

1 Introduction

During the last fifteen years a large number of studies have been published to elucidate the etiology of posttraumatic stress disorder (PTSD). From the data provided in these studies it can be stated that trauma-related pathology depends on a variety of variables. Besides characteristics of the trauma, biological and psychological variables of the traumatized person influence the processes of adaptation to traumatic experiences (Ehlert, Wagner, Heinrichs & Heim, 1999; Newport & Nemeroff, 2000; Seedat & Stein, 2001). As observed in previous studies, it is not merely the exposure to traumatic events, but the levels of social support as well as daily working conditions and organizational factors that increase the risk for PTSD in rescue workers (Brewin, Andrews & Valentine, 2000; Corneil, Beaton, Murphy, Johnson & Pike, 1999; van der Ploeg & Kleber, 2003). Furthermore, gender is a well-known risk factor for PTSD in the general population (Breslau, 2002b; Stein, Walker & Forde, 2000), but research rarely discusses this issue at all and methodological differences make it hard to draw conclusions from those that do (Freedman, Gluck, Tuval-Mashiach, Brandes, Peri & Shalev, 2002). Moreover, gender differences in vulnerability to traumas specific to the work in rescue services are hardly researched (Hodgins, Creamer & Bell, 2001).

Professional "life savers", such as rescue workers, must cope with extraordinary and persistent occupational demands that are potentially cumulative. These demands include threats to their own and their coworkers' safety, injuries and deaths of children, gruesome victim incidents, body handling, completed suicides and mass casualty accidents (Beaton & Murphy, 1995).

Several professional groups of rescuers such as policemen, paramedics, sea rescue services or fire fighters have already been identified as high-risk populations for PTSD as they are exposed to potentially traumatizing life-threatening situations not only personally, but also as rescuers of people in emergency situations (Carlier, Lamberts, Fouwels & Gersons, 1996; Corneil et al., 1999; McFarlane, 1989; Wagner, Heinrichs & Ehlert, 1998). Personnel involved in air medical rescue and transport are additionally exposed to a variety of risks not encountered by nonflight rescuers (Hickman & Mehrer, 2001).

As specified above, clinical psychology has come to understand quite a bit about what makes people sick and unhappy. It has become a science primarily focusing on healing and concentrated on repairing damage within a disease model of human functioning. This almost exclusive atten-

tion to pathology neglects fulfilled individuals as well as their subjective well-being and happiness (Diener, 2000). In recent years, research questions in studies of high-risk populations for PTSD have seldom turned the focus of attention from damage caused toward the detection of resilience factors. This direction of research corresponds with approaches such as Antonovsky's salutogenic model (1987), which seeks factors that contribute to health and well-being. Despite the risks rescue workers are exposed to, their occupational environment is also characterized by a wide range of challenges and rewards and the majority of them stay healthy (Arnetz, 2001).

People obtain benefit from the belief that they are living in a caring and humane society and the observation of attempts to save life reinforces this. Rescues or attempts to rescue hikers lost in the mountains, victims of car crashes or seriously ill patients increase well-being by giving powerful expression to the great value of human life and in this way contribute to social cohesion (McKie & Richardson, 2003). Rescue professionals, in return, deserve the benefit of research to assist them in staying healthy and in providing the best possible care in the challenging circumstances they encounter. As yet, no effective prevention measures exist for rescuers. Studies aiming to detect protective factors in these populations may contribute to the development of prevention programs.

The core of this thesis is the presentation of the results of two cross-sectional studies on adaptation in personnel of the Swiss Air-Rescue Rega (from the German word 'Rettungsflugwacht' and the French translation 'garde aérienne') involved in air rescue missions. The main aim of this research was to apply the approaches of salutogenesis and positive psychology on male and female air rescue workers in order to determine individual and work-related factors that may contribute to or hinder successful cognitive, emotional and biological adaptation.

The thesis is organized as follows: Following the introduction, a literature review on stress theories in general and a diathesis-stress model in particular is provided in chapter 1.1. The processes of biological and psychological adaptation to chronic and traumatic stress are discussed in chapter 1.2. In the following two chapters a brief summary of theories and definitions of psychosocial demands (chapter 1.3) and psychosocial resources (chapter 1.4) is presented. The concepts of salutogenesis and subjective well-being are explained in detail in chapter 1.4.4.1 and 1.2.2, respectively. An overview of the professional activities of air rescue workers and of stressors affect-

ing ground and more specifically air rescuers and health care workers is given in chapter 1.5. Finally, the theoretical framework for the empirical studies is presented in chapter 1.6.

In chapter 2, data of the study on the influence of gender on psychobiological adaptation are presented. Thereafter, individual and work-related characteristics of psychobiological adaptation from the same dataset are investigated (chapter 3). Finally, chapter 4 provides a summary of the empirical data; the results are critically discussed with respect to possible explanations for the observed findings from recent literature. The relevancy of these studies as well as remaining questions and possible future goals for research are addressed.

1.1 Stress theories

The term "stress" has been used to describe a variety of negative feelings and reactions that accompany threatening or challenging situations. Stress is omnipresent and a large number of events can provoke its experience. People say they are stressed when they take an examination, when having to deal with work overload or when experiencing difficulties in relationships. However, the widespread use of the term "stress" in popular culture has made this word a very ambiguous term to describe the ways in which a person copes with psychosocial, environmental and physical challenges. Despite marked advances in stress research, there is still some confusion as to what stress is and the differentiation between stressor and stress reaction is rarely made (Chrousos, 1998a).

The modern concept of stress began with Selye's observation that diverse kinds of noxious experiences all resulted in the same syndrome. He coined the term "general adaptation syndrome" (GAS) to describe the succession of three steps, (1) an initial *alarm reaction* which is accompanied by an activation of the sympathetic-adrenomedullary (SAM) system and the hypothalamic-pituitary-adrenal (HPA) axis, (2) a *resistance phase* during which local adaptive reactions triggered by neuroendocrine signals encounter stress and (3) an *exhaustion phase* which is characterized by a gradual decrease of resistance to stress (Selye, 1955, 1993). He recognized that this GAS caused pathology only when aroused for an extended period (Selye, 1978).

Although the original stress paradigm implied that any type of stressor induces in any individual the same response, evidence has accumulated that the stress response is not caused by the nature of the stressor per se, but by the ability of the individual to deal with the stressor. The subjective perception of the situation is thus a main determinant of the psychoendocrine response pattern. Lazarus and colleagues emphasized the importance of the individual appraisal of a stressor and the importance of the perceived capacity to deal with this stressor in order to explain interpersonal differences in stress responses (Lazarus & Folkman, 1984). The pivotal postulate of their theory is that stress is inherent neither to the environment nor to the person alone, but results from the ongoing relationship between them, which they called transaction. This transaction is mediated by appraisal and coping processes that determine the outcome of the stress process. According to the transaction theory, the cognitive appraisal of stress is a two-part process that comprises a primary and a secondary appraisal. Primary appraisal involves the subjective cognitive estimation of a situation as irrelevant, beneficial or stressful and mediates between the stressor and the individual's stress reaction. Is the event appraised as stressful, it then may be evaluated either as a challenge, threat or harm/loss. Harm/loss refers to actual or past events comprising physical injuries as well as the loss of self-esteem. A threat refers to the anticipation of harm or loss, whereas a challenging situation refers to the potential for growth, mastery or some other form of gain. Each of these categories generates different emotional responses. The perception of harm or loss can elicit anger, disgust, sadness or disappointment. Threatening stressors may produce anxiety whereas challenge is likely to produce excitement. This theory helps to integrate both the motivational aspects of stress and the varying emotions that are associated with the experience of stress (Folkman & Lazarus, 1988). The perception of environmental demands, personality characteristics, prior experiences and learning as well as the subjective evaluation of available resources is called the secondary appraisal and determines how an individual copes with the stressor. The term "coping" includes the cognitive, emotional and behavioral efforts of an individual to manage specific external or internal demands. Problem-focused coping, which refers to task-oriented or instrumental coping, i.e. strategies to deal with the source of stress, is distinguished from emotion-focused or person-oriented coping, i.e. strategies to regulate emotions and affects (Lazarus & Folkman, 1984). As coping changes both the situation and one's own well-being, a new sequence of appraisal (re-appraisal) will then be initiated.

1.1.1 A diathesis-stress model of adaptation

The conception of stress as an imbalance between the demands of the environment and personal ability to cope with these demands allowed a more detailed analysis of the interaction between environmental and individual factors. According to Kaluza and Vögele (1999) diathesis-stress-models build the theoretical framework for these analyses. On the side of the environment (stressor) as well as on the side of the individual (diathesis) a distinction can be made between factors which influence a stress reaction.

The definition of these factors was based on the "Multisystem Assessment of Stress and Health (MASH)" model (Olson, 1996). The MASH model observes the effects of *demands* (stressors) and *resources* on *adaptation* on the level of the individual, his/her working life and social environment (partnership and family) (Weiss, Schneewind & Olson, 1995) and thus integrates work- and family-oriented stress models with the transactional cognitive stress model (Lazarus & Folkman, 1984). The "salutogenic" approach proposed by Antonovsky (1987) had an important influence on the conception of the MASH-model (Weiss et al., 1995). In contrast to the predominant "pathogenic" models, which focus on illness and psychopathology, the MASH-model primarily focuses on resources and processes, which enhance health. Therefore, in the MASH-model adaptation comprises the extent of physiological and mental health as well as the degree of satisfaction on the levels mentioned above.

1.2 Psychobiological adaptation to chronic stress and trauma

Highly threatening stressors such as trauma or severe strain at work coincide with a variety of psychological and physiological reactions. Effects of stress potentially become manifest in the following dimensions: physiology (e.g. alterations in neuroendocrine, autonomic and immune functions), behavior (e.g. aggressive response, altered health-related behavior), subjective experience (e.g. feelings of distress, anger or anxiety), psychosocial disorders and impairments (e.g. depression), cognitive function (e.g. alterations in informational processing and memory functions) as well as reduced self-confidence and action competence (Chrousos, 1998a; Steptoe, 2000).

As mentioned above, maladaptation to stress can cumulate in stress-related disorders. The most prominent stress-related disorder is PTSD. It is associated with clinically important psychological distress that transcends ordinary misery and unhappiness, but also with psychobiological abnormalities (Friedman, 2000; Friedman, Charney & Deutch, 1995; Yehuda & McFarlane, 1997). PTSD will be described in detail in chapter 1.2.1.

According to set-point theories of subjective well-being (SWB), people react to events but then return to baseline levels of happiness and satisfaction over time. However, recent research on SWB provided evidence that adaptation is not inevitable and that individual differences in adaptation do exist (Lucas, Clark, Georgellis & Diener, 2004). Definitions of SWB will be discussed in chapter 1.2.2.

The body responds to external and internal stimuli by releasing hormonal and neurotransmitter mediators that trigger physiological responses of cells and tissues throughout the body. Stress leads to activation of the autonomous nervous system and of the endocrine system (McEwen, 2000). The neuroendocrine stress response is described in detail in chapter 1.2.3.

1.2.1 Posttraumatic stress disorder

1.2.1.1 Definitions and clinical presentation

The definition of posttraumatic stress disorder (PTSD) in DSM-IV (APA, 1994) is based on a conceptual model that differentiates traumatic events from other stressful experiences and PTSD from other responses to stress. Traumatic (catastrophic) events, in contrast to "ordinary" stressful experiences, have been linked etiologically in the DSM to a specific syndrome, that of PTSD (Breslau, 2002a).

PTSD is an anxiety condition that may develop subsequent to traumatic events. The hallmark symptoms of the disorder are intrusive memories and images of the trauma and behavioral avoidance of cues that remind the person of the incident. PTSD is known to create significant life impairment, including occupational dysfunction. PTSD was first recognized among persons who had directly experienced trauma. More recently, researchers have demonstrated that PTSD can develop in persons who witness upsetting events in the workplace, such as ambulance attendants, emergency personnel, police officers or fire fighters (Alexander & Klein, 2001; Clohessy &

Ehlers, 1999; Heinrichs, Wagner, Schoch, Soravia, Hellhammer & Ehler, in press; Hodgins et al., 2001; Jonsson, Segesten & Mattsson, 2003; Laposa, Alden & Fullerton, 2003; Reinhard & Maercker, 2003; Wagner et al., 1998).

1.2.1.2 Risk factors for posttraumatic stress disorder

Pre-traumatic risk factors that are known to be related to the development of PTSD are female gender, traumatic events in the past, personality traits and a past history of psychiatric disorders (Ballenger, Davidson, Lecrubier, Nutt, Foa, Kessler, McFarlane & Shalev, 2000; Brewin et al., 2000). Although it is known that work-related stress contributes to the development of burnout and depression, the degree to which it may increase the risk for PTSD remains to be determined. Studies of workplace stress in emergency services have focused primarily on the contribution of stress to general health outcomes and to clinical conditions, such as depression (Laposa et al., 2003). The authors reported a relationship between stress caused by interpersonal conflict in the workplace and PTSD symptoms, whereas stress created by organizational factors and patient care was apparently less problematic. Laposa and coworkers (Laposa et al., 2003) therefore suggested that emergency department personnel can manage the work but that it is the job's interpersonal environment that is relevant to PTSD levels. Similar conclusions were drawn for rescue workers. There, the levels of social support, the daily working conditions and organizational factors were hypothesized to increase the risk for PTSD additionally to the exposure to traumatic events (Brewin et al., 2000; Corneil et al., 1999; van der Ploeg & Kleber, 2003).

1.2.1.3 Epidemiology and gender differences in posttraumatic stress disorder

As is common with many other psychiatric disorders, PTSD occurs more frequently in women than in men, but also the risk of exposure to specific events suggests a gender difference and the vulnerability to specific traumas differs for women and men (Ballenger et al., 2000; Freedman et al., 2002). Thus, research regarding gender differences in the prevalence and the intensity of PTSD following traumatic events is confusing and limited. Most studies do not discuss the issue at all and methodological differences make it hard to draw firm conclusions from those that do (Freedman et al., 2002).

Gender differences in PTSD prevalence rates are well documented in numerous studies of civilian populations, community surveys and survivors of major trauma (Breslau, Davis, Andreski, Peterson & Schultz, 1997; Breslau, Kessler, Chilcoat, Schultz, Davis & Andreski, 1998; Holbrook, Hoyt, Stein & Sieber, 2002; Kessler, Sonnega, Bromet, Hughes & Nelson, 1995; Stein et al., 2000). Estimates of the lifetime prevalence of PTSD in American females are relatively high, ranging between 10% and 18% (Breslau, Davis, Andreski & Peterson, 1991; Breslau et al., 1998; Kessler et al., 1995; Resnick, Kilpatrick, Dansky, Saunders & Best, 1993). These estimates are at least twice as high as those in males (Breslau, 2002b; Breslau et al., 1997; Holbrook et al., 2002). Current full or partial PTSD prevalence rates (i.e. past month) of 2.7% and 8.2% were found in resident Canadian women compared to 1.2% and 1.8% in men (Stein et al., 2000; Stein, Walker, Hazen & Forde, 1997). In a German community sample of young people (aged 14 to 24) Perkonig, Kessler, Storz and Wittchen (2000) found relatively low current rates of 2.2% for females and 1.1% for males. Some studies, however, have not found such differences at all (Ehlers, Mayou & Bryant, 1998; Freedman et al., 2002; Ross & Wonders, 1993; Sutker, Davis, Uddo & Ditta, 1995). The Australian national survey of mental health and well-being reported a 12-month PTSD prevalence of 1.2% for males and 1.4% for females. Although slightly higher rates were apparent for females across all age groups under age 55, the relative similarity of PTSD prevalence across males and females was unexpected and contrary to much (although by no means all) previous research (Creamer, Burgess & McFarlane, 2001).

However, the exact prevalence of the disorder in the community remains a matter of some debate. Findings across studies are often hard to compare owing to different methodologies, the use of different diagnostic criteria and the fact that some studies report lifetime rates while others report current rates of the disorder. In addition, there are surprisingly few comparable studies from other parts of the world except the United States, although it may be speculated that cultural differences influence the way in which women adjust to and recover from traumatic experiences (Creamer et al., 2001).

In addition to probable gender differences in prevalence rate and vulnerability to traumatic stress, several authors found gender differences in recovery. PTSD was more likely to become chronic in women (Breslau, 2002b; Breslau et al., 1998; Holbrook et al., 2002). However, in another study, similar rates of recovery in both men and women were observed (Freedman et al., 2002).

Studies of exposure to specific events suggest a gender difference, with men more frequently exposed to combat, mugging, or beating and women more frequently exposed to rape and sexual assault (Freedman et al., 2002). In terms of the total amount of lifetime exposure, results are mixed, with some studies reporting more frequent exposure amongst men (Breslau et al., 1991; Creamer et al., 2001; Kessler et al., 1995; Stein et al., 1997; Stretch, Knudson & Durand, 1998), while women were more likely to experience a trauma with a high probability of subsequent PTSD (with the exception of combat) (Creamer et al., 2001; Kessler et al., 1995). Others show no difference between men and women (Breslau et al., 1997; Freedman et al., 2002; Kessler et al., 1995). Recent work suggests that the gender difference in PTSD is primarily due to females' greater risk following assaultive violence (Breslau, Chilcoat, Kessler, Peterson & Lucia, 1999b; Stein et al., 2000). Especially, women were found to be at increased risk for PTSD following non-sexual assaultive violence (e.g. mugging or other physical attack) but not following nonassaultive trauma (e.g. fire, witnessing injury to others) (Breslau, 2002b; Stein et al., 2000). With respect to other categories of traumatic events, gender differences are small. Recent evidence indicates that the gender difference in PTSD persists even after adjusting for the type of antecedent traumatic event (Pole, Best, Weiss, Metzler, Liberman, Fagan & Marmar, 2001; Stein et al., 2000). However, these findings are in contradiction with results from the Australian national survey, which indicated that when trauma type was controlled, the increased vulnerability for women virtually disappeared (Creamer et al., 2001). In other words, Australian women prove to be more vulnerable to the development of PTSD only following certain types of trauma, whereas a higher vulnerability to trauma seems to persist independently of the type of traumatic exposure for American women.

1.2.2 Subjective well-being and health

Subjective well-being (SWB) comprises the analysis of how people evaluate their lives – both, at the moment and for longer periods, such as for the past year. While moods and emotions reflect on-line reactions to events happening, each individual also makes broader judgments about his or her life as a whole, as well as about domains such as marriage and work. Thus, SWB concerns the study of what laypeople might call happiness (Argyle, 2001; Diener, Suh, Lucas & Smith, 1999).