M		Self def 78			
68	68	34	F	Dis 99 Deb 87	Narc 98	Paranoid 105 Borderline 81 Schizotypal 78	Bipolar 95 Somatoform 90 Anx 79	Delus 105 Major depr 92
69	69	23	M	Dis 75	Schizoid 75 Narc 108 Aggr 76 Pass agr 80	Paranoid 80	Anx 92 Dysthymia 78	Delus 77
70	70		M	Invalid Profile				
71	71	26	F	Des 80	Schizoid 80 Narc 90			
72	72	24	F	Dis 79	Depr 78 Dep 81 Self def 83		Anx 75	
73	73	20	F	Des 80	Narc 85		Bipolar 75	

74	74	22	F		Schizoid 97 Avoid 82 Depr 76 Compu 78 Self def 77		Anx 77 Dysthymia 77	
75	75	35	F	Dis 88 Deb 87	Schizoid 84 Avoidant 75 Depr 77 Pas-aggr 83 Self def 81	Schizotypal 92 Paranoid 108	Anx 82 Somatoform 85 dysthymia 108 PTSD 98	Thought dis 93 Maj depr 88 Delu 108
76	76	36	F	Des 80	Compu 88		Anx 80	
77	77	40	M		Avoidant 77 Depr 79 Narc 100		Anx 88	
78	78	28	M	Disc 80	Dep 92 Pass aggr 76		Anx 111 Dysthymia 76 PTSD 77 Alc dep 81	
79	79	34	F	Dis 88 Deb 76	Dep 76 Self def 80	Paranoid 93	Anx 82	Maj depr 81 Delu 108
80	80	41	M		Schizoid 81 Avoidant 77 Depr 80 Narc 93 Pas-aggr 77		Anx 85 Dysthymia 76 Alc dep 79	
81	81	24	F	Deb 76	Schizoid 83 Depr 85 Self def 79	Borderline 90 Paranoid 75	Anx 80 Dysthymia 83	Maj depr 80
82	82	31	F	Des 84	Narc 85			
83	83	29	F		Schizoid 78 Avoidant 90 Depr 81 Dep 95 Self def 75		Anx 75	
84	84	27	F	Dis 77	Narc 90 Compu 99			
85	85	31	F	Invalid Profile				

86	86	32	F	Dis 100 Deb 93	Schizoid 79 Avoidant 87 Depr 86 Narc 84 Aggr 87 Pas-aggr 76	Schizotypal 94 Paranoid 104	Anx 104 Somatoform 89 Dysthymia 94	Thought dis 89 Maj depr 94 Delu 104
87	88	30	F	Dis 100 Deb 89	Schizoid 81 Avoidant 87 Depr 92 Dep 84 Self def 81	Schizotypal 76 Borderline 98	Anx 85 Somatoform 81 Dysthymia 84 PTSD 104	Thought dis 89 maj depr 101 Delu 104
88	89	31	F		Depr 76	Paranoid 100	Anx 80	Delu 78
89	90	21	F	Des 89	Histrionic 88 Narc 98			
90	91	22	M	Des 84	Narc 79			
91	92	24	M		Narc 93		Anx 75	
92	93	29	F		Avoid 76 Dep 77 Self def 78			
93	94	31	F	Dis 76 Des 80 Deb 76	Avoid 78 Depr 75 Aggr 83 Compul 75		Anx 77	
94	95	32	M	Dis 85 Deb 77	Dep 75 Pass- agr 97	Paranoid 85	Anx 76 Dysthymia 75	Delu 77
95	96	28	F	Dis 78	Depr 76 Compu 75 Pass aggr 78 Self def 83	Borderline 80 Paranoid 75	Anx 94	
96	97	34	M		Schizoid 75 Avoidant 77 Dep 83 Self def 75		Anx 85 Dysthymia 75	
97	98	28	F	Des 80	Narc 112	Paranoid 100	Anx 92 Bipolar 85	Delu 115

98	99	25	M	Dis 88	Schizoid 84 Avoidant 79 Depr 102 Anti 75 Pass-aggr 95 Self def 82	Schizotypal 86 Borderline 80 Paranoid 78	Anx 75	
99	100	25	F		Dep 77 Histri 76 Self def 82	Borderline 76	Anx 77	
100	101	22	F	Dis 88	Narc 99 Pass-aggr 78 Self def 75	Schizotypal 92 Paranoid 108	Anx 76	
101	102	38	M		Anti 75 Aggr 76 Pas-aggr 82		Anx 78 Dysthymia 79	
102	104	25	M		Avoidant 77 Depr 77 Narc 75 Aggr 78 Pas-aggr 77 Self def 75		Anx 80	
103	105	34	F		Dep 79		Anx 83	Delu 75
104	108	35	F		Dep 86 Narc 82 Self def 76		Anx 85 Bipolar 85	
105	109	38	M	Dis 87	Schizoid 78 depr 82 Narc 77		Anx 76 Bipolar 75 Dysthymia 85	Delus 77
106	110	27	F	Dis 84	Avoidant 75 Dep 84 Pas-aggr 82 Self def 77	Schizotypal 94 Paranoid 103	Dysthymia 76	
107	111	33	M		Schizoid 75		Anx 75	
108	112	25	F	Dis 84 Deb 76	Narc 83 self def 83	Paranoid 76	Anx 78	
109	113	29	F	Dis 77	Dep 83 Pas-aggr 80 Self def 79		Anx 83	
110	114	35	M	Dis 80	Schizoid 75 Depr 100 Dep 81 Pas-aggr 84	Borderline 92	Anx 98 Dysthymia 99 PTSD 91	Thought dis 76 Major depr 101

111	115	29	F	Dis 83	Depr 92 Dep 84 Self def 89	Borderline 86	Dysthymia 78	
112	116	38	M	Dis 89	Avoid 77 Depr 102 Dep 92 Self def 76			Delu 76
113	117	33	F	Dis 81 Deb 89	Schizoid 82 Pas-aggr 84 Self def 79	Borderline 83 Paranoid 104	Anx 78 Somatoform 88 Dysthymia 79	Major depr 88
114	119	42	F		Hist 100 Narc 77		Bipolar 80	
115	120	24	M		Hist 92			
116	121	32	F	Dis 79	Avoid 79 Depr 78 Self def 75	Paranoid 78	Anx 80	Delusional 82
117	122	27	M	Dis 91	Depr 99 Dep 100	Borderline 83	Anx 82 Bipolar 77 Dysthymia 76 Alc dep 75	
118	124	35	M	Des 90	Avoid 75 Narc 75 Pas-aggr 85	Schizotypal 80 Paranoid 80	Anx 80	Delus 90
119	125	28	F	Dis 84	Narc 115 Comp 78		Anx 75	
120	126	24	F	Des 84	Dep 89			
121	127	23	F	Disc 81	Schiz 76 Dep 79 Narc 75		Anx 85 Bipolar 76	
122	128	35	M	Des 80	Depr 75 Self def 77		Anx 80 Dysthymia 79	
123	129	35	F	Dis	Depr 89 Aggr 75 Pas-aggr 75 Self def 80	Paranoid 90		Delus 80
124	130	31	F	Dis 75	Schiz 80 Avoid 80 Dep 85 Comp 80 Self def 80	Borderline 75	Anx 75	
125	131	35	M	Disc 98 Deb 81	Depr 80 Avoida 87 Pass-aggr 82		Anx 105 Dysthymia 99 PTSD 95	Thought dis 75 Maj Depr 85
126	132	23	F	Invalid profile				
127	134	30	F	Des 80 Deb 76	Dep 82 Narc 77 Pass-agggr 81	Paranoid 115	Anx 83	Delus 85

128	135	35	M	Des 95	Pas-aggr 85		Anx 80 Dysthymia 75	
129	136	25	M		Avoid 78 Depr 77 Dep 78 Pas-aggr 80	Schizoid 78	Anx 90 Bipolar 81 Dysthymia 76	
130	137	22	M		Dep 83 Pass-aggr 83		Anx 80	
131	138	21	M	Des 89	Hist 92			
132	139	28	M		Avoid 80 Depr 80		Anx 80	
133	140	27	F	Dis 90 Deb 80	Aggr 80 Pas-aggr 80	Borderline 85 Paranoid 90	Bipolar 105	Maj depr 80 Delus 84
134	141	27	F	Dis 83 Deb 91	Schizoid 81 Depr 82 Dep 76 Self def 75	Schizotypal 75 Borderline 85 Paranoid 76	Anx 80 s Somatoform 103 d Dysthymia 110	Thought dis 87 Maj depr 100 Delu 100
135	142	32	M	Des 80	Schizoid 83 Narc 104			
136	143	33	F	Dis 78	Depr 75 Self def 76		Anx 93 PTSD 77	Delu 102
137	144	35	F	Invalid Profile				
138	148	31	F		Schizoid 83 Depr 78 Dep 79 Self def 83	Paranoid 79	Anx 85	
139	149	26	F		Schizoid 83 Avoidant 79 Compul 99	Paranoid 75	Anx 77	
140	150	34	M	Dis 75	Schizoid 83 Avoid 79 Depr 81 Dep 92 Pas-aggr 77 Self def 81	Paranoid 80	Anx 75 Dysthymia 82	

141	152	26	F	Dis 90 Deb 85	Schizoid 78 Depr 76 Dep 78 Pas-aggr 81 Self def 83	Borderline 106 Paranoid 75	Anx Somatoform 85 Bipolar 97 Alc dep 77	Maj depr 100
142	153	30	M	Dis 81 Deb 76	Schizoid 78 Avoid 78 Depr 92 Dep 75 Pas-aggr 75		Anx 88 Dysthymia 81	
143	154	39	F	Des 90	Narc 100 Comp 80			
144	155	35	F	Dis 75	Avoid 100 Depr 90 Self def 80	Schizotypal 90	Anx 80 Dysthymia 80	
145	157	32	F	Dis 85 Des 80	Pas-aggr 75 Self def 75	Borderline 80 Paranoid 75		

Key: dis=disclosure deb=debasement des=desirability Depr =depressive Dep =dependent Self def =self defeating comp=compulsive avoid=avoidant aggr=aggressive pass-aggr=passive aggressive anx=anxiety PTSD=posttraumatic stress disorder maj depr=major depression alc dep=alcohol dependence delu=delusional disorder thought dis=thought disorder

National Center for PTSD

CLINICIAN-ADMINISTERED PTSD SCALE FOR DSM-IV

Name: _____ ID # :_____

Date: _____

Interviewer: _____

Study: _____

Dudley D. Blake, Frank W. Weathers, Linda M. Nagy,
Danny G. Kaloupek, Dennis S. Charney, & Terence M. Keane

National Center for Posttraumatic Stress Disorder

Behavioral Science Division -- Boston VA Medical Center
Neurosciences Division -- West Haven VA Medical Center

Revised July 1998

LIFE EVENTS CHECKLIST

Listed below are a number of difficult or stressful things that sometimes happen to people. For each event check one or more of the boxes to the right to indicate that: (a) it *happened to you* personally, (b) you *witnessed it* happen to someone else, (c) you *learned about it* happening to someone close to you, (d) you're *not sure* if it fits, or (e) it *doesn't apply* to you.

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

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

Criterion A. The person has been exposed to a traumatic event in which both of the following were present:
(1) the person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others
(2) the person's response involved intense fear, helplessness, or horror. Note: In children, this may be expressed instead by disorganized or agitated behavior

I'm going to be asking you about some difficult or stressful things that sometimes happen to people. Some examples of this are being in some type of serious accident; being in a fire, a hurricane, or an earthquake; being mugged or beaten up or attacked with a weapon; or being forced to have sex when you didn't want to. I'll start by asking you to look over a list of experiences like this and check any that apply to you. Then, if any of them do apply to you, I'll ask you to briefly describe what happened and how you felt at the time.

Some of these experiences may be hard to remember or may bring back uncomfortable memories or feelings. People often find that talking about them can be helpful, but it's up to you to decide how much you want to tell me. As we go along, if you find yourself becoming upset, let me know and we can slow down and talk about it. Also, if you have any questions or you don't understand something, please let me know. Do you have any questions before we start?

ADMINISTER CHECKLIST, THEN REVIEW AND INQUIRE UP TO THREE EVENTS. IF MORE THAN THREE EVENTS ENDORSED, DETERMINE WHICH THREE EVENTS TO INQUIRE (E.G., FIRST, WORST, AND MOST RECENT EVENTS; THREE WORST EVENTS; TRAUMA OF INTEREST PLUS TWO OTHER WORST EVENTS, ETC.)

IF NO EVENTS ENDORSED ON CHECKLIST: *(Has there ever been a time when your life was in danger or you were seriously injured or harmed?)*

IF NO: *(What about a time when you were threatened with death or serious injury, even if you weren't actually injured or harmed?)*

IF NO: *(What about witnessing something like this happen to someone else or finding out that it happened to someone close to you?)*

IF NO: *(What would you say are some of the most stressful experiences you have had over your life?)*

EVENT #1

What happened? *(How old were you? Who else was involved? How many times did this happen? Life threat? Serious injury?)*	*Describe (e.g., event type, victim, perpetrator, age, frequency):*
How did you respond emotionally? *(Were you very anxious or frightened? Horrified? Helpless? How so? Were you stunned or in shock so that you didn't feel anything at all? What was that like? What did other people notice about your emotional response? What about after the event -- how did you respond emotionally?)*	*A. (1)* *Life threat? NO YES [self ___ other ___]* *Serious injury? NO YES [self ___ other ___]* *Threat to physical integrity? NO YES [self ___ other ___]* *A. (2)* *Intense fear/help/horror? NO YES [during ___ after ___]* *Criterion A met? NO PROBABLE YES*

EVENT #2

What happened? *(How old were you? Who else was involved? How many times did this happen? Life threat? Serious injury?)*	*Describe (e.g., event type, victim, perpetrator, age, frequency):*
How did you respond emotionally? *(Were you very anxious or frightened? Horrified? Helpless? How so? Were you stunned or in shock so that you didn't feel anything at all? What was that like? What did other people notice about your emotional response? What about after the event -- how did you respond emotionally?)*	*A. (1)* *Life threat? NO YES [self ___ other ___]* *Serious injury? NO YES [self ___ other ___]* *Threat to physical integrity? NO YES [self ___ other ___]* *A. (2)* *Intense fear/help/horror? NO YES [during ___ after ___]* *Criterion A met? NO PROBABLE YES*

EVENT #3

What happened? *(How old were you? Who else was involved? How many times did this happen? Life threat? Serious injury?)*	*Describe (e.g., event type, victim, perpetrator, age, frequency):*
How did you respond emotionally? *(Were you very anxious or frightened? Horrified? Helpless? How so? Were you stunned or in shock so that you didn't feel anything at all? What was that like? What did other people notice about your emotional response? What about after the event -- how did you respond emotionally?)*	*A. (1)* *Life threat? NO YES [self ___ other ___]* *Serious injury? NO YES [self ___ other ___]* *Threat to physical integrity? NO YES [self ___ other ___]* *A. (2)* *Intense fear/help/horror? NO YES [during ___ after ___]* *Criterion A met? NO PROBABLE YES*

For the rest of the interview, I want you to keep (EVENTS) in mind as I ask you some questions about how they may have affected you.

I'm going to ask you about twenty-five questions altogether. Most of them have two parts. First, I'll ask if you've ever had a particular problem, and if so, about how often in the past month *(week)*. Then I'll ask you how much distress or discomfort that problem may have caused you.

Criterion B. The traumatic event is persistently reexperienced in one (or more) of the following ways:

1. **(B-1)** recurrent and intrusive distressing recollections of the event, including images, thoughts, or perceptions.
Note: In young children, repetitive play may occur in which themes or aspects of the trauma are expressed.

Frequency	*Intensity*	*Past week*
Have you ever had unwanted memories of (EVENT)? What were they like? *(What did you remember?)* [IF NOT CLEAR:] *(Did they ever occur while you were awake, or only in dreams?)* [EXCLUDE IF MEMORIES OCCURRED ONLY DURING DREAMS] **How often have you had these memories in the past month *(week)*?** 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How much distress or discomfort did these memories cause you? Were you able to put them out of your mind and think about something else?** *(How hard did you have to try?)* **How much did they interfere with your life?** 0 None 1 Mild, minimal distress or disruption of activities 2 Moderate, distress clearly present but still manageable, some disruption of activities 3 Severe, considerable distress, difficulty dismissing memories, marked disruption of activities 4 Extreme, incapacitating distress, cannot dismiss memories, unable to continue activities ***QV (specify)*** _____	*F* ____ *I* ____ ***Past month*** *F* ____ *I* ____ ***Sx: Y N*** ***Lifetime*** *F* ____ *I* ____ ***Sx: Y N***

2. **(B-2)** recurrent distressing dreams of the event. **Note:** In children, there may be frightening dreams without recognizable content.

Frequency	*Intensity*	*Past week*
Have you ever had unpleasant dreams about (EVENT)? Describe a typical dream. *(What happens in them?)* **How often have you had these dreams in the past month *(week)*?** 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How much distress or discomfort did these dreams cause you? Did they ever wake you up?** [IF YES:] *(What happened when you woke up? How long did it take you to get back to sleep?)* [LISTEN FOR REPORT OF ANXIOUS AROUSAL, YELLING, ACTING OUT THE NIGHTMARE] *(Did your dreams ever affect anyone else? How so?)* 0 None 1 Mild, minimal distress, may not have awoken 2 Moderate, awoke in distress but readily returned to sleep 3 Severe, considerable distress, difficulty returning to sleep 4 Extreme, incapacitating distress, did not return to sleep ***QV (specify)*** _____	*F* ____ *I* ____ ***Past month*** *F* ____ *I* ____ ***Sx: Y N*** ***Lifetime*** *F* ____ *I* ____ ***Sx: Y N***

3. **(B-3)** acting or feeling as if the traumatic event were recurring (includes a sense of reliving the experience, illusions, hallucinations, and dissociative flashback episodes, including those that occur on awakening or when intoxicated). **Note:** In young children, trauma-specific reenactment may occur.

Frequency	***Intensity***	***Past week***
Have you ever suddenly acted or felt as if (EVENT) were happening again? *(Have you ever had flashbacks about [EVENT]?)* [IF NOT CLEAR:] *(Did this ever occur while you were awake, or only in dreams?)* [EXCLUDE IF OCCURRED ONLY DURING DREAMS] **Tell me more about that. How often has that happened in the past month *(week)*?** 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How much did it seem as if (EVENT) were happening again?** *(Were you confused about where you actually were or what you were doing at the time?)* **How long did it last? What did you do while this was happening?** *(Did other people notice your behavior? What did they say?)* 0 No reliving 1 Mild, somewhat more realistic than just thinking about event 2 Moderate, definite but transient dissociative quality, still very aware of surroundings, daydreaming quality 3 Severe, strongly dissociative (reports images, sounds, or smells) but retained some awareness of surroundings 4 Extreme, complete dissociation (flashback), no awareness of surroundings, may be unresponsive, possible amnesia for the episode (blackout) ***QV (specify)*** _____	***Past week*** *F* ____ *I* ____ ***Past month*** *F* ____ *I* ____ ***Sx: Y N*** ***Lifetime*** *F* ____ *I* ____ ***Sx: Y N***

4. **(B-4)** intense psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event

Frequency	***Intensity***	***Past week***
Have you ever gotten emotionally upset when something reminded you of (EVENT)? *(Has anything ever triggered bad feelings related to [EVENT]?)* **What kinds of reminders made you upset? How often in the past month *(week)*?** 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How much distress or discomfort did (REMINDERS) cause you? How long did it last? How much did it interfere with your life?** 0 None 1 Mild, minimal distress or disruption of activities 2 Moderate, distress clearly present but still manageable, some disruption of activities 3 Severe, considerable distress, marked disruption of activities 4 Extreme, incapacitating distress, unable to continue activities ***QV (specify)*** _____	***Past week*** *F* ____ *I* ____ ***Past month*** *F* ____ *I* ____ ***Sx: Y N*** ***Lifetime*** *F* ____ *I* ____ ***Sx: Y N***

5. (B-5) physiological reactivity on exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event

Frequency	***Intensity***	***Past week***
Have you ever had any physical reactions when something reminded you of (EVENT)? *(Did your body ever react in some way when something reminded you of [EVENT]?)* **Can you give me some examples?** *(Did your heart race or did your breathing change? What about sweating or feeling really tense or shaky?)* **What kinds of reminders triggered these reactions? How often in the past month *(week)*?** 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How strong were (PHYSICAL REACTIONS)? How long did they last?** *(Did they last even after you were out of the situation?)* 0 No physical reactivity 1 Mild, minimal reactivity 2 Moderate, physical reactivity clearly present, may be sustained if exposure continues 3 Severe, marked physical reactivity, sustained throughout exposure 4 Extreme, dramatic physical reactivity, sustained arousal even after exposure has ended ***QV (specify)*** _____	***F*** ____ ***I*** ____ ***Past month*** ***F*** ____ ***I*** ____ ***Sx: Y N*** ***Lifetime*** ***F*** ____ ***I*** ____ ***Sx: Y N***

Criterion C. Persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness (not present before the trauma), as indicated by three (or more) of the following:

6. (C-1) efforts to avoid thoughts, feelings, or conversations associated with the trauma

Frequency	***Intensity***	***Past week***
Have you ever tried to avoid thoughts or feelings about (EVENT)? *(What kinds of thoughts or feelings did you try to avoid?)* **What about trying to avoid talking with other people about it?** *(Why is that?)* **How often in the past month *(week)*?** 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How much effort did you make to avoid (THOUGHTS/FEELINGS/CONVERSATIONS)?** *(What kinds of things did you do? What about drinking or using medication or street drugs?)* [CONSIDER ALL ATTEMPTS AT AVOIDANCE, INCLUDING DISTRACTION, SUPPRESSION, AND USE OF ALCOHOL/DRUGS] **How much did that interfere with your life?** 0 None 1 Mild, minimal effort, little or no disruption of activities 2 Moderate, some effort, avoidance definitely present, some disruption of activities 3 Severe, considerable effort, marked avoidance, marked disruption of activities, or involvement in certain activities as avoidant strategy 4 Extreme, drastic attempts at avoidance, unable to continue activities, or excessive involvement in certain activities as avoidant strategy ***QV (specify)*** _____	***F*** ____ ***I*** ____ ***Past month*** ***F*** ____ ***I*** ____ ***Sx: Y N*** ***Lifetime*** ***F*** ____ ***I*** ____ ***Sx: Y N***

7. **(C-2)** efforts to avoid activities, places, or people that arouse recollections of the trauma

Frequency	***Intensity***	***Past week***
Have you ever tried to avoid certain activities, places, or people that reminded you of (EVENT)? *(What kinds of things did you avoid? Why is that?)* **How often in the past month *(week)*?** 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How much effort did you make to avoid (ACTIVITIES/PLACES/PEOPLE)?** *(What did you do instead?)* **How much did that interfere with your life?** 0 None 1 Mild, minimal effort, little or no disruption of activities 2 Moderate, some effort, avoidance definitely present, some disruption of activities 3 Severe, considerable effort, marked avoidance, marked disruption of activities or involvement in certain activities as avoidant strategy 4 Extreme, drastic attempts at avoidance, unable to continue activities, or excessive involvement in certain activities as avoidant strategy ***QV (specify)*** _____	***F*** ____ ***I*** ____ ***Past month*** ***F*** ____ ***I*** ____ ***Sx: Y N*** ***Lifetime*** ***F*** ____ ***I*** ____ ***Sx: Y N***

8. **(C-3)** inability to recall an important aspect of the trauma

Frequency	***Intensity***	***Past week***
Have you had difficulty remembering some important parts of (EVENT)? Tell me more about that. *(Do you feel you should be able to remember these things? Why do you think you can't?)* **In the past month *(week)*, how much of the important parts of (EVENT) have you had difficulty remembering?** *(What parts do you still remember?)* 0 None, clear memory 1 Few aspects not remembered (less than 10%) 2 Some aspects not remembered (approx 20-30%) 3 Many aspects not remembered (approx 50-60%) 4 Most or all aspects not remembered (more than 80%) ***Description/Examples***	**How much difficulty did you have recalling important parts of (EVENT)?** *(Were you able to recall more if you tried?)* 0 None 1 Mild, minimal difficulty 2 Moderate, some difficulty, could recall with effort 3 Severe, considerable difficulty, even with effort 4 Extreme, completely unable to recall important aspects of event ***QV (specify)*** _____	***F*** ____ ***I*** ____ ***Past month*** ***F*** ____ ***I*** ____ ***Sx: Y N*** ***Lifetime*** ***F*** ____ ***I*** ____ ***Sx: Y N***

9. (C-4) markedly diminished interest or participation in significant activities

Frequency	***Intensity***	***Past week***
Have you been less interested in activities that you used to enjoy? *(What kinds of things have you lost interest in? Are there some things you don't do at all anymore? Why is that?)* [EXCLUDE IF NO OPPORTUNITY, IF PHYSICALLY UNABLE, OR IF DEVELOPMENTALLY APPROPRIATE CHANGE IN PREFERRED ACTIVITIES] **In the past month *(week)*, how many activities have you been less interested in?** *(What kinds of things do you still enjoy doing?)* **When did you first start to feel that way?** *(After the [EVENT]?)* 0 None 1 Few activities (less than 10%) 2 Some activities (approx 20-30%) 3 Many activities (approx 50-60%) 4 Most or all activities (more than 80%) ***Description/Examples***	**How strong was your loss of interest?** *(Would you enjoy [ACTIVITIES] once you got started?)* 0 No loss of interest 1 Mild, slight loss of interest, probably would enjoy after starting activities 2 Moderate, definite loss of interest, but still has some enjoyment of activities 3 Severe, marked loss of interest in activities 4 Extreme, complete loss of interest, no longer participates in any activities ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely* *Current* _____ *Lifetime* _____	***Past week*** *F* ____ *I* ____ ***Past month*** *F* ____ *I* ____ ***Sx: Y N*** ***Lifetime*** *F* ____ *I* ____ ***Sx: Y N***

10. (C-5) feeling of detachment or estrangement from others

Frequency	***Intensity***	***Past week***
Have you felt distant or cut off from other people? What was that like? How much of the time in the past month *(week)* have you felt that way? When did you first start to feel that way? *(After the [EVENT]?)* 0 None of the time 1 Very little of the time (less than 10%) 2 Some of the time (approx 20-30%) 3 Much of the time (approx 50-60%) 4 Most or all of the time (more than 80%) ***Description/Examples***	**How strong were your feelings of being distant or cut off from others?** *(Who do you feel closest to? How many people do you feel comfortable talking with about personal things?)* 0 No feelings of detachment or estrangement 1 Mild, may feel "out of synch" with others 2 Moderate, feelings of detachment clearly present, but still feels some interpersonal connection 3 Severe, marked feelings of detachment or estrangement from most people, may feel close to only one or two people 4 Extreme, feels completely detached or estranged from others, not close with anyone ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely* *Current* _____ *Lifetime* _____	***Past week*** *F* ____ *I* ____ ***Past month*** *F* ____ *I* ____ ***Sx: Y N*** ***Lifetime*** *F* ____ *I* ____ ***Sx: Y N***

11. (C-6) restricted range of affect (e.g., unable to have loving feelings)

Frequency	*Intensity*	*Past week*
Have there been times when you felt emotionally numb or had trouble experiencing feelings like love or happiness? What was that like? *(What feelings did you have trouble experiencing?)* **How much of the time in the past month** ***(week)*** **have you felt that way? When did you first start having trouble experiencing (EMOTIONS)?** *(After the [EVENT]?)* 0 None of the time 1 Very little of the time (less than 10%) 2 Some of the time (approx 20-30%) 3 Much of the time (approx 50-60%) 4 Most or all of the time (more than 80%) ***Description/Examples***	**How much trouble did you have experiencing (EMOTIONS)?** *(What kinds of feelings were you still able to experience?)* [INCLUDE OBSERVATIONS OF RANGE OF AFFECT DURING INTERVIEW] 0 No reduction of emotional experience 1 Mild, slight reduction of emotional experience 2 Moderate, definite reduction of emotional experience, but still able to experience most emotions 3 Severe, marked reduction of experience of at least two primary emotions (e.g., love, happiness) 4 Extreme, completely lacking emotional experience ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely* *Current* _____ *Lifetime* _____	***F*** ____ ***I*** ____ ***Past month*** ***F*** ____ ***I*** ____ ***Sx: Y N*** ***Lifetime*** ***F*** ____ ***I*** ____ ***Sx: Y N***

12. (C-7) sense of a foreshortened future (e.g., does not expect to have a career, marriage, children, or a normal life span)

Frequency	*Intensity*	*Past week*
Have there been times when you felt there is no need to plan for the future, that somehow your future will be cut short? Why is that? [RULE OUT REALISTIC RISKS SUCH AS LIFE-THREATENING MEDICAL CONDITIONS] **How much of the time in the past month** ***(week)*** **have you felt that way? When did you first start to feel that way?** *(After the [EVENT]?)* 0 None of the time 1 Very little of the time (less than 10%) 2 Some of the time (approx 20-30%) 3 Much of the time (approx 50-60%) 4 Most or all of the time (more than 80%) ***Description/Examples***	**How strong was this feeling that your future will be cut short?** *(How long do you think you will live? How convinced are you that you will die prematurely?)* 0 No sense of a foreshortened future 1 Mild, slight sense of a foreshortened future 2 Moderate, sense of a foreshortened future definitely present, but no specific prediction about longevity 3 Severe, marked sense of a foreshortened future, may make specific prediction about longevity 4 Extreme, overwhelming sense of a foreshortened future, completely convinced of premature death ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely* *Current* _____ *Lifetime* _____	***F*** ____ ***I*** ____ ***Past month*** ***F*** ____ ***I*** ____ ***Sx: Y N*** ***Lifetime*** ***F*** ____ ***I*** ____ ***Sx: Y N***

Criterion D. Persistent symptoms of increased arousal (not present before the trauma), as indicated by two (or more) of the following:

13. (D-1) difficulty falling or staying asleep

Frequency	*Intensity*	*Past week*
Have you had any problems falling or staying asleep? How often in the past month *(week)*? When did you first start having problems sleeping? *(After the [EVENT]?)* 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day Sleep onset problems? Y N Mid-sleep awakening? Y N Early a.m. awakening? Y N Total # hrs sleep/night _____ Desired # hrs sleep/night _____	**How much of a problem did you have with your sleep?** *(How long did it take you to fall asleep? How often did you wake up in the night? Did you often wake up earlier than you wanted to? How many total hours did you sleep each night?)* 0 No sleep problems 1 Mild, slightly longer latency, or minimal difficulty staying asleep (up to 30 minutes loss of sleep) 2 Moderate, definite sleep disturbance, clearly longer latency, or clear difficulty staying asleep (30-90 minutes loss of sleep) 3 Severe, much longer latency, or marked difficulty staying asleep (90 min to 3 hrs loss of sleep) 4 Extreme, very long latency, or profound difficulty staying asleep (> 3 hrs loss of sleep) ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely* *Current* _____ *Lifetime* _____	*Past week* F ____ I ____ *Past month* F ____ I ____ Sx: Y N *Lifetime* F ____ I ____ Sx: Y N

14. (D-2) irritability or outbursts of anger

Frequency	*Intensity*	*Past week*
Have there been times when you felt especially irritable or showed strong feelings of anger? Can you give me some examples? How often in the past month *(week)*? When did you first start feeling that way? *(After the [EVENT]?)* 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day *Description/Examples*	**How strong was your anger?** *(How did you show it?)* [IF REPORTS SUPPRESSION:] *(How hard was it for you to keep from showing your anger?)* **How long did it take you to calm down? Did your anger cause you any problems?** 0 No irritability or anger 1 Mild, minimal irritability, may raise voice when angry 2 Moderate, definite irritability or attempts to suppress anger, but can recover quickly 3 Severe, marked irritability or marked attempts to suppress anger, may become verbally or physically aggressive when angry 4 Extreme, pervasive anger or drastic attempts to suppress anger, may have episodes of physical violence ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely* *Current* _____ *Lifetime* _____	*Past week* F ____ I ____ *Past month* F ____ I ____ Sx: Y N *Lifetime* F ____ I ____ Sx: Y N

15. (D-3) difficulty concentrating

Frequency	*Intensity*	*Past week* / *Past month* / *Lifetime*
Have you found it difficult to concentrate on what you were doing or on things going on around you? What was that like? How much of the time in the past month *(week)*? When did you first start having trouble concentrating? *(After the [EVENT]?)* 0 None of the time 1 Very little of the time (less than 10%) 2 Some of the time (approx 20-30%) 3 Much of the time (approx 50-60%) 4 Most or all of the time (more than 80%) ***Description/Examples***	**How difficult was it for you to concentrate?** [INCLUDE OBSERVATIONS OF CONCENTRATION AND ATTENTION IN INTERVIEW] **How much did that interfere with your life?** 0 No difficulty with concentration 1 Mild, only slight effort needed to concentrate, little or no disruption of activities 2 Moderate, definite loss of concentration but could concentrate with effort, some disruption of activities 3 Severe, marked loss of concentration even with effort, marked disruption of activities 4 Extreme, complete inability to concentrate, unable to engage in activities ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely* *Current* _____ *Lifetime* _____	*Past week* F ____ I ____ *Past month* F ____ I ____ Sx: Y N *Lifetime* F ____ I ____ Sx: Y N

16. (D-4) hypervigilance

Frequency	*Intensity*	*Past week* / *Past month* / *Lifetime*
Have you been especially alert or watchful, even when there was no real need to be? *(Have you felt as if you were constantly on guard?)* **Why is that? How much of the time in the past month *(week)*? When did you first start acting that way?** *(After the [EVENT]?)* 0 None of the time 1 Very little of the time (less than 10%) 2 Some of the time (approx 20-30%) 3 Much of the time (approx 50-60%) 4 Most or all of the time (more than 80%) ***Description/Examples***	**How hard did you try to be watchful of things going on around you?** [INCLUDE OBSERVATIONS OF HYPERVIGILANCE IN INTERVIEW] **Did your (HYPERVIGILANCE) cause you any problems?** 0 No hypervigilance 1 Mild, minimal hypervigilance, slight heightening of awareness 2 Moderate, hypervigilance clearly present, watchful in public (e.g., chooses safe place to sit in a restaurant or movie theater) 3 Severe, marked hypervigilance, very alert, scans environment for danger, exaggerated concern for safety of self/family/home 4 Extreme, excessive hypervigilance, efforts to ensure safety consume significant time and energy and may involve extensive safety/checking behaviors, marked watchfulness during interview ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely* *Current* _____ *Lifetime* _____	*Past week* F ____ I ____ *Past month* F ____ I ____ Sx: Y N *Lifetime* F ____ I ____ Sx: Y N

17. (D-5) exaggerated startle response

Frequency	***Intensity***	***Past week***
Have you had any strong startle reactions? When did that happen? *(What kinds of things made you startle?)* **How often in the past month (week)? When did you first have these reactions?** *(After the [EVENT]?)* 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How strong were these startle reactions?** *(How strong were they compared to how most people would respond?)* **How long did they last?** 0 No startle reaction 1 Mild, minimal reaction 2 Moderate, definite startle reaction, feels "jumpy" 3 Severe, marked startle reaction, sustained arousal following initial reaction 4 Extreme, excessive startle reaction, overt coping behavior (e.g., combat veteran who "hits the dirt") ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely* *Current* _____ *Lifetime* _____	***F*** ___ ***I*** ___ ***Past month*** ***F*** ___ ***I*** ___ ***Sx: Y N*** ***Lifetime*** ***F*** ___ ***I*** ___ ***Sx: Y N***

Criterion E. Duration of the disturbance (symptoms in Criteria B, C, and D) is more than 1 month.

18. onset of symptoms

[IF NOT ALREADY CLEAR:] **When did you first start having (PTSD SYMPTOMS) you've told me about?** *(How long after the trauma did they start? More than six months?)*	_____ ***total # months delay in onset*** ***With delayed onset (≥ 6 months)? NO YES***

19. duration of symptoms

		Current	***Lifetime***
[CURRENT] **How long have these (PTSD SYMPTOMS) lasted altogether?** [LIFETIME] **How long did these (PTSD SYMPTOMS) last altogether?**	*Duration more than 1 month?* *Total # months duration* *Acute (< 3 months) or chronic (≥ 3 months)?*	***NO YES*** _____ ***acute chronic***	***NO YES*** _____ ***acute chronic***

Criterion F. The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.

20. subjective distress

		Past week
[CURRENT] **Overall, how much have you been bothered by these (PTSD SYMPTOMS) you've told me about?** [CONSIDER DISTRESS REPORTED ON EARLIER ITEMS] [LIFETIME] **Overall, how much were you bothered by these (PTSD SYMPTOMS) you've told me about?** [CONSIDER DISTRESS REPORTED ON EARLIER ITEMS]	0 None 1 Mild, minimal distress 2 Moderate, distress clearly present but still manageable 3 Severe, considerable distress 4 Extreme, incapacitating distress	___ ***Past month*** ___ ***Lifetime***

21. impairment in social functioning

[CURRENT] **Have these (PTSD SYMPTOMS) affected your relationships with other people? How so?** [CONSIDER IMPAIRMENT IN SOCIAL FUNCTIONING REPORTED ON EARLIER ITEMS] [LIFETIME] **Did these (PTSD SYMPTOMS) affect your social life? How so?** [CONSIDER IMPAIRMENT IN SOCIAL FUNCTIONING REPORTED ON EARLIER ITEMS]	0 No adverse impact 1 Mild impact, minimal impairment in social functioning 2 Moderate impact, definite impairment, but many aspects of social functioning still intact 3 Severe impact, marked impairment, few aspects of social functioning still intact 4 Extreme impact, little or no social functioning	***Past week*** ___ ***Past month*** ___ ***Lifetime*** ___

22. impairment in occupational or other important area of functioning

[CURRENT -- IF NOT ALREADY CLEAR] **Are you working now?** IF YES: **Have these (PTSD SYMPTOMS) affected your work or your ability to work? How so?** [CONSIDER REPORTED WORK HISTORY, INCLUDING NUMBER AND DURATION OF JOBS, AS WELL AS THE QUALITY OF WORK RELATIONSHIPS. IF PREMORBID FUNCTIONING IS UNCLEAR, INQUIRE ABOUT WORK EXPERIENCES BEFORE THE TRAUMA. FOR CHILD/ADOLESCENT TRAUMAS, ASSESS PRE-TRAUMA SCHOOL PERFORMANCE AND POSSIBLE PRESENCE OF BEHAVIOR PROBLEMS] IF NO: **Have these (PTSD SYMPTOMS) affected any other important part of your life?** [AS APPROPRIATE, SUGGEST EXAMPLES SUCH AS PARENTING, HOUSEWORK, SCHOOLWORK, VOLUNTEER WORK, ETC.] **How so?** [LIFETIME -- IF NOT ALREADY CLEAR] **Were you working then?** IF YES: **Did these (PTSD SYMPTOMS) affect your work or your ability to work? How so?** [CONSIDER REPORTED WORK HISTORY, INCLUDING NUMBER AND DURATION OF JOBS, AS WELL AS THE QUALITY OF WORK RELATIONSHIPS. IF PREMORBID FUNCTIONING IS UNCLEAR, INQUIRE ABOUT WORK EXPERIENCES BEFORE THE TRAUMA. FOR CHILD/ADOLESCENT TRAUMAS, ASSESS PRE-TRAUMA SCHOOL PERFORMANCE AND POSSIBLE PRESENCE OF BEHAVIOR PROBLEMS] IF NO: **Did these (PTSD SYMPTOMS) affect any other important part of your life?** [AS APPROPRIATE, SUGGEST EXAMPLES SUCH AS PARENTING, HOUSEWORK, SCHOOLWORK, VOLUNTEER WORK, ETC.] **How so?**	0 No adverse impact 1 Mild impact, minimal impairment in occupational/other important functioning 2 Moderate impact, definite impairment, but many aspects of occupational/other important functioning still intact 3 Severe impact, marked impairment, few aspects of occupational/other important functioning still intact 4 Extreme impact, little or no occupational/other important functioning	***Past week*** ___ ***Past month*** ___ ***Lifetime*** ___

Global Ratings

23. global validity

ESTIMATE THE OVERALL VALIDITY OF RESPONSES. CONSIDER FACTORS SUCH AS COMPLIANCE WITH THE INTERVIEW, MENTAL STATUS (E.G., PROBLEMS WITH CONCENTRATION, COMPREHENSION OF ITEMS, DISSOCIATION), AND EVIDENCE OF EFFORTS TO EXAGGERATE OR MINIMIZE SYMPTOMS.	0 Excellent, no reason to suspect invalid responses 1 Good, factors present that may adversely affect validity 2 Fair, factors present that definitely reduce validity 3 Poor, substantially reduced validity 4 Invalid responses, severely impaired mental status or possible deliberate "faking bad" or "faking good"

24. global severity

ESTIMATE THE OVERALL SEVERITY OF PTSD SYMPTOMS. CONSIDER DEGREE OF SUBJECTIVE DISTRESS, DEGREE OF FUNCTIONAL IMPAIRMENT, OBSERVATIONS OF BEHAVIORS IN INTERVIEW, AND JUDGMENT REGARDING REPORTING STYLE.	0 No clinically significant symptoms, no distress and no functional impairment 1 Mild, minimal distress or functional impairment 2 Moderate, definite distress or functional impairment but functions satisfactorily with effort 3 Severe, considerable distress or functional impairment, limited functioning even with effort 4 Extreme, marked distress or marked impairment in two or more major areas of functioning	***Past week*** ___ ***Past month*** ___ ***Lifetime*** ___

25. global improvement

RATE TOTAL OVERALL IMPROVEMENT PRESENT SINCE THE INITIAL RATING. IF NO EARLIER RATING, ASK HOW THE SYMPTOMS ENDORSED HAVE CHANGED OVER THE PAST 6 MONTHS. RATE THE DEGREE OF CHANGE, WHETHER OR NOT, IN YOUR JUDGMENT, IT IS DUE TO TREATMENT.	0 Asymptomatic 1 Considerable improvement 2 Moderate improvement 3 Slight improvement 4 No improvement 5 Insufficient information

Current PTSD Symptoms

Criterion A met (traumatic event)? NO YES

_____ *# Criterion B sx (≥ 1)?* NO YES

_____ *# Criterion C sx (≥ 3)?* NO YES

_____ *# Criterion D sx (≥ 2)?* NO YES

Criterion E met (duration ≥ 1 month)? NO YES

Criterion F met (distress/impairment)? NO YES

CURRENT PTSD (Criteria A-F met)? NO YES

IF CURRENT PTSD CRITERIA ARE MET, SKIP TO ASSOCIATED FEATURES.

IF CURRENT CRITERIA ARE NOT MET, ASSESS FOR LIFETIME PTSD. IDENTIFY A PERIOD OF AT LEAST A MONTH SINCE THE TRAUMATIC EVENT IN WHICH SYMPTOMS WERE WORSE.

Since the (EVENT), has there been a time when these (PTSD SYMPTOMS) were a lot worse than they have been in the past month? When was that? How long did it last? *(At least a month?)*

IF MULTIPLE PERIODS IN THE PAST: **When were you bothered the most by these (PTSD SYMPTOMS)?**

IF AT LEAST ONE PERIOD, INQUIRE ITEMS 1-17, CHANGING FREQUENCY PROMPTS TO REFER TO WORST PERIOD: **During that time, did you (EXPERIENCE SYMPTOM)? How often?**

Lifetime PTSD Symptoms

Criterion A met (traumatic event)? NO YES

_____ *# Criterion B sx (≥ 1)?* NO YES

_____ *# Criterion C sx (≥ 3)?* NO YES

_____ *# Criterion D sx (≥ 2)?* NO YES

Criterion E met (duration ≥ 1 month)? NO YES

Criterion F met (distress/impairment)? NO YES

LIFETIME PTSD (Criteria A-F met)? NO YES

Associated Features

26. guilt over acts of commission or omission

Frequency	*Intensity*	Past week / Past month / Lifetime
Have you felt guilty about anything you did or didn't do during (EVENT)? Tell me more about that. *(What do you feel guilty about?)* **How much of the time have you felt that way in the past month** ***(week)*****?** 0 None of the time 1 Very little of the time (less than 10%) 2 Some of the time (approx 20-30%) 3 Much of the time (approx 50-60%) 4 Most or all of the time (more than 80%) ***Description/Examples***	**How strong were these feelings of guilt? How much distress or discomfort did they cause?** 0 No feelings of guilt 1 Mild, slight feelings of guilt 2 Moderate, guilt feelings definitely present, some distress but still manageable 3 Severe, marked feelings of guilt, considerable distress 4 Extreme, pervasive feelings of guilt, self-condemnation regarding behavior, incapacitating distress ***QV (specify)*** _____	F ___ I ___ Sx: Y N

27. survivor guilt [APPLICABLE ONLY IF MULTIPLE VICTIMS]

Frequency	*Intensity*	Past week / Past month / Lifetime
Have you felt guilty about surviving (EVENT) when others did not? Tell me more about that. *(What do you feel guilty about?)* **How much of the time have you felt that way in the past month** ***(week)*****?** 0 None of the time 1 Very little of the time (less than 10%) 2 Some of the time (approx 20-30%) 3 Much of the time (approx 50-60%) 4 Most or all of the time (more than 80%) 8 N/A ***Description/Examples***	**How strong were these feelings of guilt? How much distress or discomfort did they cause?** 0 No feelings of guilt 1 Mild, slight feelings of guilt 2 Moderate, guilt feelings definitely present, some distress but still manageable 3 Severe, marked feelings of guilt, considerable distress 4 Extreme, pervasive feelings of guilt, self-condemnation regarding survival, incapacitating distress ***QV (specify)*** _____	F ___ I ___ Sx: Y N

28. a reduction in awareness of his or her surroundings (e.g., "being in a daze")

Frequency	***Intensity***	***Past week***
Have there been times when you felt out of touch with things going on around you, like you were in a daze? What was that like? [DISTINGUISH FROM FLASHBACK EPISODES] **How often has that happened in the past month *(week)*?** [IF NOT CLEAR:] *(Was it due to an illness or the effects of drugs or alcohol?)* **When did you first start feeling that way?** *(After the [EVENT]?)* 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How strong was this feeling of being out of touch or in a daze?** *(Were you confused about where you actually were or what you were doing at the time?)* **How long did it last? What did you do while this was happening?** *(Did other people notice your behavior? What did they say?)* 0 No reduction in awareness 1 Mild, slight reduction in awareness 2 Moderate, definite but transient reduction in awareness, may report feeling "spacy" 3 Severe, marked reduction in awareness, may persist for several hours 4 Extreme, complete loss of awareness of surroundings, may be unresponsive, possible amnesia for the episode (blackout) ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely* *Current* _____ *Lifetime* _____	F ____ I ____ ***Past month*** F ____ I ____ Sx: Y N ***Lifetime*** F ____ I ____ Sx: Y N

29. derealization

Frequency	***Intensity***	***Past week***
Have there been times when things going on around you seemed unreal or very strange and unfamiliar? [IF NO:] *(What about times when people you knew suddenly seemed unfamiliar?)* **What was that like? How often has that happened in the past month *(week)*?** [IF NOT CLEAR:] *(Was it due to an illness or the effects of drugs or alcohol?)* **When did you first start feeling that way?** *(After the [EVENT]?)* 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How strong was (DEREALIZATION)? How long did it last? What did you do while this was happening?** *(Did other people notice your behavior? What did they say?)* 0 No derealization 1 Mild, slight derealization 2 Moderate, definite but transient derealization 3 Severe, considerable derealization, marked confusion about what is real, may persist for several hours 4 Extreme, profound derealization, dramatic loss of sense of reality or familiarity ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely* *Current* _____ *Lifetime* _____	F ____ I ____ ***Past month*** F ____ I ____ Sx: Y N ***Lifetime*** F ____ I ____ Sx: Y N

30. depersonalization

Frequency	*Intensity*	*Past week*
Have there been times when you felt as if you were outside of your body, watching yourself as if you were another person? [IF NO:] *(What about times when your body felt strange or unfamiliar to you, as if it had changed in some way?)* **What was that like? How often has that happened in the past month *(week)*?** [IF NOT CLEAR:] *(Was it due to an illness or the effects of drugs or alcohol?)* **When did you first start feeling that way?** *(After the [EVENT]?)* 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How strong was (DEPERSONALIZATION)? How long did it last? What did you do while this was happening?** *(Did other people notice your behavior? What did they say?)* 0 No depersonalization 1 Mild, slight depersonalization 2 Moderate, definite but transient depersonalization 3 Severe, considerable depersonalization, marked sense of detachment from self, may persist for several hours 4 Extreme, profound depersonalization, dramatic sense of detachment from self ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely* *Current* _____ *Lifetime* _____	*F* ____ *I* ____ ***Past month*** *F* ____ *I* ____ ***Sx: Y N*** ***Lifetime*** *F* ____ *I* ____ ***Sx: Y N***

CAPS SUMMARY SHEET

Name:_____ ID#:_____ Interviewer:_____ Study:_____ Date:_____

A. Traumatic event:

B. Reexperiencing symptoms	*PAST WEEK*			*PAST MONTH*			*LIFETIME*		
	Freq	*Int*	*F+I*	*Freq*	*Int*	*F+I*	*Freq*	*Int*	*F+I*
(1) intrusive recollections									
(2) distressing dreams									
(3) acting or feeling as if event were recurring									
(4) psychological distress at exposure to cues									
(5) physiological reactivity on exposure to cues									
B subtotals									
Number of Criterion B symptoms (need 1)									

C. Avoidance and numbing symptoms	*PAST WEEK*			*PAST MONTH*			*LIFETIME*		
	Freq	*Int*	*F+I*	*Freq*	*Int*	*F+I*	*Freq*	*Int*	*F+I*
(6) avoidance of thoughts or feelings									
(7) avoidance of activities, places, or people									
(8) inability to recall important aspect of trauma									
(9) diminished interest in activities									
(10) detachment or estrangement									
(11) restricted range of affect									
(12) sense of a foreshortened future									
C subtotals									
Number of Criterion C symptoms (need 3)									

D. Hyperarousal symptoms	*PAST WEEK*			*PAST MONTH*			*LIFETIME*		
	Freq	*Int*	*F+I*	*Freq*	*Int*	*F+I*	*Freq*	*Int*	*F+I*
(13) difficulty falling or staying asleep									
(14) irritability or outbursts of anger									
(15) difficulty concentrating									
(16) hypervigilance									
(17) exaggerated startle response									
D subtotals									
Number of Criterion D symptoms (need 2)									

Total Freq, Int, and Severity (F+I)	*PAST WEEK*			*PAST MONTH*			*LIFETIME*		
	Freq	*Int*	*F+I*	*Freq*	*Int*	*F+I*	*Freq*	*Int*	*F+I*
Sum of subtotals (B+C+D)									

E. Duration of disturbance	*CURRENT*	*LIFETIME*
(19) duration of disturbance at least one month	*NO YES*	*NO YES*

F. Significant distress or impairment in functioning	*PAST WEEK*	*PAST MONTH*	*LIFETIME*
(20) subjective distress			
(21) impairment in social functioning			
(22) impairment in occupational functioning			
AT LEAST ONE ≥ 2?	*NO YES*	*NO YES*	*NO YES*

PTSD diagnosis	*CURRENT*	*LIFETIME*
PTSD PRESENT – ALL CRITERIA (A-F) MET?	*NO YES*	*NO YES*
Specify: (18) with delayed onset (≥ 6 months delay)	*NO YES*	*NO YES*
(19) acute (< 3 months) or chronic (≥ 3 months)	*acute chronic*	*acute chronic*

Global ratings	*PAST WEEK*	*PAST MONTH*	*LIFETIME*
(23) global validity			
(24) global severity			
(25) global improvement			

Associated features	*PAST WEEK*			*PAST MONTH*			*LIFETIME*		
	Freq	*Int*	*F+I*	*Freq*	*Int*	*F+I*	*Freq*	*Int*	*F+I*
(26) guilt over acts of commission or omission									
(27) survivor guilt									
(28) reduction in awareness of surroundings									
(29) derealization									
(30) depersonalization									

APPENDIX E: TRAUMATIC EVENTS EXPERIENCED

ID No	V2	V3	V4	V5
1	1) Mother's HIV illness 2) Witnessed mine and fire station accidents (chest and head injuries)	Withdrew consent		
2	2) Hijacking +assault (2 years previously)	Nil new reported	Nil new reported	Nil new reported
3	1) Attempted hijacking 2) Fire/explosion during military training	Nil new reported	Withdrew consent	
4	1) Armed Robbery 2)Assault age 16	Nil new reported	Work related: 1) saw bodies of murdered children, 2) case of rape,	1) Deaths of colleagues in the line of duty (heard about it)
5	1) Mom's CVA 2) Brother's drug taking	No new events	Duty related: 1) Armed robberies, 2) found dead bodies	Shooting incident (broke into neighbour's car)
6	1) Chronic abuse from dad (physical and emotional) 2) MVA aged 16 3) Death of grandfather	1) Death of colleagues (heard about it)	Work related cases of 1) rape, 2) assault	1) Death of colleagues (as in V3)
7	1) Attempted suicide by setting himself alight in car 2) Armed robbery 3) Hijacking (separate incident)	1) Death of friend's son	1) Wife took an overdose	1) Death of colleague In the line of duty:2) Shot at by taxi driver
8	1) Death of grandmother from cancer 2) Murder of uncle (did not witness) 3) Witnessed MVA	1) Death of uncle (as in V2)	Opened dockets for 1) murder, 2) MVA's, 3) domestic violence	1) Death of colleagues
9	1) Aged 15 fell off tree and injured spinal cord 2) Death of cousin aged 25	Nil new reported	Nil new reported	No new events
10	1) Death of friend by stabbing 2) Assaulted 2 years ago	Nil new reported	Duty related: 1) MVA – 1 death	No new events
11	1) Assaulted while in army 2) Sudden death of father when she was 14	Line of duty: 1) shootout at Pick and Pay	Line of duty: 1) suicide scene Line of duty: 2) shootout Pick and Pay used gun	2) As in v4 Nil new reported
12	1) Bicycle accident aged 17	Nil new reported	1) Death of colleague in line of duty (heard about it)	Nil new reported

13	1) Death of grandmother when he was 16 (very close to her)	Nil new reported	1) Death of colleague (heard about it)	Nil new reported
14	1) Natural disaster (Virginia mud dam burst) involved +witnessed	1) MVA (witnessed)	1) Came upon dead body while off duty	1) Death of colleagues in line of duty (heard about it)
15	1) Attempted robbery (armed) was shot in incident) 2) Death of aunt (AIDS) 7 yrs ago	Nil new 1) reported death of aunt as in V2	Duty related: 1) dead bodies 2) Gun shot as is V2	1) Death of colleague in line of duty (heard about it)
16	1) Childhood sexual molestation	Nil new reported	Duty related: 1) smash and grab Duty related: 2) domestic violence cases	Duty related: deaths of 2 colleagues
17	1) MVA (was driver)	1) MVA as in V2	Duty related: 1) Pedestrian dead Duty related: 2) rape of woman	Nil new reported 1) (V2 incident repeated)
18	1) brother committed suicide 2) father burnt	No new events As V2	Duty related MVA (dismembered bodies).	Duty related: 1) Cases of rape, 2) assault
19	1) MVA came upon scene – 5 dead 2) Gran raped 2 yrs ago 3) Colleague shot dead (heard about it)	Nil new reported	Duty related: 1) woman raped and murdered	1) Shoot out at Pick and Pay 2) Witness to MVA off duty
20	1) Mortuary exposure 2) Brother attempted suicide when she was 8yrs	Nil new reported	Duty related: 1) baby died of aspiration	1) Death of colleague by shooting (heard about it)
21	1) MVA (x2, 1 month apart) passenger 2 yrs ago	Nil new reported 1) (family squabbles on IES)	Duty related: 1) cases of armed robbery, 2) murder Non traumatic stress: problems with supervisor	Nil new reported (still stress with supervisor)
22	1) Armed robbery at home (9 yrs ago) 2) Murder of father 9 yrs ago 3) Sexually assaulted aged 13	Nil new reported	Duty related: 1) cases of rape	Nil new 1) (broke up with boyfriend)
23	No traumatic events reported	Nil reported	Duty related: 1) cases of hijacking x2	No new events
24	1) MVA 1993 2) Armed robbery 3) Mother's chronic illness	Nil new – as before (3)	Duty related cases of domestic violence	Duty related cases of assault and 2) domestic violence

25	1) Diagnosis of HIV 4 yrs ago 2) Fire at home Witnessed fire, sister hurt 3) Death of friend of AIDS 4 yrs ago	1) MVA (involved in)	1) Diagnosis of HIV 4 yrs ago	Duty related: 1) verbal abuse by motorists, 2) threatened with gun (taxi driver)
27	1) Witnessed MVA 2) Came across abandoned baby	No new events – as in V2	No new events -as in V2	Duty related: 1) MVA, 2) abandoned baby
28	1) MVAx2 (driver) 2) Mugged 2 yrs ago 3) Township violence (political) aged 14	No new events, as in V2	Duty related: 1) Death of child (drowning) 2) Death of child (shot)	Duty related MVAs
29	Death of father in MVA 1 year ago	No new events	Duty related cases of MVAs, and 2) assault	No new events Death of father still an issue
30	1) Death of brother in MVA	Nil traumatic	Duty related: 1) stabbing (resulted in death)	1) Death of colleague
31	1) Sister's death (RVD) 2) Friend's suicide 3) Beat girlfriend	Nil new 1) Fight with girlfriend	Nil new reported	Duty related: 1) shot at thief
32	1) Shot at while trying to help rape victim (10 yrs ago)	Lost to follow up		
33	Physically Abusive marriage	1) Brother's death 2) as in V2	No new events	1) Death of sister in law
34	1) Death of uncle 1 yr ago 2) MVA(driver, not injured) 3) Domestic violence: husband threatened to shoot her 4) Suicide of brother and cousin (12 yrs ago)	Nil new reported	Duty related: 1) rape of child 2) domestic violence cases	Nil new reported
35	1) Sexual abuse as a child 2) Domestic violence (divorced now)	1) Sexual abuse as a child 2) Death of grandmother	Duty related: 1) called to scene of dead child 2) called to scene of suicide	No new events
36	Lost to follow up			
37	Domestic violence (own experience)	No new events – as in V2	Lost to follow up	
38	1) Witnessed repeated domestic abuse in tavern 5 yrs ago 2) Witnessed MVA's x2 3) Friend's suicide (5 yrs ago)	1) Witnessed stabbing 2) Witnessed death of man due to head injury	Duty related: 1) stabbing 2) Dead body	Lost to follow up

39	Nil traumatic Financial worries	No events	Duty related: 1) physical assault 2) domestic violence	Duty related: 1) Cases of domestic violence, 2) MVAs
40	1) MVA aged 18 2) Witnessed burning of child 11 years ago 3) Death of cousin aged 24	1) Floods due to burst pipe	Duty related: 1) suspect burnt (guarding in hosp) – reminded of child burning	Death of colleagues 1) (1 in MVA, 2) 1 in shootout)
41	Robbed at gunpoint 1 year ago	Friend's suicide	No new events - as in V2	1) Friend's suicide
42	1) Sister's HIV 2) Kidnap of sister	Duty related: 1) cases of rape	Duty related; 1) cases of rape	Nil new: 1) sister's destructive behaviour
43	1) MVA (passenger)5yrs ago	Nil new 1) (MVA)	Duty related: 1) case of burnt man(by girlfriend)	Deceased MVA
44	1) Sisters death	No new events – as in V2	No new events As in V2	1) Death of sister
45	MVA 4 years	No new events	Duty related MVAs	Duty related: MVAs
46	1) Wife and 2) son diagnosed with cancer	1) Wife's relapse 2) Experience in defence force	Death of wife	1) Death of wife, 2) son's illness
47	1) MVA 1995 2) MVA 2001 3) Death of friend (AIDS)	Nil new reported	Duty related: 1) stabbing	1) Friend's death 2) MVA
48	Robbed at gunpoint 7 years ago	1) Son's injury and suffering 2) As V2	Physical fight with girlfriend	Duty related :1) cases of domestic violence 2) fights with girlfriend
49	Raped (gunpoint)-HIV + as a result	1) Divorce 2) As in V2	No new events Previous sexual assault still an issue	Rape as in V2 + duty related cases of rape and assault
50	1) Township violence exposure(12 yrs ago) 2) MVA whilst at school (passenger)	Called to scene of MVA (no symptoms related to this)	Duty related MVAs	Nil new reported
51	1) Brother shot 2) Sudden death of brother	1) MVA 2) And 3) as in V2	Duty related: MVAs	Illness
52	1) MVA 6 yrs ago 2) Mental illness of dad – left home	No new events – as in V2	1) MVA 2) Duty related: MVAs, 3) assault 4) rape	MVA
53	Uncle committed suicide 4 years ago	1) As v2 2) Brother's death 3) MVA	Duty related: 1) suicide 2) housebreaking	3) MVA 4) IOD while chasing suspect

54	MVA 4 years ago	No new events – as in V2	Duty related: Domestic violence	Duty related cases of domestic violence
55	1) MVA 11 yrs ago 2) Armed robbery at home 5 yrs ago 3) Diagnosed HIV + 1 yr ago	Duty related: 1) directing traffic became "confused"	Duty related domestic violence	1) housebreaking 2) domestic violence
56	1) Death of aunt of HIV 2 yrs ago	Nil new reported	Duty related: 1) hunting criminals at night, 2) cases of rape, 3) domestic violence	Duty related 1) cases of assault, 2) MVAs
57	1) Assaulted aged 19 2) Friend committed suicide 10 years ago 3) Sister died of AIDS	1) mother diagnosed with breast cancer	Duty related: 1) domestic violence 2) rape 3) MVAs	Duty related 1) assault + 2) MVAs
58	1) Death of aunt	1) Death of aunt (as V2) 2) witnessed attempted rape	duty related: 1) witnessed shooting of thug by colleague 2) Gang rape	Duty related gang rape
59	1) MVA at primary school 2) Grandmother's stroke	1) witnessed MVA 2) as V2	Duty related: 1) MVAs 2) Housebreaking 3) Domestic violence	No new events
60	1) Assaulted 2 months ago	1) Friends died of HIV 2) assault as in V2	Duty related: 1) domestic violence cases 2) suicide	Suspended due to negligent use of firearm
61	No events (struggling with course)	Nil traumatic (failed exams)	Sudden death of brother (aged 35)	Brother's death
62	1) Exposure to township violence 12 yrs ago 2) Suicide of friend (found him shot) 3) Father killed by hostel dwellers (aged 11)	Duty related: cases of 1) domestic violence, 2) armed robbery	Nil new reported	Nil new reported
63	1) MVAs 2001, 2) 2002, 3) 2003 (driver each time, 2003 most severe)	As before + MVA 1 month ago	As before + duty related: 1) decomposed body of old lady 3) Assault (bottle)	MVAs experienced in V2 and V 3

64	1) Assaulted with sjambok 1 yr ago 2) Death of father 2 yrs ago 3) MVA 3 yrs ago	Nil new reported	Duty related: 1) smash and grab, 2) evicting illegal vendors	Duty related: Security guard strikes
65	1) Death of wife of cancer 5 months ago	No new events	Death of wife as in V2 grieving ++	lost to follow up
66	1) shack collapsed in storm 5 yrs ago 2) Witnessed 3) MVA 1 yr ago 4) Witnessed uncle stabbed aged 12 5) Death of grandmother 9 yrs ago	No new events	Duty related:1) Attended to MVAs (1-teenager trapped in vehicle)	No new events NB 1) problems with supervisor (racism)
67	Nil traumatic (financial stressors)	Nil traumatic 1) financial stress only	Duty related 1) MVAs 2) sudden death of brother (aged 41)	Duty related 1) MVAs
68	Deaths of 3 family members	No new events - as in V2	1) Death of brother 2) Duty related: assaults	Duty related cases of assault
69	1) Death of father (shot) 6 yrs ago 2) MVAs 10 yrs ago and 3) 5 yrs ago (passenger)	1) Death of grandmother	Duty related: 1) shootout	Duty related 1) shoot out
70	1) Bullying as a child	1) Bullied as a child	No new events 1) (Bullying as a child)	No new events (Bullying still an issue)
71	1) Involved in serious MVA 8 years ago	1) Involved in serious MVA 2) Wife's retrenchment	No new events 1) (MVA as prev)	MVA (as prev)
72	1) Witnessed mother's domestic violence	No new events reported	Duty related: 1) Cases of assault Prev: 2) witnessed domestic violence	Duty related: cases of rape, assault Prev as V2
73	1) Death of grandfather 2) Uncle committed suicide (shot himself)	Duty related: 1) Aborted foetus, 2) domestic violence cases	Duty related: 1) Case of dead body	Duty related 1) aborted foetus
74	1) Sexually molested as a child	Lost to follow up	Lost to follow up	Lost to follow up
75	1) Death of brother in law of AIDS 2) Boyfriend shot (non fatal) 2 years ago	No new events	Duty related: 1) Cases of assault, 2) murder	Withdrew consent

76	1) Boyfriend shot himself in front of her 6 years ago 2) Father's death 1 year ago	No new events reported	No new events	Lost to follow up
77	No traumatic events experienced	No events	1) Brother had a CVA	No new events
78	Assault	1) Physical assault	1) Assault	1) Assault
79	1) Aunt found dead in veld	1) Death of friend	Duty related: 1) Fire in which 10 people died	1) Diagnosed cancer of the uterus
80	No traumatic events experienced	No event	Duty related: 1) Cases of assault 2) Guarding dead bodies	Duty related: 1) Seeing dead bodies
81	1) Attempted housebreaking 3 years ago 2) Hijacked 3 years ago	1) Father of child jailed for rape	Duty related: 1) Cases of assault	Duty related: 1) cases of assault
82	1) Raped by boyfriend and his friends aged 14/15 2) Death of aunt	No new events 1) (Rape as in V2)	1) Diagnosed HIV +	No new events As V2
83	1) Held at gunpoint during housebreaking 6 months ago	No new events (as before)	1) Diagnosed Cancer of cervix 2) (held up at gunpoint)	1) Diagnosed cancer of cervix 2) Held up at gunpoint (as V1)
84	1) Sudden deaths of sister and 2) father	No new events	Duty related: 1) Cases of assault	Duty related: Cases of rape and domestic violence
85	1) Death of ex boyfriend 1 year ago	Lost to follow up	Lost to follow up	Duty related: Rape of child
86	Unexpected death of cousin (suspected AIDS)	Duty related: 1) Man shot in neck 2) Cousin's death	Duty related: 1) Man shot in head	Duty related: Man shot in head
88	1) Freak accident of brother-car exploded while fixing(witnessed)	No new events1) (brother's accident as in V2)	Duty related: 1) Guarding dead body 2) (brother's accident)	1) Witnessed brothers accident (as V2)
89	1) Armed robbery while working at Macdonalds	No new events 1) (robbery as in V2)	No new events 1) (robbery as in V2, V3)	No new events
90	1) Death of aunt	Duty related: 1) Cases of assault, 2) domestic violence	Duty related: 1)Case of assault	Duty related: 1) cases of domestic violence

91	1) MVA- hit by car 2 years ago 2) Aunt and cousin died 1 year apart	Duty related: 1) Domestic violence cases, 2) assault	Duty related: 1) Called to scene of suicide victim, shot through mouth	Lost to follow up
92	1) Mother's death 2 years ago	Duty related: 1) Hijacking, 2) assault	Duty related: 1) Called to murder scene	Duty related: 1) Case of murder
93	1) Death of sister 3 years ago	No new events	Duty related: 1) Man shot in head ?suicide ?accidental	Duty related: 1) domestic violence cases
94	1) Raped at age 16	Duty related: 1) Guarding dead bodies 2) Rape still an issue	Duty related: 1) Guarding dead bodies. 2) Rape still an issue	Duty related: 1) guarding dead bodies 2) rape still an issue
95	1) Township violence exposure 2) MVAs 3) Assault	Duty related: 1) Cases of domestic violence	1) Developmental delay of child	Duty related: 1) Cases of domestic violence
96	1) Death of infant cousin (illness) 2) Parents separation	No new events	Duty related: 1) Guarding of dead body (man shot)	1) Metro officer shot 1 week ago (colleague)
97	1) MVAs x 3 2002, 2) 2003, 3) 2004 (passenger each time)	No new events 3) (MVAs as in V2)	Duty related: 1) Cases of assault, 2) housebreaking	Duty related: 1) MVAs
98	MVA	1) Death of uncle 3 weeks ago	Duty related: 1) Domestic violence cases 2) Prev: MVA	1) MVA 3 weeks ago Duty related: 2) domestic violence
99	1) Assaulted 2 years ago 2) Shot 2001 during robbery 3) Death of aunt	Withdrew consent		
101	1) Death of sister in MVA 2) Sexual molestation age 13 3) Witnessed taxi accident	No new events	Duty related: 1) cases of assaulted 2) Breakup of relationship with father of child	Duty related; 1) cases of assaulted
104	1) Traumatic circumcision 4 yrs ago	No new events 1) (traumatic circumcision)	No new events 1) (as V2, 3)	No new events 1) Traumatic circumcision

108	1) Death of friend 2) Armed robbery	No new events 1) (as V2)	1) Armed robbery (as V2) 2) Death of father	1) Heard about shooting incident
110	1) Death of sister of AIDS	No new events 1) sister's death	Duty related: 1) MVA	1) Caring for cousin who is HIV +
111	1) Sexual abuse as a child 2) Armed robberies x 2	No new events (as V2)	Duty related: 1) MVAs, 2) mortuary experience	Lost to follow up
112	Nil- parents fighting	1) MVAs at work	Lost to follow up	
113	1) MVA of cousin	1) MVAs on road 2) Rape of cousin	Duty related: 1) MVAs	No new events
114	1) Mob disruption at church	No new events 1) (mob disruption at church)	Withdrew consent	
115	1) Death of child illness 5 yrs ago	No new events 1) (death of child)	No new events	Duty related: 1) MVAs
116	1) Death of sister 1 wk ago ?cause	No new events 1) (death of sister)	No new events	Duty related: 1) exposure to MVAs
117	1) Death of mother of cancer	No new events (as V2)	1) Sister diagnosed with HIV	1) Death of colleague in MVA while on duty
119	1) Husband killed in hijacking 10 yrs ago	No new events	Lost to follow up	Duty related: 1) MVAs
120	1) Death of grandmother of cancer 5 yrs ago 2) MVAs x 3 (not serious)	1) Death of friend	Duty related: 1) MVAs	Duty related 1) involved in serious MVA, colleague died
121	1) MVA 2002	No new events 1) (MVA)	Duty related: 1) MVAs (people burnt)	Duty related: 1) sergeant shot (heard about it)
122	1) MVA 6 yrs ago	No new events 1) (MVA)	Duty related: 1) MVAs	Duty related: 1) MVAs
124	1) Witnessed killing, armed robbery aged 17	No new events (as V2)	Duty related: 1) MVAs	Duty related: 1) involved in shooting incident 2 wks ago
125	1) Nil – unable to conceive	Nil new (as V2)	No new events	No new events
126	1) Childhood sexual abuse	1) MVAs 2) (as v2)	1) Childhood sexual abuse	No new events 1) Childhood sexual abuse
127	1) Death of father 6 years ago	Nil new events relationship problems	No new events 1) (death of father still an issue)	Duty related: 1) assaulted while on duty
128	1) Armed robbery 2 yrs ago	No new events (as V2)	Lost to follow up	
129	1) Death of uncle (AIDS) 4 yrs ago	1) MVAs on duty	Duty related: 1) MVAs	Duty related: 1) shooting
130	1) Death of girlfriend 2) Brother (HIV)	MVAs (As V2)	No new events (as V2)	1) Father's death 2) Brother's death
131	Lost to follow up		No new events	Nil traumatic Financial and relationship problems
132	1) Death of brother (shot 10 yrs ago) 2) Death of sister 3 yrs ago post partum 3) Death of mother of TB 6 yrs ago	Nil new (deaths in family as V2)	No new events	No new events

134	Nil traumatic (financial problems)	Nil traumatic, family problems, exam stress	Duty related: 1) MVAs	No new events
135	1) Death of friend in MVA	Withdrew consent		
137	Nil – parents divorce	No new events	Duty related: MVAs	No new events
138	1) Witnessed train accident	No new events (as V2)	No new events (as V2, 3)	Duty related 1) shooting incident sergeant shot
139	1) Death of grandfather 10 years ago	1) MVAs 2) Death of girlfriend	1) Girlfriend and he held up	Duty related: 1) MVAs ++
140	1) Domestic violence of parents	Lost to follow up		
141	1) Death of sister 2) Illness of sister (another)	1) MVAs on road	Duty related: 1) MVAs	No new events
142	1) MVA 6 yrs ago (driver)	1) MVAs on road As in V2	Lost to follow up	
143	1) Domestic violence, divorce	No new events (as V2)	No new events 1) Divorce	No new events 1) Divorce
144	1) Death of niece 2) Exposure to ++suicides	No new events (as v2)	Duty related: 1) Exposure to suicides	Duty related: 1) MVAs
148	1) Death of father she was aged 12 2) Parents separation	1) MVAs on road	1) Death of father	No new events 1) Death of father
149	1) MVA (knocked child)	No new events (as V2)	No new events	Duty related: 1) MVA 2 wks ago 2) Colleague shot
150	No traumatic events exp	1) Abuse from public 2) Financial stress	No new events	Duty related 1) MVAs
152	1) Suicide of colleague	Lost to follow up		
153	1) Death of mother 5 years ago 2) Death of brother (shot)	1) Death of brother 2) Abusive marriage	1) Abusive relationship 2) Death of mother and brother	1) Abusive marriage and divorce
154	1) Brother killed 8 years ago	No new events	Lost to follow up	No new events
155	1) Death of friend of AIDS	No new events (as V2)	1) Husband deserted her	No new events
157	1) Sisters illness (HIV)	No new events (as V2)	Duty related: 1) MVAs As V2	No new events

Appendix F:Hamilton Depression Rating Scale

1. Depressed Mood

0 Absent.
1 These feelings states indicated only on questioning.
2 These feeling states spontaneously reported verbally.
3 Communicates feeling states non-verbally i.e., through facial expression.

2. Feelings of Guilt.

0 Absent.
1 Self reproach.
2 Ideas of guilt or rumination over past errors or sinful deeds.
3 Present illness is a punishment. Delusions of guilt.
4 Hears accusatory of denunciatory voices and/or experiences threatening visual hallucinations.

3. Suicide

0 Absent.
1 Feels life is not worth living.
2 Wishes he/she were dead or any thoughts of possible death to self.
3. Suicide ideas or gesture.
4 Attempts of suicide (any serious attempt rates 4).

4. Insomnia (Early)

0 No difficulty falling asleep.
1 Complaints of occasional falling asleep i.e. more than half an hour.
2 Complains of nightly difficulty falling asleep.

5. Insomnia (middle)

0 No difficulty.
1 Patient complains of being restless and disturbed during the night.
2 Waking during the night- any getting out of bed rates 2 (except for purposes of voiding).

6. Insomnia (Late)

0 No difficulty.
1 Waking in the early hours of the morning but goes back to bed.
2 Unable to fall asleep again if out of bed.

7. Work and Activities

0 No difficulty.
1 Thoughts and feelings of incapacity, fatigue or weakness related to activities, work or hobbies.
2 Loss of interest in activities, hobbies or work –either reported by patient, or indirect in listlessness, indecision and vacillation (feels he/she has to push self to work or activities).
3 Decrease in actual time spent in activities or decrease in productivity. In hospital, rate 3 if patient does not spend at least 3 hours a day in activities (hospital job or hobbies exclusive of ward chores).
4 Stopped working because of present illness. In hospital, rate 4 if patient engages in no activities except ward chores, or if patient fails to perform ward chores unassisted.

8. Retardation

0 Normal speech and thought.
1 Slight retardation at interview.
2 Obvious retardation at interview.
3 Interview difficult.
4 Complete stupor.

9. Agitation

0 None.
1 Fidgetiness.
2 "Playing with" hands, hair, etc.
3 Moving about, can't sit still.
4. Hand wringing, nail biting, hair pulling, biting of lips.

10. Anxiety (Psychic)

0 No difficulty.
1 Subjective tension and irritability.
2 Worrying about minor matters.
3 Apprehensive attitude apparent in face or speech.
4 Fears expressed without questioning.

11. Anxiety (Somatic) physiological concomitants of anxiety such as: gastrointestinal e.g. dry mouth, wind, indigestion, diarrhea, cramps, belching. Cardiovascular e.g. palpitations, headaches. Respiratory e.g. hyperventilation, sighing. Urinary frequency, sweating.

0 Absent.
1 Mild.
2 Moderate.
3 Severe.
4 Incapacitating.

12. Somatic symptoms (gastro-intestinal)

0 None.
1 Loss of appetite but eating without staff encouragement. Heavy feeling in abdomen.
2 Difficulty eating without staff urging. Requests or requires laxatives or medication for bowels or mediation for GI symptoms.

13. Somatic symptoms (General)

0 None.
1Heaviness in limbs, back, or head. Backaches, headaches, muscle aches.
2 Loss of energy and fatigability.
Any clear cut symptom rates 2.

14. Genital symptoms such as loss of libido, menstrual disturbances.

0 Absent.
1 Mild.
2 Severe.

15. Hypochondriasis

0 Not present.
1 Preoccupations with health.
2 Frequent complaints, requests for help etc.
3 Hypochondrial delusions.

16. Loss of Weight

(A) When rating by history.

0 No weight loss.
1 Probable weight loss associated with present illness.
2 Definite (according to patient) weight loss.

(B) On weekly ratings by ward psychiatrist when actual weight changes are measured

0 Less than half kg weight loss in a week.
1 Greater than half kg weight loss.
2 Greater than 1 kg weight loss in a week.

17. Insight

0 Acknowledges being depressed and ill.
1 Acknowledges illness but attributes cause to bad food, climate, overwork, virus, need for rest etc.
2 Denies being ill.

APPENDIX G

The Impact of Event Scale - Revised

Below is a list of difficulties people sometimes have after stressful life events. Please read each item, and then indicate how distressing each difficulty has been for you DURING THE PAST SEVEN DAYS with respect to _____, how much were you distressed or bothered by these difficulties?

	Not at all	A little bit	Moderately	Quite a bit	Extremely
1. Any reminder brought back feelings about it	0	1	2	3	4
2. I had trouble staying asleep	0	1	2	3	4
3. Other things kept making me think about it	0	1	2	3	4
4. I felt irritable and angry	0	1	2	3	4
5. I avoided letting myself get upset when I thought about it or was reminded of it	0	1	2	3	4
6. I thought about it when I didn't mean to	0	1	2	3	4
7. I felt as if it hadn't happened or wasn't real	0	1	2	3	4
8. I stayed away from reminders about it	0	1	2	3	4
9. Pictures about it popped into my mind	0	1	2	3	4
10. I was jumpy and easily startled	0	1	2	3	4
11. I tried not to think about it	0	1	2	3	4

12. I was aware that I still had a lot of feelings about it, but I didn't deal with them	0	1	2	3	4
13. My feelings about it were kind of numb	0	1	2	3	4
14. I found myself acting or feeling as though I was back at that time	0	1	2	3	4
15. I had trouble falling asleep	0	1	2	3	4
16. I had waves of strong feelings about it	0	1	2	3	4
17. I tried to remove it from my memory	0	1	2	3	4
18. I had trouble concentrating	0	1	2	3	4
19. Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart	0	1	2	3	4
20. I had dreams about it	0	1	2	3	4
21. I felt watchful or on-guard	0	1	2	3	4
22. I tried not to talk about it	0	1	2	3	4

Scoring:
Avoidance Subscale = mean of items 5, 7, 8, 11, 12, 13, 17, 22
Intrusion Subscale = mean of items 1, 2, 3, 6, 9, 14, 16, 20
Hyperarousal Subscale = mean of items 4, 10, 15, 18, 19, 21

APPENDIX H: TESTS FOR NORMAL DISTRIBUTION FOR PHYSIOLOGICAL VARIABLES AT EACH VISIT

	V1 bld Cortisol	V1 sal Cortisol	V1 uri Cortisol	V1 IL6	V1 TNF	V2 bld Cortisol	V2 sal Cortisol	V2 uri Cortisol	V2 IL6	V2 TNF	V3 bld Cortisol	V3 sal Cortisol	V3 uri Cortisol	V3 IL6	V3 TNF
Number of values	137	135	135	138	138	136	133	128	137	137	130	130	119	131	131
Minimum	97	0	25	0.25	0.01	89	0	25	0.04	0.01	13	0	8	0.38	0.09
25% Percentile	265	6	109	1.695	1.268	244	12	93.25	1.905	0.96	209	4.75	99	1.64	0.87
Median	365	14	178	2.38	3.06	315	25	148.5	2.38	2.13	296	11	203	2.12	1.98
75% Percentile	555.5	37	281	3.405	6.11	458	38	224	3.27	4.05	427	23	322	3.02	5.41
Maximum	1362	178	1302	48.9	72.69	1832	132	855	39.47	75	1187	85	1230	34	74
Mean	440.2	26.71	228.5	4.258	5.375	397.7	28.44	194.2	3.39	3.767	355.5	15.78	255	3.316	4.364
Std. Deviation	254.8	31.03	181.9	6.06	8.29	251.7	21.45	154.1	3.97	7.349	232.3	15.65	223.5	4.012	7.751
Std. Error	21.77	2.67	15.65	0.5159	0.7057	21.59	1.86	13.62	0.3392	0.6278	20.38	1.372	20.49	0.3505	0.6772
Lower 95% CI of mean	397.1	21.43	197.5	3.237	3.98	355	24.76	167.3	2.719	2.525	315.2	13.06	214.4	2.622	3.024
Upper 95% CI of mean	483.2	31.99	259.5	5.278	6.771	440.4	32.11	221.1	4.061	5.009	395.8	18.49	295.5	4.009	5.704
D'Agostino & Pearson normality test (K2)	39.21	69.09	86.74	157.3	176	91.96	65.44	69.51	208.7	231.5	39.36	52.24	57.88	182.5	198.9
P value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Passed normality test (alpha=0.05)?	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
P value summary	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****

	V4 bld Cortisol	V4 sal Cortisol	V4 uri Cortisol	V4 IL6	V4 TNF	V5 bld Cortisol	V5 sal Cortisol	V5 uri Cortisol	V5 IL6	V5 TNF
Number of values	121	117	99	121	122	118	119	110	118	118
Minimum	81	0	7	0.04	0.12	74	0	8	0.1	0.03
25% Percentile	257	6.5	125	1.465	1.095	239.3	4	188	1.533	0.985
Median	355	10	219	2.18	1.74	348	8	322.5	2.19	1.91
75% Percentile	574	20	361	3.58	4.033	563.5	16	489.3	4.065	4.478
Maximum	1342	131	1751	46.06	19.85	1505	81	2069	52.1	33.87
Mean	442.3	15.87	310.8	4.469	3.227	417.8	11.56	378.5	5.482	3.465
Std. Deviation	259.9	18.01	296.5	7.674	3.667	247.3	12.07	276.4	9.605	4.765
Std. Error	23.63	1.665	29.8	0.6976	0.332	22.77	1.106	26.35	0.8842	0.4386
Lower 95% CI of mean	395.5	12.57	251.7	3.088	2.569	372.7	9.373	326.3	3.731	2.597
Upper 95% CI of mean	489.1	19.17	370	5.851	3.884	462.9	13.75	430.8	7.233	4.334
D'Agostino & Pearson normality test (K2)	27.53	119.2	63.32	124.6	78.05	36.81	85.89	83.65	107.8	127.3
P value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Passed normality test (alpha=0.05)?	No	No	No	No	No	No	No	No	No	No
P value summary	****	****	****	****	****	****	****	****	****	****

APPENDIX I: DSM-IV TR CRITERIA FOR POST-TRAUMATIC STRESS DISORDER

A. The person has been exposed to a traumatic event in which both of the following were present:

1) The person experienced, witnessed or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others
2) The person's response involved intense fear, helplessness or horror.
Note: in children this may be expressed instead by disorganized or agitated behaviour.

B. The traumatic event is persistently re experienced in one (or more) of the following ways:

1) Recurrent and intrusive distressing recollections of the event including images, thoughts or perceptions. Note: in young children, repetitive play may occur in which themes or aspects of the trauma are expressed.
2) Recurrent distressing dreams of the event. Note: in children, there may be frightening dreams without recognizable content.
3) Acting or feeling as if the traumatic event were recurring (includes a sense of reliving the experience, illusions, hallucinations and dissociative flashback episodes, including those that occur on awakening or when intoxicated. Note: in children, trauma specific reenactment may occur.
4) Intense psychological distress on exposure to internal or external cues that symbol or resembles an aspect of the event.
5) Physiological reactivity on exposure to internal cues that symbolize or resemble an aspect of the traumatic event.

C. Persistence avoidance of stimuli associated with the trauma, and numbing of general responsiveness (not present before the trauma), as indicated by three or more of the following:

1) Efforts to avoid thoughts, feelings, or conversations associated with the trauma.
2) Efforts to avoid activities, places or people that arouse recollections of the trauma.
3) Inability to recall an important aspect of the trauma.
4) Markedly diminished interest or participation in significant activites.
5) Feeling of detachment or estrangement from others.
6) Restricted range of affect (e.g. unable to have loving feelings).
7) Sense of a foreshortened future (e.g. does not expect to have a career, marriage, children, or a normal lifespan)

D. Persistent symptoms of increased arousal (not present before the trauma), as indicated by two (or more) of the following:
1) Difficulty falling or staying asleep.
2) Irritability or outbursts of anger.
3) Difficulty concentrating
4) Hypervigilance

5) Exaggerated startle response.

E. Duration of the disturbance (symptoms in criteria B, C, and D) is more than 1 month.
F. The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.

Specify if:
Acute: if duration if symptoms is less than 3 months.
Chronic; if duration of symptoms is 3 months or more

Specify if:
With delayed onset: if onset of symptoms is at least 6 months after the stressor.