Psychiatric History and Adaptation in Burn Injured Patients

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Abstract

The intertwined relationship between physical and psychological problems is a topic of much interest in the rehabilitation of severely injured patients, e.g. after a burn. The present study aims at gaining further knowledge concerning the impact of psychological factors and psychiatric morbidity on short and long-term adaptation after burn injury.

Outcome was assessed for three main areas: pruritus, return to work and psychiatric health. Three separate samples of previous or current adult patients treated at the Uppsala Burn Unit during different time periods: 1980-1995 (n=248), 1996-2000 (n=86), and 2000-2005 (n=73), were assessed.

Chronic burn-related pruritus is more common than previously reported and psychological factors such as anxiety-related personality traits and coping are significantly associated with its presence.

Only a small group of former patients with work-related accidents were not working an average of nine years after injury. The unemployed reported more pain and worse perceived health, particularly in psychosocial domains.

Returning to work was explained by both injury severity and personality characteristics. Those who were not working had lower health-related quality of life and poorer traumarelated physical and psychological health, and more pain.

Preburn psychiatric morbidity is high in a lifetime perspective. Two thirds of the sample had at least one disorder according to the Structured Clinical Interview for DSM-IV Axis I disorders. Affective disorders were especially highly represented. A logistic regression showed that having a history of preburn disorders was associated with a higher risk of both PTSD and depression one year after the injury. In this material it was actually uncommon for a patient without a preburn psychiatric history to develop postburn psychiatric symptomatology.

The results have strengthened the overall model for adaptation after burn injury by showing that psychological factors and psychiatric history are important moderators of the adaptation process after the injury.

Keywords: Burns, Coping, Depression, Health Status, Outcome assessment, Personality, Post-Traumatic Stress Disorder, Psychiatric Disorders, Pruritus, Rehabilitation, Injuries

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To my parents Bo and Greta
List of publications

This thesis is based on the following papers, which are referred to in the text by their Roman numerals:


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Introduction

The burn injury

A burn injury implies damage to or destruction of living tissue, in the overwhelming majority of cases the skin, by thermal, chemical, electrical radiation energy or combinations thereof. When the skin is seriously damaged, the properties of that tissue are lost, the barrier function is destroyed and the internal milieu is exposed to and affected by threatening surroundings. A severe burn injury, where larger areas of the skin are destroyed, is a life threatening state, and the consequences include fluid and electrolyte imbalance, metabolic disturbances, bacterial contamination of tissues, and complications in all major organ systems; see reference (66). The severity of a burn injury is a function of both the characteristics of the burn injury itself and of factors related to the individual. Such factors include the proportion of the body surface that is damaged, location of the injury, depth of the injury, age at injury, presence of associated injuries, and coexisting illnesses.

The treatment of burn injuries commences with a period of specialised intensive care during which wound care and surgical treatment are carried out in parallel. Management of pain and anxiety related to the accident, and to care procedures, are main challenges during this phase of care. For the severely injured, this first period is just the beginning of a long journey involving adaptation to a life post burn.

Rehabilitation of the patient starts on the day of injury and comprises measures that are also undertaken during the phase of very specialised and technologically focused intensive care. Active surgical treatment of wounds and scars, as well as physiotherapy and occupational therapy, continue long after the patient has left the intensive care unit and are part of the process of regaining functional capacity. Along with this physical approach, psychological and psychosocial issues are actively addressed in order to identify and treat severe comorbid conditions such as posttraumatic distress disorder (PTSD), mood and substance use disorders, and less pronounced psychological problems that may interfere with adherence to various rehabilitation measures.

Potential late problems include complications such as restrictions in range of motion and in muscle strength, changes in appearance, psychological disturbance, and, occasionally, widespread social and environmental dislocation (52).
Epidemiology of burns

Viewed globally, burn injury is one of the leading causes of trauma death and one of the 30 leading causes of loss of years worldwide due to premature mortality and years lived with disability (102). There are large differences between countries with respect to the incidence of burn injuries. In general, industrial countries have lower incidences than developmental countries. This is not unexpected, as the number of burns in a country reflects the amount of exposure to risky situations. In developmental countries, open fires in households are extremely common and constitute a predominant cause, as do inadequately developed workplace safety regulations.

It is in fact difficult to find reliable data regarding the true incidence of burns in different countries, especially in the third world, but all available data indicate that the incidence is considerably higher in developing than in developed countries and that the types of burn problems also differ (9, 40, 85, 100).

The incidence of hospital admissions for burns in the UK is approximately 21/100 000 (6). The figures for Canada and the US range between 19 and 26 admissions/100 000 (121), while the incidence is 25/100 000 in New Zealand (155) and 31/100 000 in Italy (15). In Sweden the incidence of severe burn injuries that need hospital care was 14 patients/100 000 inhabitants in 2002, or approximately 1300 patients per year (144). Possible reasons for the low figure, from an international standpoint, in Sweden include well developed legislation focusing on preventive measures, well developed preventive social health care, and a fairly even economic standard within Swedish society.

Many accidents occur as a result of workplace accidents, and in a recent review 23 % of the injuries in adult samples were work-related (44).

There is a definite trend toward a decrease in the number of burn injuries over time (5), and comparisons between different countries and different years should therefore be made with caution.

Psychosocial risk factors for burn injury

"Normal people don’t get burned" is a widely used saying in the English speaking burn community (128) implying that people who are afflicted by burn injury always have similar underlying social factors or backgrounds. Although this is a great exaggeration, it is clear that the risk of being burned is considerably higher in some individuals. Thus rates of injuries related to house fires in the US are highest in the elderly, minorities, non-whites and in general those with low socioeconomic status (14, 69). Both smoking and alcohol use are related to the risk of being burned (13). Several UK studies show that the community distribution of burn injuries is related to the socio-
economic characteristics of that area of residence (97, 123). People who are underprivileged are also at higher risk in less well-off countries where this issue has been studied (39, 41, 165).

**Premorbid psychopathology**

Psychiatric disorders are common in the histories of burned patients, and the prevalence of such disorders has been reported to be 28% to 75% (112). In a study from 2003, Patterson et al (113) observed that burn patients had higher psychological distress than a non-burned normative sample, even after excluding those with a formal preinjury psychiatric diagnosis. In two studies by Fauerbach and colleagues (48, 49), the lifetime prevalence for any DSM-III-R axis I diagnosis was 64%, for affective disorder it was 31%, and for alcohol abuse or dependence it was 41%. This can be compared to population-based figures obtained in two recent epidemiological studies, an American study by Kessler et al from 1994 (73), and a Norwegian study by Kringlen et al from 2001 (84), where the lifetime prevalences for any psychiatric disorder were 48% and 52%, respectively, for depression they were 17% and 18%, respectively, and for alcohol abuse or dependence they were 24% and 23%, respectively.

In many patients with pre-injury psychiatric disorders, it seems that the disorder in question has contributed significantly to the aetiology of the injury itself (106, 120, 126). Furthermore, patients with a pre-injury psychiatric history are more likely to have preventable injuries, require longer hospitalisation and have problems with adjustment early in their recovery (25, 112, 120, 153).

Self-inflicted burns account for about 4% of burn injuries worldwide (67), with wide variations from 0.4 to 14% (96, 158) and there are indications that the numbers are increasing (157).

**Rehabilitation and adaptation**

The goal of rehabilitation efforts after a major burn is to support the natural adaptation process in order to obtain as good an end result as possible in the widest sense.

WHO has chosen to include the concept of rehabilitation in its International Classification of Impairments, Disease and Handicaps (2). A strict definition was produced by a WHO expert Committee in 1981, and is as follows:

Rehabilitation includes all measures, aimed at conditions, and at enabling the disabled and handicapped [person] to achieve social integration. Rehabilitation aims not only at training disabled and handicapped persons to adapt to
their environment, but also at intervening in their immediate environment and society as a whole in order to facilitate their social integration. The disabled and handicapped persons themselves, their families, and the community they live in, should be involved in the planning and implementation of services related to rehabilitation (70).

A burn trauma exposes the individual to significant physical, psychological and social demands. In follow-ups 14 to 24 months after injury, about 90% of patients report physical complaints, with reactions from scars, pain, pruritus, heat sensitivity and loss of strength being the most common (145). In studies of perceived health, psychological health is often rated as inferior to physical health (20, 130). However, in a recent Swedish study it was found that nine years on average after injury, heat sensitivity and work-related problems were most pronounced. In addition, women reported a worse outcome in general than men (79).

While it is reasonable to expect patients with major burns to be at risk, even minor burns can result in significant psychological distress (151). Adaptation after burn injury is thus a complex process, and the burned area and its localisation predict perceived outcome to only a small extent (80, 146, 151). Other factors such as personality traits (51, 80), coping strategies (170), and body image dissatisfaction (47) have been found to be associated with an increased risk for psychological distress following burn injury.

Health status and outcome

WHO has not only defined health as an “absence of disease or infirmity”, but also as “a state of complete physical, mental and social well-being” (1). This definition makes health an all-embracing concept that includes an infinite number of aspects that are very difficult to measure in a manageable way. A corollary to this is that the term health will have different meanings in different contexts. Another consequence is that the assessment of health, irrespective of context, is difficult to perform in a sufficiently compact manner without systematically leaving out important information. Furthermore, attempts to assess health will not measure health as defined above, but deviations from health in one or more dimensions. Such attempts to assess deviations from health can be described in terms of “health status”, as an assessment of how a person feels and functions and the impact of an illness on the person’s ability to participate in life.

Health-related quality of life

The concept “health-related quality of life” includes health status, as well as the person’s satisfaction with his or her current health status (161).
An increasing variety of different measurements and variables are accessible for this purpose (59); some are disease or population specific, while others are more general or generic measures, e.g. Short Form 36 Health Survey (SF-36) (142, 162, 163), which are aimed to be used across different patient populations. A widely used instrument to assess burn specific health is the so-called Burn Specific Health Scale (BSHS) (20). BSHS has been revised several times since first being published in 1982. An abbreviated version, BSHS-A, was published in 1987 (101), and a subsequent revised version, BSHS-R, in 1994 (21). The latest revision, Burn Specific Health Scale-Brief (BSHS-B), was published by our research group in 2001 based on previous validation studies and a psychometric process (78). A long-term follow-up of health status in burn patients using the BSHS-B has shown that most patients report few or no health problems, while a small group of patients have severe health problems. The most common health problems were associated with working ability and with the skin in terms of heat sensitivity (79). When health-related quality of life was assessed using the SF-36, burn patients did not differ from a normal population 2-10 years after the injury (10). This suggests that disease specific and generic measures capture somewhat different health aspects.

Return to work

A central measure of adaptation and reintegration into the community is return to work. Return to work is therefore a goal of its own in different adaptation programs following various diseases and injuries. Return to work is a definite turning point for an afflicted individual and requires certain physical and emotional strengths, but it is also a measure of basic health that can be compared between different groups. The measure is, however, not uncomplicated, since it is not solely affected by the impact on physical and emotional health of the injury or disease that is the focus of the assessment. Other factors like socioeconomic background, general education, the individual’s occupational training, and the current business cycle in society are also of importance. In spite of the relevance of return to work as a measure of successful adaptation after injury, two recent reviews (44, 156) concluded that research on burn injuries and return to work is rather scanty.

The proportion of injured individuals observed to have returned to work is of course dependent on how long after injury data are collected. In a follow-up on average nine years after severe burn injury, Kildal et al (79) found that 58% of the men and 35% of the women were working, and also that those who were working had significantly better perceived health. Wrigley et al (180) reported that 50% were employed one year after burn injury. They also found that the strongest predictor of returning to work was being employed prior to the injury. In a study by Brych and colleagues (28) comprising injured individuals who were employed prior to the burn, 66% of the patients
had returned to work at six months and 90 % at 24 months. They also found that the probability of returning to work was reduced by the presence of a psychiatric history and by extremity burns and that it was inversely related to the extent of the burn. A recent review concluded that the proportion of patients returning to their preburn employment varied between 52% and 90 % in different studies (156).

In a community integration study where “productivity” in terms of work, school or volunteer activity was determined, there was an association with age of the patients, severity of the burn and pre injury job satisfaction (43). Fauerbach et al (50) found, in line with both Brych et al (28) and Wrigley et al (180), that preburn psychiatric history was related to employment at the time of injury, and injury severity, and that preburn work status and preburn psychiatric history alone, and in combination, could predict postburn work status. Hence there is interplay between injury severity and psychosocial factors regarding return to work, which is also reported in the review by Esselman et al (44). These authors concluded that there is evidence that the severity of the burn injury and psychological problems predict return to work, and that employment status at the time of the injury and comorbid conditions limit the success of a vocational rehabilitation program.

Pruritus

Most burn patients develop pruritus, or itch, during the rehabilitation phase, with a reported incidence as high as 87 % after discharge from hospital (176). For some individuals, pruritus is the dominating health complaint after severe burn injury. Pruritus seems to be most severe in partial thickness burns; it peaks at one to two weeks, i.e. during the time period when most wounds are healing, and diminishes gradually thereafter (17). Rebuilding of the skin continues for an extended time period, and pruritus has previously been said to persist up to 18 months after the burn (64). However, the clinical impression is that some patients continue to have severe pruritus even after several years, although there is limited information about its presence long after injury. Pruritus after burn injury has been associated with some injury-related factors such as the extent of injury, time until wound closure, and burn localisation, but the underlying mechanism of pruritus is not well known.

Psychological factors have been suggested to contribute to the complaint, particularly in chronic pruritus (64, 82). In patients with atopic dermatitis, chronic idiopathic urticaria and hand dermatoses, stressful life events, emotional stress, symptoms of anxiety and depression, as well as personality factors, have thus been associated with increased pruritus (29, 61, 105, 140). It has also been shown that experimentally induced pruritus increases in healthy controls after experiencing a mental stressor (55).
Recent research reveals an increasingly complex picture where pruritus is subserved promoted by specific neural elements both peripherally and centrally and where there are many more mediators involved in addition to histamine (11, 68, 114). The currently accepted view is that central mechanisms, direct effects of stress hormones, activation of pain-inhibitory systems and conditioning of behaviour are all involved and should be considered in the treatment of prolonged problems with pruritus (114).

Psychiatric morbidity during the adaptation phase

During the immediate post-burn phase, cognitive changes such as delirium and transient psychotic reactions may occur, usually as a result of infections, alcohol withdrawal, metabolic complications, or high doses of drugs (112).

Bearing in mind that individuals who sustain a burn injury are often affected by pre-morbid psychiatric disorders, which makes them more vulnerable to post-burn psychiatric problems (see above), a number of other potential triggers for post-burn psychiatric illness must be considered. First, psychological responses to the burn trauma may not only be a result of the devastating impact of the burn injury itself, but may also be caused by what the patient has witnessed or experienced during the accident. Such experiences may elicit psychological responses that become enduring and pathological (160). Secondly, a burn injury is extremely painful, and furthermore, treatment of a burn injury involves a number of iterating, painful procedures, a feature which has been related to depression and anxiety (154). Third, burn patients are often physically isolated in order to prevent infections, something that contributes to a sense of social deprivation. Fourth, alteration in body appearance and limitations in physical functioning may add to the risk of impairment in psychic well-being (110).

In two comprehensive reviews of the literature published in 1980 and 1993, respectively, Malt et al and Patterson et al (92, 112) reported that anxiety and depression were the most prevalent disturbances in burn patients at follow-up. It was found that symptoms of depression and anxiety generally occurred together, with prevalence rates between 25% and 65% one year post burn, and that most symptoms subsided after that period (112).

Depression after burn injury

In more recent studies published after 1990 and using self-report instruments, depression prevalence rates vary between 2% (149) and 53% (166) the first month after the burn, and between 13% (175) and 34% (166) at 12 months post burn. Only a limited number of studies have used clinician-administered semi-structured interviews. In a study from the US by Faurerbach et al (49), the Structured Clinical Interview for DSM-III-R psychiatric
disorders (SCID-I) was utilised to diagnose major depression. At the time of discharge from hospital four out of 95 patients (4 %) were diagnosed with an ongoing major depression. Of those 49 patients who remained in the study at the 12-month follow-up, five (11 %) fulfilled major depression criteria. In a similar study of 45 burn patients in Greece (90), 16 % were diagnosed with a mood disorder during hospitalisation and 20 % at the 12-month follow-up. However, both studies suffered from high attrition rates.

A number of possible risk factors for post-burn depression have been examined with conflicting results, probably as a result of poor statistical power (160). Pre-morbid psychopathology was not related to symptoms of depression in the studies by Tedstone et al (151) and Williams and Griffiths (175), whereas Fauerbach et al (49) reported that pre-burn affective disorder was significantly related to post-burn affective disorder. The latter is in agreement with general trauma literature (135).

Inconsistencies have also been reported with respect to the role of burn severity and locus of burn. The extent of physical injury seems to be of minor importance (166, 175). However, when patients with premorbid psychopathology were excluded, one study reported that the presence of physical injury was the single best predictor for development of depression in a mixed sample of burn- and motor vehicle accident patients (91). In the previously mentioned study by Madianos et al (90), face disfigurement was significantly associated with the presence of psychiatric morbidity, at least during acute hospitalisation. In a study of psychosocial adjustment five years after burn injury, significantly more patients with disfigurement on the hands or face reported symptoms of depression as compared to those with no visible burns (110).

Posttraumatic stress disorder
PTSD is classified together with the anxiety disorders in the DSM (Diagnostic and Statistical Manual of Mental Disorders) nosologic system, but differs from other anxiety disorders in that it has to be preceded by a traumatic event and that exposure to the traumatic event has to involve a threat to life or physical integrity (3). It also has to include a moment of intense fear or helplessness. Subsequently, the affected individual must suffer symptoms of intrusion and display avoidant behaviour and hyperarousal. These symptoms must cause substantial subjective distress or functional impairment for at least four weeks. Lately, the term sub-threshold or partial PTSD has been used in order to fully cover those individuals who suffer from posttraumatic symptomatology, but without fulfilling all necessary criteria for full PTSD. The reason for this is based on criticism that the PTSD concept is too restrictive, since a number of individuals who do not fulfil diagnostic criteria for full PTSD will exhibit clinically significant levels of impairment (103). It has also been suggested that individuals who at one point exhibit some but
not all criteria for PTSD are at risk for later development of a complete PTSD (31).

Acute stress disorder (ASD) was introduced into the DSM-IV in 1994 (3). The current diagnostic criteria for ASD are similar to the criteria for PTSD, although the criteria for ASD contain a greater emphasis on dissociative symptoms, and the diagnosis can only be given within the first month after a traumatic event. The inclusion of ASD in the DSM-IV was not accompanied by extensive research, and some debate exists regarding whether the diagnostic criteria accurately reflect pathological reactions to trauma that occur within the first month after a trauma (27).

Much research has focused on PTSD in burn populations since specific diagnostic criteria were included in the DSM-III. In a review by Baur (16) comprising studies between 1986 and 1996, the prevalence rates of PTSD in adult burn populations varied between 31 % and 45 %. In more recent studies using self-report instruments, frequencies vary between 2 % (149) and 26 % (159) within the first month post burn and between 13 % (175) and 33 % (145) at the 12-month follow-up. Using the SCID-I methodology, Fauerbach et al (49) reported a prevalence of 8 % at discharge from hospital and 20 % at the 12-month follow-up. Similar findings were obtained from the study by Madianos (90) who reported a prevalence rate of 18 % within the first month post burn and 20 % at the 12-month follow-up.

Not unexpectedly, the figures for sub-threshold PTSD after burn injury are higher than those reported for full PTSD (51, 111).

A high comorbidity between PTSD and depression has been described both in burn patients and other trauma populations (75, 91, 107), and questions have been raised regarding whether PTSD and depression are separate disorders in the aftermath of trauma or part of a single general traumatic stress construct (107).

The risk factors for developing PTSD after a burn injury have been addressed by several studies. Fauerbach et al (49) found that pre-burn affective disorder, but not anxiety disorders, increased the risk of post-burn PTSD, whereas Perry et al (116) reported that subjective emotional distress and perceived social support after injury were related to the development of PTSD. In a study by van Loey et al (159), PTSD symptoms were predicted by anxiety measures and objective factors such as female gender, locus, and severity of injury. In another study, cosmetic disfigurement was related to the manifestation of PTSD symptoms of avoidance and emotional numbing in females injured by burn (58). Furthermore, personality traits have been related to PTSD after burn. A study by Fauerbach et al (51) indicated that neuroticism was higher and extraversion was lower in patients who developed PTSD compared with those who did not develop PTSD. In addition, a study from our group revealed that coping style, life threat during the accident, and early symptoms appeared to be strong predictors of PTSD symptoms at three months after burn injury (169). Finally, screening for night-
mares seems to be a simple tool to identify individuals at high risk of having PTSD symptomatology (88).

**Personality**

A major function of personality is to solve major life tasks – the problems that confront individuals in everyday life – such as developing the capacity for satisfying relationships and establishing meaningful goals (30). Assessment of various aspects of personality has become increasingly meaningful, since recent research has shown that personality traits are important predictors of health and treatment outcome. According to WHO, personality is defined as “the ingrained pattern of thought, feeling, and behaviour characterising an individual’s unique lifestyle and mode of adaptation, and resulting from constitutional factors, development, and social experience” (4).

Biologically oriented personality theories tend to use a dimensional approach to classify and explain human behaviour. The three-factor model, proposed by Eysenck, suggests that personality is a hierarchical structure in which a large number of specific traits are organised into three higher-order factors, Extraversion, Neuroticism and Psychoticism (45). The five-factor approach has arisen from two different traditions, a lexical analysis of the natural language and psychometrics of personality measures (71). The currently most studied product of this approach is Costa and McCrae’s five-factor model of Neuroticism, Extraversion, Openness to experience, Agreeableness, and Conscientiousness (35).

According to the major Scandinavian personality theorist, Henrik Sjöbring, personality is conceived in terms of independent constitutional factors which are normally distributed. He postulated three such personality variants which he labelled Validity, Stability and Solidity (137). Partly based on the theories of Sjöbring, as well as on other theories on biologically based dimensions of personality, Daisy Schalling developed the Karolinska Scales of Personality (KSP) (131, 132). The KSP were primarily designed for the purpose of operationalising and measuring constructs defining vulnerability for different forms of psychopathology. Recently, the KSP was subjected to further revision and development, thereby reducing the number of items and improving psychometric properties. Since the revisions were extensive, the new instrument was renamed the Swedish universities Scales of Personality (SSP) (63).

A vital assumption in personality research is that basic personality traits are stable over time in adulthood. Empirical evidence supports this assumption with findings of substantial rank-order stability and small changes in mean levels over time as evaluated by different personality inventories in diverse cohorts (36, 37, 62, 124, 152)
Personality traits have also been shown to be of importance in relation to burn trauma. Persons with high neuroticism and extroversion scores are more likely than others to be exposed to traumatic events (24), and individuals afflicted by burn injury exhibit such personality traits to a greater extent than a normative sample (51, 172). Furthermore, personality traits have been suggested to have an important impact on long-term physical and psychological outcome (60, 80, 89, 171, 172) as well as on the use of healthcare after burn injury (167).

Coping
Coping is a complex process that is not so easily defined. It can, however, be understood from a predominant conceptual theory, the transactional view of coping. This theory by Lazarus describes coping as a psychological process that is an “ongoing cognitive and behavioural effort to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person” (86). Coping is looked upon as neither positive nor negative in itself. The health consequences are dependent upon both the specific situation and the person who uses the coping strategy. In general, “problem focused coping” has been positively associated with health, whereas “avoidant”, “self controlling” and “support seeking” strategies have been negatively associated with health (115). The findings in the burn literature are somewhat contradictory with regard to problem focused coping and support seeking (116, 151), while avoidant coping is more consistently associated with poorer health (26, 81, 122, 151, 169, 170).

Fear-avoidance
This concept originally evolved from pain research and represents fear of experiencing pain and avoiding situations that are associated with possible painful experiences (87). It has been shown to be related to poorer physical performance and self-reported disability (178). In a sample of burn patients, Willebrand et al (171) found that fear-avoidance was related to poorer self rated health and longer sick leave. In this context fear-avoidance was adapted to the burn situation and referred to fear of re-injury or harm instead of pain.
Background and aims of the study

This thesis is part of a large multidisciplinary project concerning different aspects of burn trauma conducted at the Uppsala Burn Unit in collaboration with Uppsala University. The Uppsala Burn Unit is one of two national burn units, and has the entire northern part of Sweden, approximately three million inhabitants, as its catchment area.

The project is based on the concept that the individual’s “burden”, with reference to previous psychiatric history, personality traits, coping strategies, other environmental factors and genetic disposition, interacts with the exposure to traumatic stress and the response to such stress, and that this interaction is a main determinant for the adaptation process (Figure 1).

![Diagram](image)

*Figure 1. Proposed interactions affecting adaptation after burn injury.*

The present study is based in part on previous results from the research group. In an earlier thesis (168) Willebrand developed a burn-specific instrument to assess coping, and using this she observed that avoidant coping was related to poorer perceived health status, more maladaptive personality traits, and was a strong predictor of psychological symptoms after burn injury. In another thesis, Kildal (77) developed the Burn Specific Health Scale–Brief, and in using this he demonstrated that issues related to the skin,
work and body image were important problem areas in earlier patients, but also that personality and coping affected the perceived health outcome.

The general aim of the present thesis was to gain further knowledge concerning the impact of psychosocial factors and psychiatric morbidity on short and long-term adaptation after burn injury. More specifically the aims were:

1. To describe the occurrence of pruritus after recovery from burn injuries, and to explore the possible impact of personality traits and coping strategies.

2. To investigate long-term health and work-status after work-related burns.

3. To explore personality predictors of return to work after burn injury, and investigate health outcome after burn injury in those who had returned to work versus those who had not.

4. To assess lifetime, preburn and postburn prevalence of psychiatric disorders using strict DSM-IV criteria in burn injured subjects and to assess the incidence of major depression and PTSD at one year after burn trauma.
Methodology

Participants and procedures

The papers comprising this thesis are based on three separate samples of burn patients treated in the Burn Unit at Uppsala University Hospital. Papers I and II are investigations performed in a group of former burn patients who were treated between 1980 and 1995. Paper III is based on an investigation of former burn patients who were injured between 1996 and 2000. Finally, Paper IV is a prospective study of consecutive burn patients admitted to the Burn Unit between March 2000 and January 2005. The sociodemographic and burn-related data regarding the different patient populations are shown in Table 1. In 1996, all patients treated at the Uppsala University Hospital Burn Unit from 1980 through 1995 were identified in order to assess health status (78). The inclusion criteria for this study were: 18 years of age or older at the time of follow-up, Total body surface area (TBSA) burned ≥ 10 %, or a length of stay (LOS) ≥ 7 days irrespective of TBSA burned. In all, 334 former patients were approached and a total of 248 former patients (74.3 %) returned the health survey comprising 94 items from different versions of the Burn Specific Health Scale (78) and questions concerning their current work situation. These 248 responders constituted the main group of patients in paper I and the basis for selection of participants in paper II. In order to assess personality traits and coping, all former patients who had been 15 years or older at the time of injury were approached a second time in 1999 (174). Individuals younger than 15 years at the time of injury were excluded in order to increase the likelihood that the participants had memories of the time period after hospital discharge. This selection rendered a sample of 227 former patients. Information regarding the study purpose, questionnaires and prepaid envelopes were mailed to the former patients. Reminder letters and questionnaires were sent one month later. Out of the 227 eligible patients, 161 responded (70.9 %). These patients constitute a subgroup in paper I.

The study sample in paper II comprises the patients from the abovementioned sample who had suffered from work-related burn injury. Out of the original 248 former patients, 97 (39 %) were identified as having been involved in a work-related burn accident. Eleven patients had reached
Table 1. Sociodemographic and burn-related characteristics of the participants in papers I – IV.

<table>
<thead>
<tr>
<th>Paper</th>
<th>Sample</th>
<th>Total sample</th>
<th>N</th>
<th>Response rate (%)</th>
<th>M/ F Age at injury</th>
<th>Age at investigation</th>
<th>TBSA burned</th>
<th>TBSA-FT</th>
<th>LOS (days)</th>
<th>Years since injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980-1995</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>All</td>
<td>334</td>
<td>248</td>
<td>74.3</td>
<td>199/49</td>
<td>36.8 (16.1)</td>
<td>46.1 (15.6)</td>
<td>23.1 (16.2)</td>
<td>7.4 (9.3)</td>
<td>30.8 (29.4)</td>
</tr>
<tr>
<td>I</td>
<td>Subgroup</td>
<td>227</td>
<td>161</td>
<td>70.9</td>
<td>127/34</td>
<td>38.4 (14.2)</td>
<td>47.7 (14.2)</td>
<td>24.0 (16.0)</td>
<td>7.2 (9.4)</td>
<td>29.8 (25.0)</td>
</tr>
<tr>
<td>II</td>
<td>Work-related injury</td>
<td>248</td>
<td>86</td>
<td>na</td>
<td>83/3</td>
<td>34.9 (10.4)</td>
<td>43.9 (11.3)</td>
<td>24.1 (17.5)</td>
<td>6.8 (8.2)</td>
<td>28.6 (27.5)</td>
</tr>
<tr>
<td>1996-2000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>All</td>
<td>116</td>
<td>86</td>
<td>74.1</td>
<td>63/23</td>
<td>43.3 (17.2)</td>
<td>47.0 (17.2)</td>
<td>17.1 (14.4)</td>
<td>8.0 (10.6)</td>
<td>21.8 (22.7)</td>
</tr>
<tr>
<td>II</td>
<td>Occupationally active</td>
<td>116</td>
<td>48</td>
<td>na</td>
<td>37/11</td>
<td>40.8 (10.2)</td>
<td>44.4 (10.2)</td>
<td>17.5 (15.3)</td>
<td>7.9 (11.2)</td>
<td>19.7 (21.8)</td>
</tr>
<tr>
<td>2000-2005</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>All</td>
<td>86</td>
<td>73</td>
<td>85</td>
<td>53/20</td>
<td>43.4 (15.6)</td>
<td>43.4 (15.6)</td>
<td>24.6 (19.8)</td>
<td>10.5 (14.4)</td>
<td>25.2 (28.5)</td>
</tr>
<tr>
<td>Subgroup</td>
<td></td>
<td>73</td>
<td>64</td>
<td>88</td>
<td>48/16</td>
<td>44.0 (15.9)</td>
<td>44.0 (15.9)</td>
<td>25.2 (20.7)</td>
<td>10.7 (14.7)</td>
<td>27.2 (29.9)</td>
</tr>
</tbody>
</table>

Values are means (SD). N is the actual investigated sample. M/F = males/females. TBSA = total body surface area, TBSA-FT = TBSA full-thickness burn, LOS = length of stay at the Burn Unit. na = not applicable.

1 personality and coping were assessed 11.4 (4.5) years after injury.
retirement age at the time of the health survey and were therefore excluded. Thus, the study sample in paper II includes 86 former patients.

Participants in paper III were recruited from those patients who had been admitted to the Burn Unit between January 1996 and March 2000, and were 18 years or older at the time of the investigation in October 2001. These criteria resulted in 147 former patients, of whom 19 were deceased at the time of the study, four were not Swedish citizens and did not live in Sweden, six had no registered address, and two could not participate due to dementia, as reported by relatives. A survey covering health, personality traits, coping, satisfaction with care, and sociodemographic variables including previous and current work status was sent to the remaining 116 former patients together with an information letter and a prepaid response envelope. Reminder letters and questionnaires were sent out one month later, and again after another three weeks. Eighty-six former patients (74.1 %) returned the questionnaire booklet, and 51 of these had been employed at the time of the burn injury. Three patients had retired due to age at the time of the investigation. The remaining 48 former patients constitute the study sample in paper III.

Participants in paper IV were consecutive patients admitted for treatment between March 2000 and January 2005 with the following inclusion criteria: 1) 18 years of age or older, 2) Swedish speaking, 3) without documented mental retardation or dementia, and 4) TBSA burned ≥ 5 % or LOS at the Burn Unit of more than one day. Patients who were temporarily admitted and had their main care provided elsewhere (n = 22) were not included. Eighty-six patients fulfilled the inclusion criteria. Thirteen out of them chose not to participate (n = 10) or were missed for administrative reasons (n = 3), leaving 73 patients (85 %) in the final sample. The 13 non-participants were older but did not differ from participants with respect to sex, TBSA burned, Total body surface area full thickness burn (TBSA-FT) or LOS. Sixty-four of the originally included 73 patients attended the follow-up visit at one year (88 %). Of the nine participants who left the study before one year, five declined further participation, two could not be reached, one had moved to another hospital region, and one had died. After giving their informed consent, patients were examined twice, during acute care as soon as possible after inclusion, and at 12 months after the burn. Interviews at the Burn Unit were not undertaken until patients were devoid of cognitive dysfunction when screened by the Mini Mental State Examination (MMSE) (56).
Assessments and measures

Personality traits

Personality traits (papers I and III) were measured with the Swedish universities Scales of Personality (SSP) (63). The SSP consists of 91 items grouped in 13 scales with seven items in each: Somatic Trait Anxiety, Psychic Trait Anxiety, Stress Susceptibility, Lack of Assertiveness, Detachment, Embitterment, Mistrust, Trait Irritability, Impulsiveness, Adventure Seeking, Social Desirability, Verbal Trait Aggression and Physical Trait Aggression. Each item is given as a statement with a four-point response format, ranging from 1 = “does not apply at all”, to 4 = “applies completely”. T-scores were calculated for each gender separately. The SSP has been standardised in a representative national sample and the internal consistency in terms of Chronbach’s alpha ranged between 0.59 and 0.84 (63). In paper I, Chronbach’s alpha values ranged between 0.66 and 0.85. The present data were also adjusted for age (172).

Coping

Coping was assessed by means of the Coping with Burns Questionnaire (CBQ) (173) (paper I). The CBQ was designed to measure coping after discharge from hospital, and some items are burn- or trauma-related. The CBQ consists of 33 items and six scales derived in factor analysis: Emotional Support, Optimism/Problem solving, Avoidance, Revaluation/Adjustment, Self-Control and Instrumental Action. Internal consistency is moderate to high with Chronbach’s alpha values ranging from 0.56 to 0.83 (173). The participants were instructed to think back to the time when they were discharged from hospital, to think about the problems they faced and how much they used the strategies described in each item. Items were rated on a scale of 1 = "does not apply/not used", to 4 = "used a great deal".

Fear-avoidance

Fear-avoidance (paper III) was assessed by responses on a 5-point scale to four statements:

1. My burn injury has put my body at risk for the rest of my life.
2. I can’t do the same things as other people do since there is too big a risk that I might be burn-injured again.
3. I’m afraid that I might get hurt again if I put myself in risky situations.
4. It is really not safe for a person with a condition like mine to be physically active.
Items 1, 2 and 4 were taken from the Tampa Scale of Kinesiophobia (TSK) (83) and adapted to the burn population. The TSK measures fear-avoidance beliefs and fear of (re)injury due to movement. Item 3 was constructed specifically for this sample. The answers were given on a 5-point scale ranging from 0 = “Always applicable” to 4 = “Never applicable”, with a higher score indicating a lower degree of fear-avoidance beliefs. In the statistical analysis the scores were reversed, so that a higher score indicates a higher degree of fear-avoidance beliefs. The four items had a Chronbach’s alpha value of 0.69 (134).

Health

The Burn Specific Health Scale –Brief (BSHS-B) was used to assess burn-related health in papers II and III (78). The BSHS-B is a 40-item questionnaire with nine sub-scales measuring perceived function and wellbeing. Four scales reflect psychosocial difficulties: Affect, Body Image, Interpersonal Relationships and Sexuality, and five scales reflect physical difficulties: Heat Sensitivity, Simple Abilities, Treatment Regimens, Hand Function, and Work. The items were rated on a five-point scale ranging from 0 = “extreme(ly)” to 4 = “not/none at all”. The Chronbach’s alpha values ranged between 0.75 – 0.93. (78).

In papers I and II, respectively, two questions were adopted from the Abbreviated Burn Specific Health Scale (101). Pruritus (paper I) was thus assessed based on the response to the statement “My burn itches a lot”. In paper II, pain was assessed based on the response to the statement “I have a lot of pain”. The response format for these questions was a five-step scale ranging from 0 = “extremely” to 4 = “not at all” and 0 = “all the time” to 4 = “never”, respectively.

The Short-Form 36 Health Survey (SF-36) was used to measure health-related quality of life in paper III (142). The SF-36 contains 36 items divided in eight scales: Physical Functioning, Role-Physical, Bodily Pain, General Health, Vitality, Social Functioning, Role-Emotional, and Mental Health. The first four subscales form the Physical Composite Scale and the last four form the Mental Composite Scale. The Swedish version of the SF-36 has shown adequate reliability, construct and clinical validity (117, 142).

Psychiatric symptoms and disorders

In paper III, the Hospital Anxiety and Depression Scale (HADS) was administered to assess current mood (182). The HADS is designed for use in non-psychiatric groups and it has been evaluated in several clinical populations with satisfactory reliability and validity (19, 182). The two subscales, Anxiety and Depression, have seven items each and are rated on a scale from 0 = “no symptom” to 3 = “severe symptom” (182).
Also in paper III, the Impact of Event Scale-Revised (IES-R) was administered to assess symptoms of PTSD. The IES-R contains 22 items divided into three subscales: Intrusion, Avoidance and Arousal. The items are rated on a four-step scale from 0, 1, 3 to 5 where 0 = no symptom, and 5 = a high frequency of the symptom. The IES-R has shown good internal consistency and test-retest reliability (164). In addition, the Intrusion and Avoidance subscales have demonstrated good agreement with other measures of PTSD, which suggests clinical relevance (143, 164). The IES-R total scores were used in the analyses.

The Structured Clinical Interview for DSM-IV for psychiatric disorders (SCID-I) was used in paper IV (53). This semi-structured interview is designed to be administered by a clinician or trained mental health professional. An Axis I SCID interview usually takes between one and two hours, depending on the complexity of the psychiatric history and the subject's ability to clearly describe episodes of current and past psychopathology. In the present study, the SCID-I interview was modified to assess all lifetime as well as current axis I diagnoses. Furthermore, the duration criterion for PTSD was omitted at assessment during care.

Cognitive status

The Mini Mental State Examination (MMSE) (56) was utilised in paper IV to exclude a cognitive dysfunction.

Statistical analyses

Analyses are summarised in Table 2. The SPSS statistics program was used in all the papers.

Table 2. Assessment methods and statistics used in papers I to IV.

<table>
<thead>
<tr>
<th>Paper</th>
<th>Statistical method</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Logistic regression</td>
</tr>
<tr>
<td>II</td>
<td>Mann-Whitney U-test</td>
</tr>
<tr>
<td></td>
<td>Chi-square</td>
</tr>
<tr>
<td>III</td>
<td>Mann-Whitney U-test</td>
</tr>
<tr>
<td></td>
<td>Chi-square</td>
</tr>
<tr>
<td></td>
<td>Fisher’s exact test</td>
</tr>
<tr>
<td></td>
<td>Logistic regression</td>
</tr>
<tr>
<td>IV</td>
<td>Mann-Whitney U-test</td>
</tr>
<tr>
<td></td>
<td>Chi-square</td>
</tr>
<tr>
<td></td>
<td>Fisher’s exact test</td>
</tr>
<tr>
<td></td>
<td>Logistic regression</td>
</tr>
</tbody>
</table>
Ethics

All studies were performed according to the principles of the Helsinki declaration (8) and were approved by the Uppsala University Ethics Committee.
Results

Pruritus, personality traits and coping in long-term follow-up of burn-injured patients (Paper I)

One hundred and three (42%) of the 248 individuals who responded to the first inquiry reported no burn-related pruritus, 108 (44%) reported occasional pruritus, and 37 (15%) reported persistent pruritus on average 9.3 (1-18) years after the injury. The relative number of individuals who experienced no pruritus increased over time from 21% in those investigated within four years to 56% in those investigated more than 12 years after injury (Figure 2).

![Figure 2. Occurrences of pruritus at different time intervals after burn injury: • = no pruritus; ■ = occasional pruritus; ▲ = persistent pruritus. Figures in parentheses represent total number of patients in each time interval.](image)

The 161 patients who participated in the analyses of personality and coping had a virtually identical degree of pruritus as the entire sample. Three multiple logistic regression analyses were performed in order to explain the role of personality traits, coping strategies, and individual characteristics in re-
ported pruritus. In the models, no pruritus was contrasted with i) presence of pruritus, ii) occasional pruritus = ratings of 2 (‘sometimes’) and 3 (‘seldom’) and iii) persistent pruritus = ratings of 0 (‘all the time’) and 1 (‘most of the time’).

Time since injury (-), TBSA burned (+) and the personality trait Psychic Trait Anxiety (+) together explained 16% of the likelihood of having pruritus as such. The personality trait Psychic Trait Anxiety (+), together with TBSA burned (+) statistically predicted 14% of the risk of having occasional pruritus. Finally, as much as 39% of the risk of having persistent pruritus was predicted by the personality trait Lack of Assertiveness (+), the coping strategies Instrumental Action (+) and Emotional Support (-), time after injury (+), and TBSA burned (+).

Work status and burn specific health after work-related burn injury (Paper II)

At follow-up, 71 of the 86 former patients injured at work (83 %) were again working. Of the remaining patients, nine individuals (10 %) were on sick leave or had a disability pension, and six (7 %) were unemployed. Of those at work, 21 patients (30%) reported having a better job than before the burn accident, 44 patients (62%) had the same job as before the burn injury, and six patients (8%) reported that because of burn-related factors they had changed to a less skilled job than before the accident.

There were no differences in age at investigation, time since injury, LOS or TBSA burned between those working and those not working. The mean age at injury in the non-working group was 5.6 years higher than in those who were working (p<0.05).

Those not working reported a poorer burn-specific health status in the psychosocial BSHS-B scales Body Image, Affect and Interpersonal Relationships (Table 3). In the physical scales, there was a significantly lower health score with respect to Treatment Regimens and, quite reasonably, Work, but not with respect to the scales Simple Abilities, Heat Sensitivity and Hand Function.

The non-working group also reported more problems with pain than the working group (Table 4).
Table 3. Burn-related health determined by the Burn Specific Health Scale-Brief (BSHS-B).

<table>
<thead>
<tr>
<th>BSHS-B domains</th>
<th>Working</th>
<th>Not working</th>
<th>Mann-Whitney U-test</th>
<th>z-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of subjects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>71</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple Abilities</td>
<td>3.94 (0.17)</td>
<td>3.73 (0.52)</td>
<td>1.42</td>
<td>0.16</td>
<td></td>
</tr>
<tr>
<td>Heat Sensitivity</td>
<td>2.67 (1.00)</td>
<td>2.25 (1.04)</td>
<td>1.59</td>
<td>0.11</td>
<td></td>
</tr>
<tr>
<td>Hand Function</td>
<td>3.91 (0.20)</td>
<td>3.67 (0.70)</td>
<td>1.75</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Treatment Regimens</td>
<td>3.74 (0.54)</td>
<td>3.29 (0.79)</td>
<td>2.95</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Work</td>
<td>3.18 (1.03)</td>
<td>1.90 (1.68)</td>
<td>2.78</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td>Body Image</td>
<td>3.24 (0.89)</td>
<td>2.70 (1.04)</td>
<td>2.15</td>
<td>0.031</td>
<td></td>
</tr>
<tr>
<td>Affect</td>
<td>3.63 (0.55)</td>
<td>2.95 (0.98)</td>
<td>2.79</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td>Interpersonal Relationships</td>
<td>3.84 (0.43)</td>
<td>3.30 (1.15)</td>
<td>2.08</td>
<td>0.038</td>
<td></td>
</tr>
<tr>
<td>Sexuality</td>
<td>3.72 (0.59)</td>
<td>3.33 (1.04)</td>
<td>1.62</td>
<td>0.11</td>
<td></td>
</tr>
</tbody>
</table>

Values are means (SD).

Table 4. Report of pain in working and non-working groups of previous burn patients.

<table>
<thead>
<tr>
<th>Amount of pain</th>
<th>Working</th>
<th>Not at all</th>
<th>A little bit</th>
<th>Quite a bit</th>
<th>Extreme(ly)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>71</td>
<td>46</td>
<td>12</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Not working</td>
<td>15</td>
<td>4</td>
<td>2</td>
<td>7</td>
<td>2</td>
</tr>
</tbody>
</table>

* Chi-square =14.2; p = 0.007

Return to work and health-related quality of life after burn injury (paper III)

The objective of paper III was i) to evaluate which factors are associated with the likelihood of returning to work, and ii) to investigate what differentiates the group that has returned to work from the group that has not.

Of the 48 former patients, 33 (69%) had returned to work while 15 (31%) had not.

Logistic regression analyses were performed in three steps, with return to work or not as a dependent dichotomous variable.

In step one, simple regressions were performed with burn-related, socioeconomic and psychological variables as independent variables. Those with a p-value below 0.1 were considered in subsequent logistic regressions (Table 5). Four of those were not included due to high intercorrelations (TBSA burned, LOS, Stress susceptibility and Impulsiveness).
Table 5. Variables from simple logistic regressions that were considered in subsequent analyses

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>$X^2$</th>
<th>p-value</th>
<th>To step 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury-related</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBSA burned</td>
<td>6.3</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>TBSA-FT</td>
<td>8.9</td>
<td>0.003 *</td>
<td></td>
</tr>
<tr>
<td>LOS</td>
<td>8.7</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Hand burns</td>
<td>2.9</td>
<td>0.09 *</td>
<td></td>
</tr>
<tr>
<td>Time since injury</td>
<td>3.5</td>
<td>0.06 *</td>
<td></td>
</tr>
<tr>
<td>Psychological</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychiatric history</td>
<td>5.0</td>
<td>0.02 *</td>
<td></td>
</tr>
<tr>
<td>Stress susceptibility</td>
<td>2.8</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Embitterment</td>
<td>5.6</td>
<td>0.02 *</td>
<td></td>
</tr>
<tr>
<td>Impulsiveness</td>
<td>3.7</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>Adventure seeking</td>
<td>2.9</td>
<td>0.09 *</td>
<td></td>
</tr>
</tbody>
</table>

In step two the selected injury-related variables on the one hand, and psychological variables on the other, were regressed separately (Table 6). Among the injury-related variables only TBSA-FT (Odds ratio = 0.48, CI = 0.27–0.75) and Time since injury (Odds ratio = 2.26, CI = 1.04–4.93) were significant. Among the psychological variables only Embitterment (Odds ratio = 0.93, CI = 0.87–0.99) was statistically significant. The final model subsequently found in step three included TBSA-FT (Odds ratio = 0.44, CI = 0.25–0.77), Time since injury (Odds ratio = 2.81, CI = 1.15–6.84) and Embitterment (Odds ratio = 0.91, CI = 0.83–0.99), and explained 58 % of the variation in return to work.

Those who had returned to work were compared with those who had not returned to work with respect to the following postburn variables: health status, psychological symptoms, coping strategies, fear-avoidance beliefs, care contacts and sick leave. That group had significantly higher health-related quality of life with respect to several subscales of the SF-36 instrument than the group that was not working (Table 7). Furthermore, the mean values of the non-working group were more than one standard deviation below normative Swedish means from reference (141) on the subscales Physical Functioning and Role Physical, and the Physical Composite Scale.

The former patients who had returned to work reported better burn-specific health status as assessed by BSHS-B in eight of the nine subscales (Table 8). Finally, they reported less dysfunctional beliefs as assessed by Fear-avoidance and less symptoms of PTSD as assessed by IES-R, but did not differ with respect to symptoms of general anxiety and depression.
Table 6. Stepwise logistic regressions with return to work as the dependent variable

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Effect size</th>
<th>Wald</th>
<th>p-value</th>
<th>Odds ratio</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 2: Stepwise logistic regression (forward selection)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injury-related variables</td>
<td>0.45</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBSA-FT</td>
<td>9.27</td>
<td>0.002</td>
<td>0.48</td>
<td>0.27–0.75</td>
<td></td>
</tr>
<tr>
<td>Time since injury</td>
<td>4.22</td>
<td>0.040</td>
<td>2.26</td>
<td>1.04–4.93</td>
<td></td>
</tr>
<tr>
<td>Hand burns</td>
<td></td>
<td></td>
<td>0.154</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychological variables</td>
<td>0.18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Embitterment</td>
<td>5.55</td>
<td>0.018</td>
<td>0.93</td>
<td>0.87–0.99</td>
<td></td>
</tr>
<tr>
<td>Psychiatric history</td>
<td></td>
<td></td>
<td>0.097</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adventure Seeking</td>
<td></td>
<td></td>
<td>0.274</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3: Stepwise logistic regression (forward selection)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final model</td>
<td>0.58</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBSA-FT</td>
<td>8.20</td>
<td>0.004</td>
<td>0.44</td>
<td>0.25–0.77</td>
<td></td>
</tr>
<tr>
<td>Time since injury</td>
<td>5.17</td>
<td>0.023</td>
<td>2.81</td>
<td>1.15–6.84</td>
<td></td>
</tr>
<tr>
<td>Embitterment</td>
<td>4.79</td>
<td>0.029</td>
<td>0.91</td>
<td>0.83–0.99</td>
<td></td>
</tr>
</tbody>
</table>

CI = Confidence Interval, TBSA-FT = Total Body Surface Area burned – Full Thickness, *Denotes Nagelkerke’s R².

Table 7. Comparisons between the group that had returned to work and the group that had not with respect to health related quality of life as assessed by SF-36.

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Returned to work</th>
<th>Not returned to work</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Functioning</td>
<td>91.7 (11.9)</td>
<td>55.6 (26.3)¹</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Role-Physical</td>
<td>88.6 (21.7)</td>
<td>50.0 (41.6)¹</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Bodily Pain</td>
<td>82.0 (22.9)</td>
<td>62.3 (26.5)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>General Health</td>
<td>78.0 (19.0)</td>
<td>57.6 (20.9)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Vitality</td>
<td>66.4 (24.1)</td>
<td>54.3 (23.8)</td>
<td>ns</td>
</tr>
<tr>
<td>Social Functioning</td>
<td>88.3 (18.5)</td>
<td>69.2 (26.7)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Role-Emotional</td>
<td>80.8 (37.3)</td>
<td>64.4 (46.2)</td>
<td>ns</td>
</tr>
<tr>
<td>Mental Health</td>
<td>79.2 (18.8)</td>
<td>64.0 (24.0)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>PCS</td>
<td>53.2 (7.2)</td>
<td>39.6 (9.5)¹</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>MCS</td>
<td>47.5 (13.0)</td>
<td>44.2 (13.8)</td>
<td>ns</td>
</tr>
</tbody>
</table>

SF-36 = Short Form 36, PCS = Physical Composite Scale; MCS = Mental Composite Scale. Values are means (SD). ¹ One standard deviation below normative mean from reference (141).
Table 8. Comparisons between the group that had returned to work and the group that had not with respect to burn-specific health and dysfunctional beliefs

<table>
<thead>
<tr>
<th></th>
<th>Returned to work</th>
<th>Not returned to work</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSHS-B Simple Abilities</td>
<td>3.8 (0.7)</td>
<td>2.7 (1.3)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Heat Sensitivity</td>
<td>2.3 (1.2)</td>
<td>1.3 (0.9)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Hand Function</td>
<td>3.9 (0.3)</td>
<td>2.3 (1.5)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Treatment Regimens</td>
<td>3.4 (0.8)</td>
<td>2.2 (1.1)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Work</td>
<td>3.3 (1.0)</td>
<td>0.5 (1.1)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Body Image</td>
<td>2.8 (1.1)</td>
<td>2.1 (1.0)</td>
<td>ns</td>
</tr>
<tr>
<td>Affect</td>
<td>3.6 (0.5)</td>
<td>2.5 (1.0)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Interpersonal Relationships</td>
<td>3.8 (0.5)</td>
<td>3.5 (0.7)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Sexuality</td>
<td>3.8 (0.4)</td>
<td>3.1 (0.9)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Fear-avoidance</td>
<td>0.8 (0.9)</td>
<td>1.9 (1.1)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>IES-R Total score</td>
<td>21.4 (20.2)</td>
<td>40.3 (27.4)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>HADS Total score</td>
<td>9.4 (5.9)</td>
<td>11.9 (6.8)</td>
<td>ns</td>
</tr>
</tbody>
</table>

BSHS-B = Burn Specific Health Scale-Brief, IES-R = Impact of Event Scale Revised, HADS = Hospital Anxiety and Depression Scale, SD = Standard Deviation. Values are means (SD).

Those who were at work also had less contact with a surgical clinic ($\chi^2 = 3.9$, $p < 0.05$), a psychiatric clinic ($\chi^2 = 11.2$, $p < 0.01$) or a physiotherapist ($\chi^2 = 7.8$, $p < 0.01$) directly after the injury. At assessment, they were less likely to have contact with a rehabilitation clinic ($\chi^2 = 8.7$, $p < 0.01$) or an occupational therapist ($\chi^2 = 6.2$, $p < 0.05$). They were also more likely to have had a period of sick leave that was shorter than six months ($\chi^2 = 15.4$, $p < 0.0001$).

Major depression and posttraumatic stress disorder symptoms following severe burn injury in relation to lifetime psychiatric morbidity (Paper IV)

The objective of Paper IV was to assess the presence of psychiatric disorders before and up to the burn injury using strict DSM-IV criteria, and to assess the incidence of minor and major depression as well as subsyndromal and full PTSD 12 months after injury. Furthermore, logistic regression methods were used to assess the impact of previous psychiatric morbidity on postburn depression and PTSD.

The prevalence of psychiatric disorders before and up to the burn injury as assessed by SCID-I interviews are shown in Table 9.

Forty-eight out of the 73 patients (66%) presented with at least one lifetime psychiatric diagnosis. The most prevalent lifetime diagnoses were ma-
major depression (41%), alcohol abuse/dependence (32%), simple phobia (16%) and panic disorder (16%). There was high comorbidity, and 30 out of the 48 patients with lifetime psychiatric disorders fulfilled criteria for two disorders or more.

One year after injury, 24 out of the 64 patients who completed the 12-month follow-up fulfilled criteria for minor/major depression and/or subsyndromal/full PTSD. Only four of them had no psychiatric history prior to the burn, while 20 of them did ($\chi^2 = 6.2, p = 0.013$).

Nine patients met criteria for major depression during acute care and 11 (17%) met these criteria at 12 months. Seven of them had a previous depression. Three patients met criteria for burn-related PTSD during acute care and six (9%) did so at 12 months. Only one of them was without any lifetime psychiatric disorder prior to the burn.

Table 9. Prevalence rates of psychiatric diagnoses in the 73 patients assessed in paper IV.

<table>
<thead>
<tr>
<th>Lifetime 12 months prior to the burn</th>
<th>During acute care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any affective disorder</td>
<td>31 (42%)</td>
</tr>
<tr>
<td>Major depressive episode</td>
<td>30 (41%)</td>
</tr>
<tr>
<td>Manic or hypomanic episode</td>
<td>6 (8%)</td>
</tr>
<tr>
<td>Dysthymia</td>
<td>2 (3%)</td>
</tr>
<tr>
<td>Any anxiety disorder</td>
<td>27 (37%)</td>
</tr>
<tr>
<td>PTSD</td>
<td>7 (10%)</td>
</tr>
<tr>
<td>Panic disorder</td>
<td>12 (16%)</td>
</tr>
<tr>
<td>Social phobia</td>
<td>4 (6%)</td>
</tr>
<tr>
<td>Simple phobia</td>
<td>12 (16%)</td>
</tr>
<tr>
<td>Any psychotic disorder</td>
<td>3 (4%)</td>
</tr>
<tr>
<td>Psychosis UNS</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Schizophrenia</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Schizoaffective disorder</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Any substance use disorder</td>
<td>23 (32%)</td>
</tr>
<tr>
<td>Alcohol abuse/dependence</td>
<td>23 (32%)</td>
</tr>
<tr>
<td>Drug abuse/dependence</td>
<td>4 (6%)</td>
</tr>
<tr>
<td>Eating disorder</td>
<td>3 (4%)</td>
</tr>
<tr>
<td>Maladaptive stress disorder</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>At least one Axis I disorder</td>
<td>48 (66%)</td>
</tr>
</tbody>
</table>

1 The figure includes five patients with PTSD at time of burn injury, of which three also had a burn-related PTSD during acute care.

Logistic regressions revealed that a depressive disorder at 12 months was associated with a lifetime anxiety disorder (OR = 4.9, p = 0.03). Subsyndromal or full PTSD at 12 months was predicted by a lifetime affective disorder (OR = 3.9; p = 0.03) and a lifetime substance use disorder (OR = 3.3; p = 0.05). Furthermore, having a depressive disorder or a subsyndromal or full PTSD at 12 months were both predicted by the presence of psychiatric lifetime comorbidity (OR = 8.7, p = 0.02 and OR = 4.0, p = 0.03, respectively).
Discussion

This thesis focuses on assessing the impact of psychosocial factors and psychiatric morbidity on short and long-term adaptation after burn injury.

Methodological considerations

Sample

An important issue concerns the extent to which the samples of burn patients used in the present investigation are representative of all burn injuries in Sweden and, in a broader sense, of burn injuries in countries with a social structure similar to that in Sweden. First, all samples originate from patients referred to the Uppsala Burn Unit, which according to a national agreement receives all severe burns from a region representing more than half the area of Sweden with a population of about 3 million inhabitants. The number of patients from northern Sweden who are referred to the Burn Unit in southern Sweden, i.e. the Linköping Burn Unit, is minimal. The sample can therefore definitely be considered population based.

Furthermore, all eligible patients in the three different patient samples have been included on a consecutive basis, which has lessened the risk of selection bias. The exclusion criteria have been few; two of them, being able to understand the Swedish language, i.e. the language of the self-reports, and having adequate cognitive functioning to be able to interpret the interviewers’ questions, were necessary consequences of the design of the study. Very few patients were excluded based on these criteria, which further supports the population base of the present study. The latter criterion was very formally determined in the form of either the presence of severe psychosis or dementia as revealed after direct contact with relatives or hospital charts (papers I-III), or passing the Mini Mental State Examination (paper IV). This strict requirement for excluding persons with inadequate mental resources is not common when reporting results from patients afflicted by burn injury. Not infrequently, patients with psychiatric disorders are said to be excluded without defining the criteria for such exclusions, or the consequences of such exclusions regarding the interpretations of the studies performed.

The response and participation rates in the studies are high compared to most other studies dealing with adaptation after burn injury. This is another
reflection of the good representativity of the study samples, and thus the validity of the observations that were made.

A general limitation, which is applicable to all three samples, is the relatively small sample size. The most obvious consequence is related to the limitations in statistical handling, and above all in attempting to fully utilise multivariate regression strategies.

Method

The use of self-reports is associated with a number of systematic, more or less pronounced biases. Such biases include the tendency to avoid extreme values, taking the easy way out and filling in the answers in a pattern, e.g. one under the other, a tendency to agree with statements and to give socially desirable answers (33). However, the use of self-reports is time saving, as they are easily administered. In addition, self-reports are not afflicted with systematic bias on the part of the interviewers. The self-report instruments used in the present thesis have been well validated in previous studies and have sound psychometric properties.

The use of the SCID-I interview in paper IV is definitely a strength. The SCID interview with its semi-structured questions has both the advantages of a structured questionnaire and the advantages of a clinical interview judgement. It is widely used, has become the standard for assessing the presence of the major axis I disorders by clinically experienced raters (181), and provides a solid basis for international comparisons.

A definite limitation is the fact that personality disorders, i.e. as assessed by the Structured Clinical Interview for DSM-IV personality disorders (SCID-II) (54), were not investigated in the present study. Individuals with personality disorders have an increased risk of being afflicted by burn injury, and personality disorders are also related to postburn maladjustment (112). Personality disorders have also been shown to be related to impaired mental health after other types of injuries (94) and after participation in paramilitary missions (99). Furthermore, there is a considerable comorbidity between Axis I and personality disorders (108), which was not taken into account in paper IV.

Design

The cross-sectional design and the collection of retrospective data imply some limitations.

The most obvious limitation in utilising cross-sectional data in a study is the inability to argue in terms of causality.

Another issue is the fact that recall biases cannot be neglected. The possibility that memory processes will have an effect on the reported results is particularly relevant when a long time period has elapsed since the actual
event. The retrospective assessment of coping is a limitation of paper I, as the ratings might have been influenced by selective memory processes. Previous research has shown that people can have difficulty remembering actual coping behaviours and thoughts (138). It is reasonable to presume that with time, reported coping strategies tend to represent dispositional rather than situational aspects of coping. In this material, however, there were no associations between reports of coping strategies and time after burn injury (173). The retrospective assessment of lifetime psychiatric disorders in paper IV may also have been affected by problems with recall. A comparison of cross-sectional and longitudinal data for major depressive disorder suggested that lifetime prevalence based on recall may greatly underestimate true morbidity (12).

The assessment of personality in papers I and III, however, should not be affected as much by the retrospective approach, since there is substantial empirical evidence to support the assumption that basic personality traits are stable over time, as has been discussed earlier (36, 37, 62, 124, 152).

The assessment of perceived pruritus was done with respect to “current time”. A specific limitation in assessing the relation between pruritus on the one hand, and personality and coping on the other, is that pruritus was assessed on average two years prior to assessment of personality and coping. This would relate to the above discussion of memory bias in the reporting of coping strategies and less to the evaluation of personality traits. A possible consequence is that the observed associations between pruritus and coping are weaker than what they would have been with a simultaneous assessment.

One of the studies, paper IV, utilised a prospective and longitudinal design. Although the study sample is small, the design as such implies a considerable strength and provides the possibility for claiming that some of the effects are causal in nature.

Pruritus

Although pruritus has been recognised as a common and troublesome companion of severe burn injury, there are large gaps in the literature concerning the true frequency and the natural progression of the problem. In a recent review focusing on burn rehabilitation and the state of the science the authors only mentioned the present study in reporting the frequency and perceived severity of pruritus a long time after burn injury (44). The paucity of studies makes it difficult to perform comparisons with previous results.

One of the major findings in paper I is that for a number of patients, pruritus continues to be a major problem several years after severe burn injury. This diverges from the most widespread textbook on burn care, which states that it is uncommon for pruritus to persist for longer than 18 months after injury (64). In the present study, 25 percent of individuals who were burned
still experienced persistent pruritus between four and eight years after burn injury, and 5 percent continued to perceive pruritus more than 12 years after injury.

Furthermore, the results of paper I suggest that certain personality traits and coping strategies are associated with postburn pruritus. These factors contributed to the reporting of pruritus to a similar degree as time since injury and extent of injury. The contributions of personality and coping were more pronounced in those with persistent pruritus than in those with occasional pruritus. This indicates that individuals with differing amounts of pruritus could be thought of as comprising separate subgroups. One possibly interesting implication of this is that individuals in these potential subgroups might benefit from different means of support or treatment which, apart from traditional pharmacological treatment, could include biofeedback, cognitive behavioural therapy and hypnotherapy, which have been shown to be beneficial in treating pruritus due to other causes (136). The benefits of such modalities would require conventional evidence based assessments before being incorporated into established care.

Although there are not many studies in the area of burn injuries, the findings in paper I showing that psychological factors affect pruritus are supported by previous findings in other patient groups (105, 114) and, in a more general perspective, by results showing that personality factors affect different aspects of somatic ill-health (104).

Work status and return to work

Papers II and III show that the majority of former patients were working at follow-up. Return to work rate was greatest (83 %) in the group with the highest degree of selection, which also had the longest time to follow-up, i.e. patients with work-related accidents in Paper II. Return to work was somewhat lower (69 %) for the patients in Paper III who had been working before the burn, and who were on average 3.6 years postburn. These results can be compared to a previous study of the entire cohort of patients that were injured between 1980 and 1995. Here the work rate was 53% on average nine years after the injury (79). The three different results are most likely due to the degree of selection and differences in time after injury. Comparison with previous research is difficult, since the existing study samples are heterogeneous with respect to burn severity and time after injury. For instance, one Norwegian study where the majority of patients had minor burns found a work rate of 91% three to 13 years after the burn (93).

What actually predicts time off work and the ability to return to work constitutes a complex interplay of different factors. While anatomic location and burn severity seem to have their most important impact in the beginning of time off work, psychosocial and other factors may play a more important role.
role in the long run regarding ability to return to work (57, 129). This is sup-
ported in the present studies where TBSA-FT and time since injury were pre-
pdictive of return to work in the group who were injured on average 3.6 years ago (Paper III), but no differences in burn severity were found between working and non-working participants who were injured on average 9.0 years ago (Paper II).

The association between injury-related factors and return to work is sup-
ported by previous research (23, 28, 65, 129, 147). In addition, the present study found that the personality trait embitterment contributed significantly to the likelihood of returning to work. As far as can be recognised from literature searches, associations between personality-related factors and return to work have not previously been explored in burn injured patients, but comparable findings have been reported in a study of return to work after myocardial infarction (139).

The individuals who were not working reported a poorer outcome regard-
ing burn-specific health according to the BSHS-B in both Papers II and III, more pain in Paper II, and lower health-related quality of life (SF-36), more symptoms of PTSD and more fear-avoidance in Paper III. Taken together, the group that was not working had poorer perceived physical and psychological health. The finding that psychosocial morbidity is related to not returning to work has also been reported in other trauma groups (95).

The results underscore the existence of a definite psychological aspect in the poorer health of the group not returning to work. How much of this is preburn vulnerability and how much is related to the actual injury and after-care remain to be explored. Pre-injury mental health, as well as pre-injury employment, have been associated with return to work rates in previous studies (46, 50). However, the fact that the samples in both papers II and III were working before the injury should lessen the impact of preburn vulnerability.

In unselected samples of burn patients, i.e. not just working participants, poorer physical and psychosocial outcome has been associated with the personality trait neuroticism (51, 60, 80, 125, 153). However, factors other than personality traits may also be of importance. In a recent publication concerning all 86 patients who were injured between 1996 and 2000, fear-avoidance was associated with more aspects of burn-specific health than the trait neuroticism. In addition, even a moderate degree of fear-avoidance was significantly associated with longer sick leave (171). Fear-avoidance is a more specific construct than personality traits and may be more suitable as a target area in rehabilitation. For instance, it has been found that functional ability increases after cognitive behavioural therapy that focuses on reducing fear-avoidance (22, 177) or work-specific fears (179).

The psychological difficulties of the non-working patients in Paper III were not as evident when judged only by the SF-36 scores. The Mental Composite Score, which is a summary of the subscales associated with men-
tal health, showed no difference between the groups. This might indicate that the mental health items on the SF-36 are not adequate in assessing the psychological issues of burn-injured patients, and that trauma- and burn-specific instruments correspond better to the concerns in this group.

When discussing and comparing work status and return to work, great caution must be exercised because, apart from physical injury variables, a variety of factors are involved that are possible confounders, and that we have not assessed. In a recent report from the Swedish Council on Technology Assessment in Health Care (7), the following additional factors are summarised as potential predictors of sick leave: ability to control the work situation, changes in the health care insurance system and the unemployment rate in society, lower social status, divorce, and having physically demanding work. In their conclusion, the Council states that this area of research is theoretically and methodologically undeveloped. More and better studies are required in order to identify individuals who have trouble returning to a working life. As stated in the introduction, this also applies to the area of burn research.

**Psychiatric Morbidity**

Previous research suggests that patients afflicted by burn have a considerable burden of preinjury psychopathology (48, 113), and also that such psychopathology is related to hospital adjustment (18, 148) and to the success of the adaptation process (48, 49, 93, 148). However, previous investigations report a large discrepancy with respect to prevalence rates, and the study designs are often hampered by methodological problems such as the use of non-standardised measures, retrospective chart reviews and high attrition rates. The insecurity involved in interpreting previous studies was one motive for assessing lifetime psychiatric history using strict DSM-IV criteria in a population based burn sample (paper IV). The findings that two thirds of our burn patients met criteria for at least one lifetime psychiatric disorder, and half of them fulfilled criteria for at least one psychiatric disorder the year preceding the burn injury, provide further evidence that, from a mental health standpoint, burn patients should be considered a vulnerable population (113). One obvious explanation for the high rates of psychiatric morbidity in the present study is the fact that no causes of burn were excluded, and that 14 % of the sample had self-inflicted burns (Table 1 in paper IV). Even when taking this into consideration, the figures are still high, with any lifetime psychiatric disorder at 60 %, when compared to those in the general population (73, 84). Another factor that may contribute to the high burden of psychiatric morbidity is that 26 % of the patients (Table 1 in paper IV) were influenced by alcohol when injured. This would be an expected observation even if alcohol abuse were not more frequent in the injured group than in the population.
Furthermore, the cognitive effects of an ongoing depressive process may function as a distracter in situations when individuals should be extra careful and alert. Some support is obtained from the observation that individuals with both bipolar and unipolar affective disorders have approximately a doubled mortality due to accidents than would be expected (109).

The mechanism underlying the increased reporting of depression, both lifetime and the year before injury, compared to a normative sample is not revealed by the present study. A reasonable hypothesis may be related to a comorbidity between depression and vulnerable personality traits. Previous research thus suggests that personality traits such as high neuroticism and high extraversion predispose to trauma exposure (24), and individuals afflicted by burn injury exhibit such personality traits to a greater extent than a normative sample (51, 172). Neuroticism has explicitly been identified as a vulnerability factor for depression and other comorbid psychiatric disorders (76), which in turn have been found to significantly contribute to the aetiology of the burn injury itself (106, 126).

One valuable observation was that the presence of at least two different psychiatric diagnoses, i.e. psychiatric comorbidity, was a prognostic marker for an increased risk for depression as well as PTSD. This is partly supported by previous findings of great comorbidity between PTSD and depression (91, 107) and it adds to the discussion of shared vulnerability (98, 107, 118), as do the findings that depressive disorder post burn was associated with lifetime anxiety disorder and PTSD was predicted by lifetime affective disorder. A more general interpretation would simply be that individuals with psychiatric comorbidity suffer more seriously from their condition (127).

Finally, the results in paper IV point to the fact that individuals without psychiatric history when injured actually have a low risk for depression and PTSD one year thereafter. This emphasises the fact that not all individuals exposed to severe traumatic stress will develop severe problems in the form, for example, of PTSD. Actually, up to 85 % of exposed individuals do not do so (133). This information can be interpreted to mean that a specific susceptibility reflected by lifetime psychiatric morbidity, for example, is an important contributor to the complex neurobiological changes that together shape PTSD.

General discussion

The findings in this thesis that different aspects of adjustment after burn trauma are affected by both psychological variables such as coping and personality, and trauma related variables, are supported by previous reports from investigations in patients afflicted by burn injury (44, 112, 150, 160). Furthermore, the occurrence of depression and PTSD after burn trauma has been linked to various adaptation problems, e.g. pain intensity (154), return
to work (28, 50), more surgery (148) and longer length of stay in hospital (120).

The revealed importance of psychological variables regarding the adaptation process is of particular interest, since the group of individuals afflicted by burns seems to be burdened by a higher prevalence of preinjury psychiatric morbidity than in the general population (paper IV).

This actualises the issue of individual preinjury psychiatric vulnerability both as an acquired and as a constitutional shared vulnerability. The acquired component is supported by the fact that the course of depressive illness shows a tendency towards more frequent, deeper, and less stress-related episodes over time (42, 119). The concept of a genetic vulnerability for depression is supported by the observation that the short serotonin transporter gene is associated with greater risk of depression following stressful events (32).

It has been suggested that there is a shared underlying neurobiological vulnerability for both anxiety and depression (98, 107, 118). This is supported by the high comorbidity of anxiety disorders and depression. In the U.S. National Comorbidity Survey as many as 58% of the patients with major depressive disorder had a comorbid anxiety disorder (74). In addition, the personality trait neuroticism as such is an independent risk factor for developing both depression and PTSD (38, 51, 72). Neuroticism is also a known risk factor for developing both somatic and psychiatric disease as mentioned before (104).

This brings us back to the hypothetical model of the overall research project of which this thesis is a part, and which is depicted in Figure 1. The present thesis has provided support for the hypothesis that adaptation, judged as perceived pruritus, return to work and the development of depression or PTSD after injury, is affected by psychic factors. Pruritus is affected by personality and coping, return to work by personality, and, finally, depression and PTSD by preinjury psychiatric morbidity. The results, therefore, have strengthened the overall model for adaptation after burn injury and are an impetus to pursue future work using the model as an intellectual framework.

Clinical implications

The observed relations between preinjury psychological and psychiatric history and variables that describe outcome after severe injury point to the fact that clinical follow-up would benefit from an assessment of the preinjury variables in question. Those variables are currently not systematically identified during acute care. An obvious risk when omitting this assessment in routine examinations is that the burn injury itself may later be erroneously blamed for postburn psychiatric problems.

A recommendation would be to include an exploration of the patient’s psychiatric history, rather than merely looking for acute psychiatric symp-
toms, and also to include other psychological parameters like personality, coping and fear-avoidance. This would help in the early identification of those subgroups of vulnerable patients who are at greater risk of having a worse outcome after the injury. It would provide a possible tool to individualise the rehabilitation, to give active support to go back to work, and to give cognitive therapeutic support during the adaptation phase, and would also be an extra efficient filter for early screening of PTSD or depression.

Future research

In a review from 1980, i.e. 26 years ago (92), it was emphasised that future research should focus on high risk situations, high risk groups and high risk reactions. This perspective is still valid today.

The present thesis, along with other investigations on burn outcome conducted since 1980, have contributed to a slightly better understanding of which factors, individual and injury-related, are of importance for the final outcome. However, the predictive value of those factors, e.g. personality traits or the presence of preinjury psychiatric disorders, is limited regarding the outcome of individual patients. Therefore, it seems that a number of not-yet-discerned components play a considerable role in how life will be after a severe burn injury for an individual former patient. Current avenues point to the possibility that the accumulated stress exposure during the entire duration of hospital care may be related to neurobiological consequences which may impede adaptation. Furthermore, it is currently known that there are considerable individual differences in how individuals handle and respond to stressful life events. The term “resilience” can be viewed upon as a reciprocal characteristic or antonym to the concept of “vulnerability”. Resilience is a crucial component in determining the way in which individuals react to and deal with stress (34).

A basic issue that must be dealt with involves the generally small samples that characterise most previous studies on outcome after burn injury. In particular, there seems to be a more or less obvious reciprocity between sample size and attrition. A way out of this dilemma would be the use of more well developed routines for conducting multicentre based studies, particularly studies with a focus on the longitudinal course. A perspective held by the American Burn Association, as well as others, involves creating a research environment within the burn community that stimulates confidence and facilitates performing randomised clinical trials in order to define the best evidence for the care of this severely afflicted group of patients.
Conclusion

Adaptation after a major burn trauma may be influenced by a multitude of different variables including injury-related physical and psychological variables. Personality traits, coping strategies and psychiatric history, together with injury variables, have been explored here and found to affect this process in different ways.

- Pruritus is a common problem many years after burn injury. Personality traits and coping are related to the presence of pruritus after burn.

- Patients who had not returned to work after work-related burn injury and burn injury in general had more pain (work-related) and worse perceived psychological and physical health (both work-related burn injury and burn injury in general).

- Return to work after burn injury was explained by both injury-related factors and personality traits.

- Two thirds of burn survivors exhibit a history of lifetime psychiatric disorders. Those with a psychiatric history have a higher risk of post-burn psychiatric problems.
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