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Victims of rape show increased cortisol responses to trauma reminders: A study in individuals with war- and torture-related PTSD

Hannah Gola [a], Harald Engler [b], Maggie Schauer [a], Hannah Adenauer [a], Carsten Riether [c], Stephan Kolassa [d], Thomas Elbert [a], Iris-Tatjana Kolassa [a,e,f,*]

[a] *Clinical Psychology & Neuropsychology, University of Konstanz, Germany*
[b] *Institute of Medical Psychology and Behavioral Immunobiology, University Hospital Essen, University of Duisburg-Essen, Germany*
[c] *Laboratory of Psychology and Behavioral Immunobiology, Institute for Behavioral Sciences, ETH Zurich, Switzerland*
[d] *Research & Innovation, SAF Simulation, Analysis & Forecasting AG, Tägerwilen, Switzerland*
[e] *Zukunftskolleg, University of Konstanz, Germany*
[f] *Clinical & Biological Psychology, University of Ulm, Germany*

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Summary Studies investigating cortisol responses to trauma-related stressors in patients with posttraumatic stress disorder (PTSD) have yielded inconsistent results, demonstrating that cortisol responses were enhanced or unaffected when confronted with trauma reminders. This study investigated the effect of the type of trauma experienced on both salivary and plasma cortisol responses during confrontation with trauma-related material. Participants were 30 survivors of war and torture, with and without rape among the traumatic events experienced. Participants of both groups (raped vs. non-raped) fulfilled DSM-IV criteria of PTSD. Plasma and salivary cortisol levels were measured at three time points during a standardized clinical interview: once before and twice after assessing individual traumatic experiences. Results show that groups did not differ in basal plasma and salivary cortisol levels. However, differential salivary cortisol responses were observed in PTSD patients who had been raped compared to those who had not been raped ($p < .05$) but had experienced an equal number of traumatic events and showed equally high PTSD symptom severity. Whereas salivary cortisol levels decreased in the course of the interview for the group with no past experience of rape ($p < .05$), those PTSD patients who had been raped showed a significant cortisol increase when reminded of their traumatic events ($p < .001$). This effect was not found in plasma cortisol. Our results indicate that the type of traumatic stress experienced contributes to cortisol

* Corresponding author at: University of Ulm, Department of Clinical & Biological Psychology, Albert-Einstein-Allee 47, 89069 Ulm, Germany. Tel.: +49 731 5026590; fax: +49 731 5026599.
E-mail address: Iris.Kolassa@uni-ulm.de (I.-T. Kolassa).

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responses during the confrontation with trauma-related material. We hypothesize, that the nearness of the perpetrator during the traumatic event might shape later psychophysiological responding to trauma reminders.

1. Introduction

The experience of traumatic events such as life-threatening accidents, combat exposure, or rape poses a risk for the development of posttraumatic stress disorder (PTSD), characterized by intrusive recollections of the trauma, persistent avoidance of trauma reminders, emotional numbing and hyperarousal (American Psychiatric Association, 1994). An abundance of studies have documented long-term alterations in the functioning of the hypothalamus—pituitary—adrenal (HPA) axis in PTSD patients. These are characterized mostly by lower (Yehuda et al., 1995) but also by normal (Tucker et al., 2004) or higher (Lindauer et al., 2006) basal cortisol levels, with a recent meta-analysis concluding that low cortisol levels in PTSD are only found under certain conditions, such as in studies with unexposed control subjects, in studies on abuse, and in studies including female subjects (Meewisse et al., 2007). Furthermore altered diurnal patterns of cortisol release have been reported (Wessa et al., 2006). In addition to the investigation of basal alterations in PTSD patients, several challenge paradigms (e.g., cognitive or pharmacological) have been developed to examine alterations in the responsivity of the hormonal stress system in PTSD patients (for a review see de Kloet et al., 2006). In this context, earlier studies also investigated cortisol reactivity in PTSD patients in response to trauma reminders, yielding inconsistent results. Whereas a study by Elzinga et al. (2003) reported a pronounced cortisol response in sexually abused women when confronted with personal trauma scripts, other studies examining cortisol reactivity after assessing individual traumatic experiences in male torture victims (Kolassa et al., 2007) or in response to combat noise in male Vietnam veterans (Liberzon et al., 1999) found no such response.

Based on current theoretical models of PTSD (Lang, 1979; Foa and Kozak, 1986; Schauer et al., 2011), studies investigating physiological responses to trauma-related cues generally assume that the physiological reactivity in response to trauma reminders observed in the laboratory should recapitulate the physiological reactivity that occurred during the trauma (Keane et al., 1985; Pole, 2007). Whereas earlier studies proposed heightened autonomic responses of PTSD patients to trauma reminders in general (Orr and Roth, 2000), more recent investigations suggest that PTSD patients who responded to trauma with a drop in arousal, such as immobility or fainting — a response set which we refer to as "dissociative shut-down" (Schauer and Elbert, 2010), show reduced autonomic psychophysiological activity and reactivity when confronted with trauma reminders (Griffin et al., 1997; Lanius et al., 2002; Pole, 2007). If trauma reminders replay aspects of the peritraumatic response mode, different physiological response patterns should also be seen during exposure treatment depending on whether the original traumatic situation had predominantly activated the sympathetic "flight-fight" or had likely driven the defensive system into immobility and "shut-down" (Schauer and Elbert, 2010). This assumption has been confirmed by neuroimaging studies, showing differential neural activation patterns for the two response types in response to trauma-related stimulation (Lanius et al., 2006, 2010).

Interestingly, studies suggest that these different peritraumatic response modes of trauma victims tend to vary with the type of trauma experienced. For example, Kaysen et al. (2005) investigated women's peritraumatic responses to different forms of crimes and found that approximately one third of women reported active physical resistance (e.g., biting, cursing, kicking), whereas a large proportion of women, especially victims of rape, reported non-active behavioral responses, i.e., "shut-down" responses. In victims of sexual assault, the failure to escape or fight an assailant is typically followed by "rape-induced paralysis" (Burgess and Holmstrom, 1976), or tonic immobility (TI, Suarez and Gallup, 1979; Marx et al., 2008). During such an episode of rape-induced paralysis or TI, sexual assault victims find themselves unable to move, resist or incapable of calling out for help, while remaining conscious — eventually resulting in many cases in flaccid and unresponsive immobility or even fainting, mediated by vaso-vagal syncope (Schauer and Elbert, 2010). Empirical studies show that a substantial number (37—52%) of survivors experiences some form of immobility during their sexual assault (Galliano et al., 1993; Heidt et al., 2005; Fuse et al., 2007). The probability of experiencing immobility is even more augmented when the sexual assault involves the attempt of or the act of vaginal coitus (Heidt et al., 2005).

Here we investigate whether the type of trauma (rape vs. other trauma types) is associated with differential stress responses when confronted with trauma-related material, using cortisol as a physiological stress marker. For that purpose, both salivary and total plasma cortisol levels of PTSD patients with severe traumata, including or not including rape, were measured at three time points during a detailed and standardized clinical interview: once before and twice after assessing individual traumatic experiences such as rape, war and torture with standardized checklists. Furthermore, basal cortisol levels of PTSD patients were compared with those in a third healthy control group.

2. Materials and methods

2.1. Participants

Cortisol reactivity was assessed in 30 individuals with current PTSD according to DSM-IV (American Psychiatric Association, 1994), recruited from the Psychotrauma Research and Outpatient Clinic for Refugees, University of Konstanz. All PTSD patients were refugees (4 from Africa, 5 Balkan, 21 Middle East and Afghanistan) with multiple highly stressful war and torture experiences, including or not including rape. On average, patients had lived in Germany for 6.4 years (SD = 4.9).