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# Intensive two-day cognitive-behavioral intervention decreases cortisol secretion in soldiers suffering from specific phobia to wear protective mask

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ABSTRACT

*Research questions:* Wearing a protective mask is compulsory for those in professions such as fire-fighters, rescue personnel and soldiers. The phobia to wear a protective mask is considered a specific claustrophobia and may become of major concern during military service. To date, no data are available with respect to the hypothalamus-pituitary-adrenocortical system activity (HPA SA) for both the so-called protective mask phobia (PMP) and its treatment. The aim of the present study was three-fold: 1) to assess HPA SA in soldiers suffering from PMP before and after intensive cognitive-behavioral treatment, 2) to compare these data with controls, and 3) to relate these data to subjective sleep.
*Methods:* 46 Swiss Army recruits suffering from PMP were enrolled in a two-day intensive treatment course. During initial and final assessments, saliva was sampled to analyse HPA SA via salivary cortisol; saliva samples were also gathered in the morning. For comparison, saliva samples were gathered of 39 Emergency Rescue Service (ERS) recruits. All participants also completed a questionnaire related to sleep and to anxiety.
*Results:* Compared to controls from the ERS, among army recruits suffering from PMP, cortisol secretion was significantly higher during initial and final assessments, and in the morning. Cortisol secretion decreased from initial and final assessment. Subjectively assessed sleep was more impaired in recruits suffering from PMP compared to controls. After cognitive-behavioral treatment, all recruits suffering from PMP were able to wear the protective mask.
*Conclusions:* Specific phobia about wearing a protective mask is treatable via a two-day intensive course. Treatment success is reflected in modified HPA SA. Methodology and results may be transferred to treat patients suffering from sleep apnea syndrome and presenting high anxiety about wearing continuous positive airway pressure devices.



## 1. Introduction

Within the broad range of psychiatric disorders, anxiety and specific phobias demand particular attention because they are among the most frequently occurring forms of such disorder (Wittchen and Jacobi, 2005). Among adults, lifetime prevalence rates are in the 2%–3% range for generalized anxiety disorders, and a 2.1%–2.4% range for agoraphobia and specific phobia (Wittchen, 1998). European epidemiological studies show twelve-month prevalence rates of 1.3% for agoraphobia, 6.4% for specific phobias, and 2.3% for social phobias (Wittchen and Jacobi, 2005; Goodwin et al., 2005). Among children and adolescents, prevalence rates range from 8.3%–27%, depending on the age and disorder (separation anxiety disorder, generalized anxiety disorder, social phobia; cf. Sadock and Sadock, 2009).

For some professions such as fire-fighters and rescue personnel the use of a protective mask (PM) and protective clothing (PC) is compulsory. More specifically, for soldiers, using PM and PC correctly and efficiently dramatically increase the chances of survival following an attack with chemical and biological weapons. The PM is worn on the face to give protection from airborne pollutants and toxic materials, and has various adjustable straps which may be tightened to secure a good fit. The core of a PM is the filter cartridge near the mouth.[1] Despite the fairly easy adjustments

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[1] Some models contain drinking tubes and corrective lens if required.

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involved, difficulties wearing both a PM and PC are often observed among military personnel (Richie, 1992). These difficulties relate to reduced visibility, more limited freedom of movement, physical complaints such as difficulty breathing, sweating and tightness, strain such as intense anxiety, feelings of nervousness and suffocation, as well as a reduced communication and liquid intake. It is estimated that between 4.3% and 20% of military combat personnel experience severe difficulties wearing a protective mask and/or supplementary protective clothing (Brooks et al., 1983; Fullerton and Ursano, 1990). However, reliable recent data are lacking (cf. Richie, 2001), which may have to do with the fact that psychiatric conditions often remain hidden in the military, and particularly among senior ranks (cf. Sandman, 1993). In this view, it is estimated that about 2–5% of Swiss recruits indicate severe difficulties to wear the protective mask, leading to discharge or to change from combat to non-combat units. Subjectively, the difficulties mentioned above may paradoxically be perceived as threatening, given that PMs and PC are among the few means of providing protection and increasing survival.

The symptoms assume the quality of a specific phobia (DSM-IV: 300.29; ICD-10: F 40.2), if before or while wearing the protective mask the following cognitive, behavioral and physical symptoms are observed or reported: increased intense anxiety, which the individual him- or herself considers as exaggerated and unjustified, avoidance of thinking about, or touching or wearing the protective mask, as well as increased heart rate and breathing, cold sweat, and a subjective respiratory depression associated with the fear of losing control and/or of suffocation. In this case, completing military service becomes difficult, and administrative discharge of military personnel otherwise fit for service will be considered. To reduce dismissal of staff or change of status from combat to non-combat personnel, the Psychological Service of the Swiss Army (PDSA) has established a psychological intervention based on cognitive-behavioral therapy to treat both the so-called protective mask phobia (PMP; cf. Oordt, 2001; Richie, 1992, 2001) and anxiety about wearing protective clothing. The aim of the intervention is to offer a quick and efficient treatment for our recruits suffering from protective mask phobia and to enable them to continue their military service.

The hypothalamic-pituitary-adrenocortical system activity (HPA SA) has attracted considerable attention as a basis for describing the neurobiological mechanisms underlying psychiatric disorders (Holsboer and Ising, 2010; Jezova and Hlavacova, 2008). For example, compelling evidence indicates that the HPA system is compromised in major depressive disorders (Hatzinger et al., 2004; for review: Holsboer, 2000; Zimmermann and Stansbury, 2004; Holsboer and Ising, 2010), in bipolar disorders (Rybakowski and Twardowska, 1999), as well as in anxiety disorders such as posttraumatic stress disorder (Kessler et al., 1995; Heim et al., 2001, 2008).

With regard to the relation between different forms of anxiety and neuroendocrine functioning, results lend support to the concept of increased HPA system activity in people suffering from anxiety disorders. An increase in cortisol secretion has been reported in children and adolescents suffering from social anxiety (Granger et al., 1994; Feder et al., 2004; Hayward et al., 2008), in children and adolescents with an anxiety disorder (Coplan et al., 2002), as well as in children suffering from separation anxiety disorder compared to healthy controls (Brand et al., 2011b). By contrast, Gerra et al. (2000) observed no significant differences in salivary cortisol secretion between 22 male adolescents with an anxiety disorder and 20 male healthy controls following a non-pharmacological challenge.

In adults, findings concerning the relation between HPA system activity and anxiety are slightly more inconsistent. To illustrate, van Duinen et al. (2010) examined 16 spider phobic subjects and 16 healthy controls. During and following a standardized stepwise exposure paradigm, spider phobic subjects reacted with a strong fear reaction to spiders, though, against expectations, salivary cortisol levels did not rise above those of healthy controls. Jezova and Hlavacova (2008) found a blunted cortisol secretion during psychosocial stress in participants with high anxiety levels as compared to participants with low anxiety levels. By contrast, Vreeburg et al. (2010) were able to find, in a larger survey, an increased morning cortisol awakening response (CAR) in persons suffering from anxiety disorders compared to healthy controls. In a similar vein, Alpers et al. (2003) were able to show that, compared to healthy controls, participants with driving phobia did not show increased saliva cortisol levels during the baseline day, though cortisol increased significantly during driving exposure sessions. Stress-induced rises in cortisol levels were also observed in patients suffering from social phobia (Furlan et al., 2001) and in patients suffering from panic disorder (Stones et al., 1999) as compared to healthy controls. Last, Bandelow et al. (2000) found increased levels for nocturnal, but not for daytime cortisol levels in patients suffering from panic disorder compared to controls. To summarize, there is evidence that anxiety and specific phobias are associated with increased HPA system activity.

To treat specific phobias such as claustrophobia, acrophobia, social phobia, spider phobia or blood phobia, the currently preferred options are cognitive-behavioral techniques (Grawe, 2004; Choy et al., 2007; Wolitzky-Taylor et al., 2008; Antony and Barlow, 2002). Specifically, as three meta-analyses have shown (Choy et al., 2007; Wolitzky-Taylor et al., 2008; Antony and Barlow, 2002), there is evidence for the superiority of exposure-based treatments over alternative treatment approaches such as imaginal exposure, virtual reality or placebo conditions. Moreover, multi-session treatments outperform single-session treatments, though the additional gain is marginal. In this respect, Davis et al. (2009) were able to show that for children and adolescents, even a one-session treatment of specific phobias, lasting for three or more hours, was successful. As a result, elements of cognitive-behavioral therapy (CBT) such as in vivo exposure, in vivo skill training, massed dose and prolonged exposure, but also psychoeducation and controlled respiration as a relaxation technique have been introduced for treating PMP within a two-day intensive course as outlined in more detail below.

Last, there is evidence that HPA system activity and sleep are related (cf. Buckley and Schatzberg, 2005; Steiger, 2007). To give a few examples, poor sleep and increased HPA SA have been observed in infants suffering from infantile colic (Brand et al., 2011a), in preschoolers (Hatzinger et al., 2008, 2010), and in adults suffering from major depressive disorders (cf. Hatzinger et al., 2004). Moreover, there is also evidence that poor sleep is related to anxiety disorders in children (Chorney et al., 2008) and adults (Buckner et al., 2008; Papadimitriou and Linkowski, 2005; Marcks et al., 2010). However, no data are available so far with respect to the relation of HPA SA and sleep in adults suffering from a specific phobia.

To summarize, there is evidence that HPA SA, specific phobia and sleep are related, and there are several reasons for further research on these links. First, specific phobias are among the most frequent psychiatric disorders; second, the specific phobia about wearing a protective mask (PMP) is not limited to professions such as fire-fighters, rescue personnel and soldiers, it is also an issue in any kind of profession in which the employee needs protection from airborne pollutants and toxic materials (painters, police officers regulating rush hour traffic, employees at nuclear energy centres, medical staff, etc.). Third, up to 40% of people suffering from sleep apnea syndrome report feelings of claustrophobia when wearing a continuous positive airway pressure (CPAP) device and, if