



## Police officers under attack: Resilience implications of an fMRI study

Julio F.P. Peres<sup>a,\*</sup>, Bernd Foerster<sup>b</sup>, Leandro G. Santana<sup>c</sup>, Mauricio Domingues Ferreira<sup>c</sup>,  
Antonia G. Nasello<sup>d</sup>, Mariângela Savoia<sup>d</sup>, Alexander Moreira-Almeida<sup>e</sup>, Henrique Lederman<sup>a</sup>

<sup>a</sup> Department of Diagnostic Imaging – Radiologia Clínica Universidade Federal de São Paulo, Escola Paulista de Medicina, SP, Brazil

<sup>b</sup> Philips Medical Systems, USA

<sup>c</sup> São Paulo State Militarized Police Force, Brazil

<sup>d</sup> Faculty of Medical Sciences, Santa Casa de São Paulo, Brazil

<sup>e</sup> School of Medicine, Universidade Federal de Juiz de Fora, Minas Gerais, Brazil

### ARTICLE INFO

#### Article history:

Received 30 July 2010

Received in revised form

22 September 2010

Accepted 2 November 2010

#### Keywords:

PTSD

Police

Psychotherapy

Resilience

Neuroimaging

fMRI

### ABSTRACT

**Objective:** Crime is now a top-priority public-health issue in many urban areas. São Paulo's state police force was the target of gunfire attack on an unprecedented scale. Several officers were killed or wounded, and many more were affected by psychological trauma. We investigated the brain activity underlying trauma, the coping effect of psychotherapy, and resilience in a highly homogenous sample that experienced the same traumatic event. The design applied was a between-group comparison of cerebral blood-oxygenation-level-dependent signals and symptom scores of police officers with and without partial Posttraumatic Stress Disorder (pPTSD).

**Method:** We used functional magnetic resonance imaging (fMRI) to investigate the retrieval of traumatic memories of 36 volunteers divided in three groups: (1) pPTSD policemen submitted to psychotherapy; (2) pPTSD policemen on the wait list; and (3) symptom-free (resilient) policemen. All participants were given a baseline fMRI scan and a follow-up scan some 40 days later. Not given psychotherapy, groups 2 and 3 were controls.

**Results:** Group 1 showed 37% fewer PTSD symptoms post-psychotherapy and their scores and neural expressions were comparable to Group 3 resilient policemen. A marked increase in medial prefrontal cortex (mPFC) activity was concomitant with decreased amygdala activity during traumatic memory retrieval in both resilient and pPTSD participants (after psychotherapy) and these findings were associated with symptom attenuation.

**Conclusions:** Our results provide neurophysiological evidence of resilience in a high-risk group for PTSD. Psychotherapy may help to build narratives and resilient integrated translations of fragmented traumatic memories via mPFC, and thus weaken their sensory content while strengthening them cognitively.

© 2010 Elsevier Ltd. All rights reserved.

### 1. Introduction

Most of us have dealt with a traumatic event of some kind such as loss, accident, or illness, or will be dealing with one at some point in our lives. Psychological trauma is closely related to the development of posttraumatic stress disorder (PTSD), involving three sets of symptoms: (i) reliving trauma (traumatic memories, nightmares, intrusive thoughts); (ii) emotional avoidance/numbness (affective distance, emotional anaesthesia); and (iii) increased arousal (irritability, insomnia and hypervigilance). Lifetime prevalence of PTSD-triggering traumatic events may be as much as 50–90%, and actual

prevalence in the general population is about 8% (Kessler et al., 1995; Vieweg et al., 2006), while partial PTSD (pPTSD) in an at-risk group exposed to combat such as Vietnam veterans has been estimated at approximately 30% (Weiss et al., 1992). After noting that individuals who do not meet the full set of diagnostic criteria for PTSD may suffer from clinically significant symptoms of PTSD (Weiss et al., 1992), the concept of pPTSD or sub-threshold PTSD was introduced to describe subsyndromal forms of PTSD (Blanchard et al., 1995; Stein et al., 1997).

Crime is now one of the most frequent causes of death in many countries. Coping with stressful and life-threatening situations is part of policing so officers are routinely exposed to critical-incident stressors in the line of duty. Although active policemen are understudied relative to other traumatized samples, this population may be critical to our understanding of responses to traumatic stressors

\* Corresponding author. Rua Maestro Cardim 887, São Paulo – SP, Brazil, Postal Code 01323-001, fax: +55 11 3284 8929.

E-mail address: [julioperes@yahoo.com](mailto:julioperes@yahoo.com) (J.F.P. Peres).

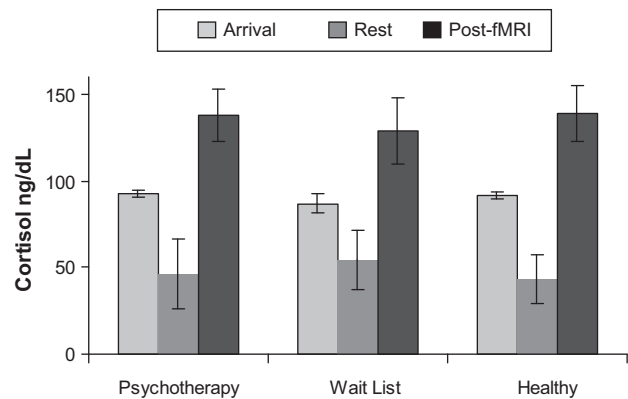
(Kessler et al., 1995; Vieweg et al., 2006; Weiss et al., 1992). A criminal organization attacked the State of Sao Paulo Militarized Police Force on an unprecedented scale in the period May 12–23, 2006, and many officers were killed or wounded in firefights. Some were traumatized, while others remained symptom free.

Whether an event is traumatic or not will depend on an individual's perceptual neural-circuitry processing and underlying resilience, which is the ability to cope effectively and adapt in the face of loss, hardship or adversity (Bonanno, 2004; Block and Kremen, 1996). Resilient individuals reported fewer posttraumatic symptoms after combat and showed greater ability to optimize emotional functioning through the use of alternative cognitive strategies (Bonanno, 2004; Florian et al., 1995). Neuroscientists have yet to comprehensively research this field. Examining neural mechanisms underlying psychological trauma or resilience is difficult given the heterogeneous symptoms and peculiarities of traumatic memories (key symptoms of PTSD). There are several methodological challenges and complex factors to control such as: (i) traumatized individuals typically present various comorbidities (e.g. major depression, substance abuse, etc.), (ii) traumatic events of different kinds (violence, accidents, loss, etc.) involve distinct sensory levels and modalities of memories (visual, tactile, olfactory, auditory, affective), (iii) different PTSD symptoms and emotions may accompany specific neural interactions during retrieval of traumatic memories (e.g. dissociative experiences are psycho-neurophysiologically different from hyperarousal experiences), (iv) the heterogeneous nature of trauma may pose difficulties when inducing reproducible responses in patients, or comparable activations in healthy control subjects, (v) the recency of the memories being studied is often different (memory expression may be modified over time, causing changes in the neural substrates involved).

In the last ten years, however, neuroimaging research has yielded important information on heightened amygdala responsivity in PTSD patients during symptomatic states, and has found that medial prefrontal cortex (mPFC) responsivity is inversely associated with PTSD-symptom severity (Shin et al., 2006). Nevertheless, the directionality of the PFC to amygdala–activity correlation has been inconsistent: negative in PTSD cases but positive in controls, suggesting coupling only in psychopathology (Shin et al., 2005; Peres et al., 2008).

Two basic issues yet to be addressed are the reasons for most trauma survivors not developing PTSD and the predictors of positive outcomes in traumatized victims (Shin et al., 2005, 2006). All the police officers in our sample had come under fire and seen colleagues being shot, so our study offered a unique opportunity to investigate victims who were all affected by the same traumatic event, which they reported as watching wounded colleagues dying after pleading for help. The study controlled all five variables listed above and was conducted 3 months after the criminal attacks, so there was sufficient time for a confident diagnosis of PTSD. In order to address the object of the study – brain activity underlying trauma, psychotherapy effect and resilience – we used functional magnetic resonance imaging (fMRI) to detect alterations in brain activity related to overcoming trauma after psychotherapy.

Since we had screened for startle response and hypervigilance (Fig. 1) as prevalent symptoms, we hypothesized that pPTSD policemen would present an exaggerated amygdala response pattern (Bremner, 2003) during traumatic memory retrieval prior to psychotherapy. On the other hand, we predicted that resilient policemen and pPTSD policemen would show increased PFC activation after psychotherapy. Based on studies that have suggested that lower cortisol levels in traumatized victims and combat veterans (Yehuda et al., 1995) pose a risk factor for PTSD, we hypothesized that



**Fig. 1.** Samples of saliva cortisol were collected using the non-invasive Salivette-Sarstedt method on three occasions: (i) on arrival at the neuroimaging center (ii) after 30 min in repose, and (iii) 15 min after concluding the fMRI scan. All salivary samples were obtained from 6pm to 8pm.

pPTSD policemen would present lower cortisol levels than healthy (symptom-free) policemen.

## 2. Methods

### 2.1. Participants

We initially examined 97 police officers, all targeted in the wave of gunfire attacks prior to the study, of whom 29.6% developed pPTSD. Twenty-four of them with pPTSD and 12 healthy (resilient) men were randomly selected for the study. All 36 policemen studied (mean age 28.2, SD = 3.2) were free of comorbidities; there were no differences in recency of the stressor and all had experienced the same event, which caused trauma for some, but not others (Table 1). According to Blanchard et al. (1995) and Stein et al. (1997) we considered pPTSD subjects as those who presented fewer than the required number of DSM-IV criterion B, or C or D symptoms for full PTSD. The pPTSD individuals selected for the study did not present symptoms in the

**Table 1**  
Demographic characteristics of the 36 policemen.

|                                                                      | pPTSD<br>Psychotherapy<br>group (n = 12) | pPTSD<br>Wait-list<br>group (n = 12) | Healthy group<br>(n = 12) |
|----------------------------------------------------------------------|------------------------------------------|--------------------------------------|---------------------------|
| Gender (male/female)                                                 | 12/0                                     | 12/0                                 | 12/0                      |
| Cerebral dominance<br>(right/non-right)                              | 12/0                                     | 12/0                                 | 12/0                      |
| Marital status<br>(single/married)                                   | 8/4                                      | 5/7                                  | 6/6                       |
| Age subjects<br>(years/months)<br>(mean/SD/range)                    | 31.2/5.8/<br>24–36                       | 27.6/3.9/<br>23–31                   | 28.2/7.8/<br>25–38        |
| Comorbidities (with/<br>without)                                     | 0/12                                     | 0/12                                 | 0/12                      |
| Psychotropic medication<br>(with/without)                            | 0/12                                     | 0/12                                 | 0/12                      |
| Age of memories<br>(months/days)                                     | 3.5                                      | 3.10                                 | 3.15                      |
| Education (secondary<br>school/university)                           | 12/0                                     | 12/0                                 | 12/0                      |
| Type of trauma (criminal<br>attack/others)                           | 12/0                                     | 12/0                                 | 12/0                      |
| Previous traumatic events<br>scoring over 10 (Impact<br>Event Scale) | 0                                        | 0                                    | 0                         |

Summary of demographic characteristics of all pPTSD subjects (24) and healthy subjects (12). SD, Standard deviation.

Download English Version:

<https://daneshyari.com/en/article/10302306>

Download Persian Version:

<https://daneshyari.com/article/10302306>

[Daneshyari.com](https://daneshyari.com)